International Conference of Ecosystems (ICE)

Tirana, Albania, June 4-6, 2011

Proceeding Book

Essays on Ecosystem and Environmental Research

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ICE_2011, Tirana, ALBANIA, June, 4-6, 2011

Agriculture University of Tirana, Albania

Agriculture and Environment Faculty, AUT, Albania
Health and Environment Association, Tirana Albania
Journal of International Environmental Aplication Science (JIEAS),
Selcuk University, Environmental Engineering Department, Konya-Turkey

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International Conference of Ecosystems (ICE)
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Agriculture and Environment Faculty, Agricultural University of Tirana, Albania
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Journal of International Environmental Application Science (JIEAS),
Selcuk University, Environmental Engineering Department, Konya-Turkey

Tirana, 05.06.2011

Opening Remarks at the First International Conference Ecosystems, Tirana, Albania

Welcome, friends, colleagues, professors, students and guests at the International Conference of the ecosystems.
Dear Mr. Dean of the Faculty of Agriculture and Environmental, Prof. Dr. Ardian Maci
Dear Mr. Vice Minister of Ministry of Agriculture, Food and Consumer Protectio, Prof. Dr. Tokli Thomaj.
Distinguished Assoc. Prof. Dr. Sukru Dursun, Turkey.
Distinguished Prof.Dr.Massimo Zuchetti, Italy

Today, 05 June, university professors and researchers from different countries of the region have gotten together to hold the first international conference of the ecosystems.

The initiative of organizing this conference arose from a group of professors from the Faculty of Agriculture and Environment, Agricultural University of Tirana, for the purpose of collecting scientific information in the field of natural ecosystems and agro ecosystems. This initiative is supported by many professors and researchers from Albania, Turkey, Italy, Bulgaria, Macedonia, Bosnia Herzegovina, Iran, Romania, etc.

This scientific activity among regional size coincides with World Environment Day. Today around the world are people organize different events dedicated to the environment, one already is, and it is this conference. The conference conducts its work in several scientific sessions.

By once again welcoming the participation and contribution of everyone in this conference, allow me on behalf of the Organising Committee, to declare open the International Conference of Ecosystems.

*Conference welcomes, Dean of the Faculty of Agriculture and Environment, Professor Ardian MAÇI.
*Conference welcomes, vice Minister of Agriculture, Food and Consumer Protection,
Prof. Dr. Tokli Thomaj.
*Conference welcomes Prof.Dr.Massimo Zuchetti, Italy
*Conference welcomes Asoc. Prof. Dr. Sukru Dursun, Turkey

Organising Committee of the International Conference of Ecosystems,
Tirana, Albania, June 5, 2011.

International Conference of Ecosystems (ICE)
Essays on Ecosystem and Environmental Research

Organized by:

Agriculture and Environment Faculty, Agricultural University of Tirana, Albania
Health and Environment Association, Tirana Albania
Journal of International Environmental Application Science (JIEAS),
Selcuk University, Environmental Engineering Department, Konya-Turkey

Tirana, 05.06.2011

Word of greeting to the Dean of Faculty of Agriculture and Environment, Agricultural University of Tirana, Albania in the ICE conference

Dear participants in the International Conference of the ecosystems.
Dear, Professors, academic researchers and students.
Dear Vice Minister of the Ministry of Agriculture, Food and Consumer Protection.
Dear organizers of the ICE conference.

In my name, as Dean of the Faculty of Agriculture and Environment and the Rector of Agricultural University of Tirana have the pleasure to greet the audience of the International Conference of Ecosystems on the topic: Issues of ecosystems and environmental research.

Conference organized in Tirana, Albania, gives message of monitoring and evaluation to better water and terrestrial ecosystems. Each of the Balkan countries and elsewhere, face new environmental situations. These situations have various causes, including primarily non-effective use of resources in ecosystems.

Facing global climate change has made their impact on biodiversity be tangible, physical ingredients of ecosystems, the health of ecosystems, destruction of biological balances etc. The International conference of Ecosystems with the workings that will be presented, by professors as well as researchers from Albania, Turkey, Italy, Macedonia, Bulgaria, Romania, Iran, Bosnia-Herzegovina, will be a contribution in the field of ecological science.

Also, the scientific achievements and prospects of cooperation between professors and researchers at universities and research institutions of the Balkan and European partners will be reflected during the proceedings of the conference,

I believe and hope that this conference will achieve the objectives.

I wish the conference a full success.

Prof. Dr. Ardian MACI
Dean of the Faculty of Agriculture and Environment
Agricultural University of Tirana, Albania.

International Conference of Ecosystems (ICE)

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Results of the First International Conference Ecosystems, Tirana, Albania

Today we dated 05 June, university professors and researchers from different countries of the region, held the first international conference on the ecosystems. The initiative of organizing this conference arose from a group of professors from the Faculty of Agriculture and Environment, Agricultural University of Tirana, for the purpose of collecting scientific information in the field of natural ecosystems and agro ecosystems. This initiative was supported by many professors and researchers from Albania, Turkey, Italy, Bulgaria, Macedonia, Bosnia Herzegovina, Iran, Romania, USA etc.. The conference presented over 40 oral and about 170 total scientific works presentations. From presentations and discussions during the conference resulted in a high level of scientific works. Scientific organizing committee and appreciates the close of the conference that the conference reached its objectives.
First International Conference on Ecosystems, Tirana, Albania comes up with these conclusions:

- ✓ Natural ecosystems are under continuing pressure of human communities.
- ✓ The use of ecological resources in ecosystems requires constant consulting scientific communities.
- ✓ Aquatic ecosystems of lakes and rivers to be protected by the state being declared as the protected areas.
- ✓ The state institutions to establish adequate legal framework for the scientific contribution that stems from universities and scientific institutions.
- ✓ Agro ecosystem to be modeled on the basis of ecological logic balance between ecological and economic resources.
- ✓ Takes special importance in the implementation of environmental low prevent environmental pollution and ecological.
- ✓ Inter-regional cooperation in improving the scientific quality of ecosystems relay on financial support.
- ✓ Special attention to be paid to environmental education activities to school communities.
- ✓ To keep the relationship closely between the scientist and researchers in international scale to share their experience and to conduct join projects as well as to solve the environmental problems.

Organising Committee of the International Conference of Ecosystems,
Tirana, Albania, June 5, 2011

VOLUME_ I

Contents of full papers

PROCEEDING

Paper 001

The impact of natural and anthropogenic forcings on past and present global climate changes

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Abstract

Understanding and quantifying natural climate variability is a prerequisite to detect and attribute anthropogenic warming and to project future climate change. It is important to extend the evaluation of models used for climate projections through the pre-industrial period when natural variations were pronounced while anthropogenic influence was small.
In anticipating future climate change, there are three main sources of uncertainty.

1) We do not know the future anthropogenic emissions and resulting atmospheric concentrations of greenhouse gases and aerosols.
2) The response to greenhouse gas and aerosol forcing differs between various models, simulated regional climate changes being particularly model-dependent.
3) In addition to anthropogenic forcing, climate changes are induced by natural forcing (e.g., volcanoes and variations in solar activity) as well as by unforced internal variability in the climate system.

The tools most commonly adopted for projecting future climate are coupled atmosphere-ocean general circulation models (AOGCMs). These numerical models provide a comprehensive three-dimensional representation of the climate system, describing the main dynamical and physical processes, their interactions and feedbacks. They can generate regional estimates of climate in response to given changes in greenhouse gas and aerosol concentrations.
The four main relevant forcings (greenhouse gases, solar variability, volcanism, land-use change) have different time-dependence over long periods, so can be separated more effectively than for the shorter instrumental period.
The potential role of solar variations in modulating recent climate has been debated for many decades and recent papers suggest that solar forcing may be less than previously believed. Century-scale solar irradiance variations have been proposed as cause for past climatic changes. However, recently, astronomical evidence has been used to suggest that low-frequency variability of solar irradiance might be very low, possibly restricted to the range of the observed high-frequency variability.
We used a climate model to analyze past climatic responses to solar and volcanic forcing, using a solar irradiance history partially based on a recent ^{10}Be findings from Antarctica. Our results suggest that, while solar irradiance changes and volcanism were the dominant forcings in preindustrial times, their combined role has been changing over the past century. Although these natural forcing factors could be responsible for some modification of the decadal structure over the 20th century, they only played a minor role in the most recent warming. Therefore, the 20th century warming is not a reflection of a rebound from the last Little Ice Age cool period, but it is largely caused by anthropogenic forcing. A small role of solar forcing for late 20th century climate change is additionally supported by the absence of a trend in the satellite-based irradiance record covering the past 30 years.
In conclusion, our model results indicate that the range of Northern-Hemisphere temperature reconstructions and natural forcing histories (cosmogenic isotope record as a proxy for solar forcing, and volcanic forcing) constrain the natural contribution to 20th century warming to be +0.2°C. Anthropogenic forcing must account for the difference between the small natural forcings and the observed warming in the late 20th century.

1. Introduction

In anticipating future climate change, there are three main sources of uncertainty.

1. We do not know the future anthropogenic emissions and resulting atmospheric concentrations of greenhouse gases and aerosols.
2. The response to greenhouse gas and aerosol forcing differs between various models, simulated regional climate changes being particularly model-dependent.
3. In addition to anthropogenic forcing, climate changes are induced by natural forcing (e.g., volcanoes and variations in solar activity) as well as by unforced internal variability in the climate system.

Forced and unforced natural climatic fluctuations cannot be forecasted at present in a deterministic sense.
The estimate of the solar forcing time series is based on the Lean et al. [1] solar irradiance reconstruction.
The response to solar forcing is detected in hemispheric mean data only over some periods in some records (those that represent annual rather than growing season data), and appears weak.
The tools most commonly adopted for projecting future climate are coupled atmosphere-ocean general circulation models (AOGCMs). These numerical models provide a comprehensive three-dimensional representation of the climate system, describing the main dynamical and physical processes, their interactions and feedbacks. They can generate regional estimates of climate in response to given changes in greenhouse gas and aerosol concentrations; an increase of greenhouse gases tends to warm the Earth, while most aerosols have a cooling effect.
The ability of the models to simulate climate is best at large horizontal scales and is severely restricted as the scale is decreased. Therefore, any intercomparison of regional climate change from such models is likely to be most meaningful when conducted for sub-continental scale (10^6–10^8 km^2) regions. An equivalent regional subdivision has been employed by Giorgi et al. [2] and Giorgi and Mearns [3].
At smaller spatial scales (i.e., the scale of many national or local impact studies), AOGCMs may still provide useful information on climate change. However, they are not capable of capturing many features of changes in local climate, such as storms, orographic rainfall and heavy precipitation events. Other techniques are commonly adopted to obtain such high resolution information, including dynamical and statistical downscaling approaches [2].

2. Uncertainties in global forcings

There are two key sources of uncertainty in projections of future regional climate that should be considered in determining the impacts of climate change:

- Uncertainties in future emissions, which affect the radiative forcing1 of the climate system. Climate modellers have recently begun to apply a number of different emissions scenarios reported in the IPCC Special Report on Emissions Scenarios (SRES, [4]) to represent the emission-related range of uncertainty.
- An additional source of uncertainty relates to the natural variability of climate. Part of this variability is unforced, due to internal perturbations in the climate system. Another part is due to external forcing from natural phenomena such as variations in solar activity or volcanic eruptions.

The four main relevant forcings (greenhouse gases, solar variability, volcanism, land-use change) have different time-dependence over long periods, so can be separated more effectively than for the shorter instrumental period.
Climate response to solar and volcanic forcing from ice cores used in Energy Balance Models and first GCM simulations show good agreement with proxy reconstructions. Although the magnitude of solar irradiance changes is unknown, large values seem to cause climates inconsistent with climate reconstructions.
We have focused on the last millennium, a period for which the natural radiative forcings remain poorly quantified. Sensitivity studies to three different solar forcing scalings from cosmogenic isotopes were performed with the NCAR model from year 900 to year 2000. The comparison between model results, 20th century trends and northern hemisphere temperature reconstructions rules out the small and large solar forcing hypotheses (0.1% and 0.65% variations of the solar constant for the Maunder minimum) and confirms a large role of solar forcing on centennial scale temperature changes. With natural forcings only, the 20th century northern hemisphere temperature fluctuations remain below 0.2°C. The solar constant is set to 1360 W/m^2

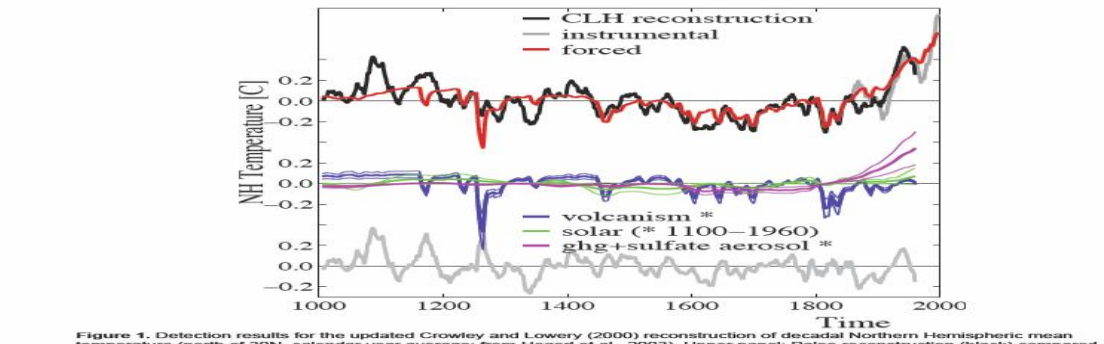

Figure 1. Detection results for the updated Crowley and Lowery (2000) reconstruction of decadal Northern Hemispheric mean temperature (north of 30N, calendar year average; from Hegerl et al., 2003). Upper panel: Paleo reconstruction (black) compared to the instrumental data (grey) and the best estimate of the combined forced response (red), middle panel: response attributed to individual forcings (thick lines) and their 5–95% uncertainty range (thin lines), lower panel: residual variability attributed to internal climate variability and errors in reconstruction and forced response. An asterisk "*" denotes a response that is detected at the 5% significance level. Results from other reconstructions are similar.

Understanding and quantifying natural climate variability on decadal to centennial time scales is a prerequisite to detect and attribute anthropogenic warming and to project future climate change. It is important to extend the evaluation of models used for climate projections through the pre-industrial period when natural variations were pronounced while anthropogenic influence was small.
The magnitude of low-frequency solar irradiance changes is highly uncertain. Tentative correlations with records of cosmogenic nuclei (10Be, 14C), sunspots, aurora histories in combination with the behaviour of solar-like stars have been used to estimate past solar irradiance. The temporal evolution of different proxy series is in reasonable agreement for the past millennium. However, the scaling required to translate a proxy record into solar irradiance anomalies is highly uncertain and published estimates of multi-decadal solar irradiance changes vary by a factor of five. Apart from changes in total solar energy output, amplification of solar forcing and changes in stratospheric ozone distribution and wave dynamics or modifications of cloud properties by variations in cosmic-radiation are under discussion.
Various Northern Hemisphere (NH), and one global, surface temperature reconstructions for the past millennium have become available. These proxy-based reconstructions are affected by uncertainties and individual studies deviate notably from each other.
However, taken together they suggest that natural low-frequency NH-temperature variations over the past millennium were within 0.3 to 0.9^{o}C. The instrumental-based temperature record shows an increase in global average surface temperature of 0.6 ± 0.2^{o}C over the 20th century.
Low-frequency solar irradiance changes were varied by a factor of 6.5 between different simulations with the NCAR coupled climate system model [5]. Simulations extended over the past 1150 years and include volcanic and anthropogenic forcing.
Three key findings emerge.

1. First, the model is able to reproduce main features of the paleo-temperature records. A clear link between the radioisotope-based solar irradiance record, NH-temperature reconstructions, and modelled temperature variations is found.
2. Second, large, low frequency solar irradiance variations are not compatible with the NH-temperature proxy records within the framework of the NCAR model. The range of model results encompass the range of reconstructed preindustrial NH-temperature variations. Given the low climate sensitivity of the NCAR model, smaller, possibly much smaller, than larger background trends in solar irradiance produce modelled climates in better agreement with the temperature proxy records.
3. Third, the cosmogenic isotope records and the NH-temperature proxy records constrain the contribution of natural climate variations to 20th century warming to be less than 0.2^{o}C. All simulations with anthropogenic forcing included match the observed temperature increase over the industrial period and simulated global average surface temperature was higher during the most recent decades than during the previous 1100 years. On the other hand, only small warming over the industrial period is found in runs with solar and volcanic forcing only. This is the case even for the high solar scaling that yields larger than reconstructed temperature variations before the industrialization.

3. The role of solar variations on climate change

The potential role of solar variations in modulating recent climate has been debated for many decades and recent papers suggest that solar forcing may be less than previously believed. Because solar variability before the satellite period must be scaled from proxy data, large uncertainty exists about phase and magnitude of the forcing.
We used a coupled climate system model to determine whether proxy-based irradiance series are capable of inducing climatic variations that resemble variations found in climate reconstructions, and if part of the previously estimated large range of past solar irradiance changes could be excluded. Transient simulations, covering the published range of solar irradiance estimates, were integrated from 850 AD to the present. Solar forcing as well as volcanic and anthropogenic forcing are detectable in the model results despite internal variability. The resulting climates are generally consistent with temperature reconstructions. Smaller, rather than larger, long-term trends in solar irradiance appear more plausible and produced modelled climates in better agreement with the range of Northern Hemisphere temperature proxy records both with respect to phase and magnitude. Despite the direct response of the model to solar forcing, even large solar irradiance change combined with realistic volcanic forcing over past centuries could not explain the late 20th century warming without inclusion of greenhouse gas forcing. Although solar and volcanic effects appear to dominate most of the slow climate variations within the past thousand years, the impacts of greenhouse gases have dominated since the second half of the last century.
There is an ongoing debate on the role of the sun in recent observed warming. Century-scale solar irradiance variations have been proposed as cause for past climatic changes (e.g., refs. 6 and 7). The latest summaries of the various uncertainties can be found in two recent reviews [8, 9]. Satellite data since 1979 quantify the irradiance variations associated with the 11-year Schwabe sunspot cycle to 0.08–0.1% of the 1,367 W/m^2 solar radiation reaching the top of our atmosphere [9]. This variation translates into a radiative forcing of 0.2–0.3 W/m^2, roughly a factor of 10 smaller than the radiative forcing by well mixed greenhouse gases (2.4 W/m^2 in 2000 AD relative to 1750 AD). Although direct measurements of solar irradiance are limited to the satellite period [9], tentative correlations with records of sunspots [10,11], aurora histories, geomagnetic indices, or the production rates of cosmogenic nuclei such as 10-Beryllium (10Be)

and radiocarbon (14C) [12, 13] in conjunction with magnetic behavior of solar-like stars [14,15] have been used to estimate solar irradiance in the past. The phase relationship between the isotopic records indicative of the sun's open magnetic field, sunspot numbers, and the sun's closed magnetic field or its total energy output is not fully understood [16]. Nevertheless, the temporal evolution of the different proxy series, particularly in certain well defined frequencies (11-year Schwabe Cycle, 80- to 85-year Gleissberg Cycle, and 207-year deVries Cycle), is in reasonable agreement across most solar proxies [8, 17], and comparisons between proxies suggest significant modulation consistent with deduced solar cycles [8]. However, the scaling required to translate a proxy record of sunspot number, or production rate of 10Be, into actual solar irradiance anomalies is highly uncertain, and published estimates of multidecadal solar irradiance changes vary by more than a factor of five [9,12]. Recently, astronomical evidence has been used to suggest that low-frequency variability of solar irradiance might be very low, possibly restricted to the range of the observed high-frequency variability [18,19]. These new estimates are lower by a factor of five or more than the upper end of previously used values [14,20]. Such low forcing from solar irradiance changes has even led to suggestions that low frequency paleoclimatic variability was not forced by solar variability.

We used a climate model to analyze paleoclimatic responses to solar and volcanic forcing, using a range of estimates of the magnitude of the solar forcing to bracket climate sensitivity to this variable. Possible transient effects of solar irradiance changes on climate have been investigated with computationally efficient models, such as Energy Balance Models [21,22] and Models of Intermediate Complexity [23,24] as well as with Atmosphere-Ocean-General Circulation Models for the 20th century [25] and the past [26,27]. Here, we employ a coupled Atmosphere–Ocean General Circulation Model in experiments covering the period of the last 1,150 years. The low-frequency solar forcing was taken from the Antarctic 10Be record of [12], following a widely accepted, but uncertain, approach also used in the most recent review of Foukal and collaborators [28]. The 10Be record was scaled to solar irradiance over much of the published range. We identify links between the solar forcing and modelled temperature as well as proxy-based temperature reconstructions.

4. Further findings on solar forcings

The solar irradiance history over the past 1,150 years was based on a recent 10Be history [12] recovered from Antarctica.

Although the annual 10Be deposition might be affected by atmospheric circulation changes, the dominant multidecadal to centennial (Maunder Minimum-type) solar modulation estimates correspond closely to independent estimates based on 14C [8] and to a recent solar irradiance reconstruction with a flux transport model of the Sun's total magnetic flux [28], and therefore are thought to represent solar variability

This finding suggests that, while solar irradiance changes and explosive volcanism were the dominant
forcings in preindustrial times, their combined role has been changing over the past century. Although these natural forcing factors could be responsible for some modification of the decadal structure over the 20th century, they only played a minor role in the most recent warming. Therefore, the 20th century warming is not a reflection of a rebound from the last Little Ice Age cool period, but it is largely caused by anthropogenic forcing. A small role of solar forcing for late 20th century climate change is additionally supported by the absence of a trend in the satellite-based irradiance record covering the past 30 years [9]. By the end of the 20th century, global temperatures simulated with natural and anthropogenic forcings included are 0.5°C warmer than if only natural factors are allowed to change after 1870 AD. A larger climate sensitivity would simply change the amplitudes but not the relative shape of the results, and thus yield a much larger than reconstructed preindustrial temperature variability for the experiment with high-scaled solar forcing. Inclusion of other forcing factors, such as absorbing aerosols as well as the indirect aerosol effect, would probably change little in the relative difference between the natural and the combined natural plus anthropogenic forcing experiments. Probabilistic approaches considering uncertainties in aerosol and other forcings indicate that 20th century anthropogenic forcing is much larger than solar forcing [29].

5. Conclusions

In conclusion, our model results indicate that the range of NH-temperature reconstructions and natural forcing histories (cosmogenic isotope record as a proxy for solar forcing, and volcanic forcing) constrain the natural contribution to 20th century warming to be 0.2°C. Anthropogenic forcing must account for the difference between a small natural temperature signal and the observed warming in the late 20th century.

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Paper 002

Global Warming and Water Stress on the World

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Abstract
There is a strong scientific evidence of the increase in the global average surface air temperature during the last century. Moreover, even though there are many uncertainties about the magnitude of the future climate change, most studies indicate that global warming is very likely in the future. Climate change is a long-term change in the statistical distribution of weather patterns over periods of time that range from decades to millions of years. It may be a change in the average weather conditions or a change in the distribution of weather events with respect to an average. Climate change may be limited to a specific region, or may occur across the whole Earth. It may be qualified as anthropogenic climate change, more generally known as global warming or anthropogenic global warming. Reasonably complete global records of surface temperature are available beginning from the last century. For earlier periods, most of the evidence is indirect-climatic changes are inferred from changes in proxies, indicators that reflect climate, such as vegetation, ice cores, sea level change and glacial geology. Increasing atmospheric concentrations of greenhouse gases, mainly carbon dioxide, have led to a warming at the surface, by nearly 0.6°C during the twentieth century, and it is widely believed that this trend will continue in the twenty-first century. Numerous empirical observations and models of the global climate confirm the hypothesis that global warming enhances the global hydrologic cycle. A global warming by 4°C is expected to increase global precipitation by about 10%. Models suggest that the increase is more likely to come as heavier rainfall, rather than as more frequent rainfalls or falls of longer duration. We saw many episodes in last few years with giving important problems at the occurring places.
Keywords: Global Warming, Water Stress, Temperature, CO2, Greenhouse, episodes.

Introduction

Water Resources

Climate change directly affects the water cycle and the quantity and quality of water resources available to meet human and environmental demands. It can lead to both floods and drought. Rising sea levels have a serious effect on coastal aquifers, a major source of urban and regional water supply systems, and higher water temperatures and changes in extremes can exacerbate many forms of water pollution. Water supply reliability, health, agriculture, energy and aquatic ecosystems will feel the impact of these changes to the water cycle. The demand for water to meet these needs is also affected by climate change. The importance of water to sustainable social and economic development cannot be underestimated, yet many countries are already facing multiple water challenges, all of them compounded by climate change.

Water in a *Changing World* shows that changes in our water resources are shaped to a great extent by a number of key externalities, among them climate change, and that decisions taken far from the conventionally defined water sector have a tremendous influence on water resources and how they are used or misused. These two principle messages of the report could not be timelier, with the challenges of climate change currently being squarely addressed and innovative responses sought with such enthusiasm. Water in a changing world describes the dynamic linkages that interconnect changes in climate, the state of our water resources, demographic expansion and migration issues, food and energy shortages, and the continuing challenge of poverty. Rather than addressing these issues in isolation, it argues that a holistic approach is crucial if we are to solve the crises we face today and avoid worse crises tomorrow.

Precipitation, Evaporation, Water Cycle:

Climate change directly affects the water cycle, and through it, the quantity and quality of water resources. It can lower minimum flows

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in rivers, affecting water availability and quality for drinking water, flora and fauna, energy production, thermal plant cooling and navigation. Climate change also creates variations in water storage and fluxes at the land surface; in storage in soil moisture and groundwater, glaciers and seasonal snow packs; in the surface water of lakes, wetlands and reservoirs; and in precipitation, runoff and evaporative fluxes to and from the land surface.
Direct impacts of climate change on the water cycle could mean that some regions will become dryer and turn into arid and semi-arid regions, or even deserts. Changes in water cycles will threaten the survival of fragile ecosystems in these regions, and consequently endanger the lives of people who depend on the natural resources that these ecosystems provide. Already today, more than 40% of the world's land resources are in dry lands that are threatened by land degradation and desertification. This has a direct impact on a quarter of a billion people, and an indirect impact on more than a billion people. The coping mechanisms used by those living with regular cycles of water scarcity are likely to become obsolete or no longer adaptive to new and changing environmental conditions.
Other regions will experience dramatic increases in disasters, such as floods caused by typhoons and hurricanes. Rainfall that exceeds the carrying capacity of the water channels can also cause flooding, threaten the infrastructure of water systems and endanger ecosystems. Changing water cycles caused by climate change will affect food production, land use and survival of plant and animal species. The development of water management strategies must, therefore, take climate change into account, as it adds to uncertainty and unpredictability in the water supply.

Migration
Drought, desertification and other forms of water scarcity are already estimated to affect as many as one-third of the world's people and are predicted to worsen, affecting consumption and migration patterns in many parts of the world. While climate change is clearly the supply-side driver affecting the availability of water resources, human demands also interact with climate change to exacerbate the pressures on the water supply. Currently the most important demand-side pressures on water arise from population growth in the early stages of a country's development and, with further development, consumption choices in the wake of rising per capita incomes. As incomes grow, people consume more – and thus more water will be needed; for instance, to produce food for tens of millions of people moving from one meal to two meals a day and/or to produce the increasing amount of meat that may be included in their diets.
Other external forces that may create either positive or negative pressures on water resources include pricing policies and subsidies for water and water-related goods, trade patterns, developments in science and technology, consumption patterns, evolution of policies and laws, social movements, and politics at global and national levels. These external forces, unlike climate change, will not create pressures directly on water management. But climate change will exacerbate the uncertainty surrounding all these development drivers, because it reduces the predictability of water resources available to fulfil the other societal and economic demands.
Managing water resources is made more difficult by a lack of knowledge and information required for decision making and long-term planning. Few countries know how much water is being used, for what purposes, nor the quantity and quality of water that is available. Few know how much water can be withdrawn without serious environmental consequences, nor the amount of finance being invested in water management and infrastructure. Climate change complicates these uncertainties.

Urgent Adaptation Strategies
One of the most pressing challenges of climate change is addressing the vulnerability of human populations, particularly the poor, to the impacts of extreme hydrologic events such as floods, storm surges and droughts. This must be done in concert with the creation of sustainable and resilient development opportunities that take into account projected climate conditions. Over the longer term, the effects of incremental climate change are likely to influence decisions about food security, energy security and land use, all with vital implications for water resource management and environmental sustainability. In this context, climate change can intensify existing pressures, thereby increasing risk, vulnerability and uncertainty.
Scarcity-low available water per capita - is forecast to worsen where population growth is still high, as in sub-Saharan Africa, South Asia and parts of South America and the Middle East. Climate change and variability will affect the poorest and most marginalized groups, making them even more vulnerable. Climate uncertainty - the inability to anticipate climate extremes - also discourages investment and innovation, and dampens the effectiveness of development efforts.
Adapting to climate change adds a critical challenge to this picture for all countries, particularly for developing countries and for cities in coastal areas. Climate models show that extremes of rainfall are likely to worsen, resulting in more floods and droughts in regions already affected - often regions with low-income levels per capita, widespread poverty, high population growth and rapid urbanization.
Adaptation capacity will vary from country to country, with developing countries having the most urgent need for adaptation strategies to be developed and/or strengthened, especially among their vulnerable populations. In poor communities where survival is the main concern, people may have few choices about how they use land and water; the perceived risks of alternatives could outweigh their potential benefits. This is why the most successful integrated rural development initiatives are taking a holistic approach and are designed to help such communities reduce risks, develop alternatives and bring trade-offs to the forefront in decision-making.

Responses to Climate Change

Adverse changes in internal, inter jurisdictional and transboundary waters can put food, social, health, economic, political and military security at risk. Some fragile states have experienced widespread conflict that has resulted in the destruction of economic infrastructure. The vulnerability of affected populations is worsened by the state's loss of control over the forces of law and order and ultimately by its loss of political legitimacy.

Investing in water systems and services is an opportunity to counter these destabilizing forces. Widespread conflict in some fragile states has destroyed much of their social and economic infrastructure. Restoring this, and renewing their institutional capacity, can help to set post-conflict nations on a path to recovery. Rebuilding after major natural disasters is also an opportunity to address long-standing infrastructure deficits.

One of the most pressing challenges that climate change brings is the vulnerability of populations, especially the poor among them, to the impacts of extreme events such as floods, storm surges and droughts. The rural poor, usually the most vulnerable and the most dependent on reliable environmental resources, represent about half of the world's population today, or 3.3 billion people. While trends indicate that by 2030, urban dwellers will make up about 60% of the world's population, a large proportion of the other 40% will continue to rely on subsistence and rain fed agriculture for their livelihoods. Climate change is likely to intensify existing pressures, increasing risk, vulnerability and uncertainty. Over the longer term, incremental climate change will impinge on decisions about food security, energy security and land use, all with implications for the management of water resources and environmental sustainability.

The number of countries and regions without enough water to produce their food is rising as populations increase. Meeting water needs during dry seasons and ensuring security of supply require water storage. Climate change will intensify climate irregularity, so that more storage will be needed to ensure the same level of security. More water will have to be kept in reservoirs as reserves for dry spells, leaving less for everyday use. But this increased need for storage is occurring at a time when pressure from users is forcing water managers to take risks and reduce carryover stocks. Many regions are not yet taking the need to store more water into account, resulting in a growing frequency of local crises during extreme drought.

The movement of water through the hydrological cycle comprises the largest flow of any material in the biosphere (Chahine, 1992). Driven by solar energy, the hydrological cycle delivers an estimated 110,000 km^3 of water to the land annually in precipitation (Speidel & Agnew 1982; L'Vovich et al. 1990; Schwarz et al. 1990). This renewable freshwater supply sustains terrestrial, freshwater, and estuarine ecosystems.

The ecological, social, and economic benefits that freshwater systems provide, and the trade-offs between consumptive and in stream benefits, will change dramatically in the coming century (Chichilnisky & Heal 1998; Wilson & Carpenter 1999; Vörösmarty & Sahagian 2000). In the past 100 yr, the amount of water withdrawn globally by humans and the land area under irrigation have risen exponentially (Figure 1). A global perspective on water withdrawals is important for ensuring sustainable water use, but is insufficient for regional and local stability. How fresh water is managed in particular basins and individual watersheds is the key to sustainable water management.

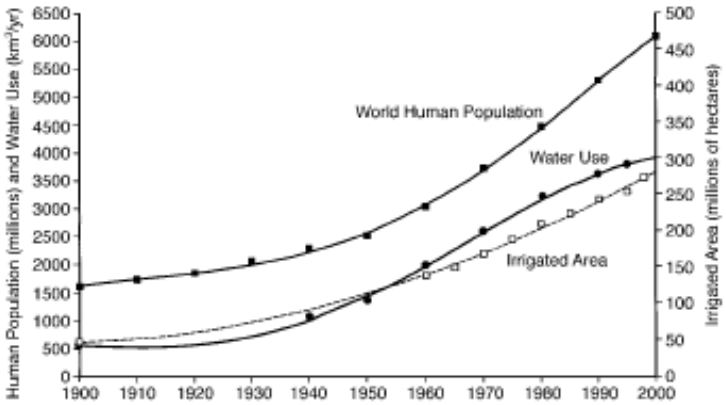

Figure 1. Global data for human population, water withdrawals, and irrigated land area from 1900 to 2000 (updated from Gleick, 1998; Jackson et al., 2001).

The goal of this report is to describe key features of human-induced changes to the global water cycle. The effects of pollution on water availability and on purification costs have been addressed previously (Carpenter et al. 1998). We focus instead on current and potential changes in the cycling of water that are especially relevant for ecological processes. We begin by briefly summarizing the global hydrological cycle: its current state and historical context. We next examine the extent to which human activities currently alter the

water cycle and may affect it in the future. These changes include ‘‘direct’’ actions, such as dam construction, and ‘‘indirect’’ ones, such as climatic change. We examine human appropriation of freshwater supply for renewable and non-renewable sources globally. The report ends by discussing changes in water use that may be especially important in the future. We highlight some current progress and suggest priorities for research, emphasizing examples for the United States.

The Global Water Cycle

Surface water

Although most of the planet is covered by water, the vast majority is in forms unavailable to terrestrial and freshwater ecosystems. Less than 3% is fresh enough to drink or to irrigate crops, and of that total, more than two-thirds is locked in glaciers and ice caps. Freshwater lakes and rivers hold 100,000 km^3 globally, less than 0.01% of all water on earth (Schwarz et al. 1990).

Atmospheric water exerts an important influence on climate and on the hydrological cycle (Shiklomanov 1989). Only 15,000 km^3 of water is typically held in the atmosphere at any time, but this tiny fraction is vital for the biosphere (Figure 2). Water vapour contributes approximately two-thirds of the total warming that greenhouse gases supply. Without these gases, the mean surface temperature of the earth would be well below freezing and liquid water would be absent over much of the planet (Ramanathan 1988, Mitchell 1989). Equally important for life, atmospheric water turns over every 10 d or so, and is the source of the earth’s precipitation.

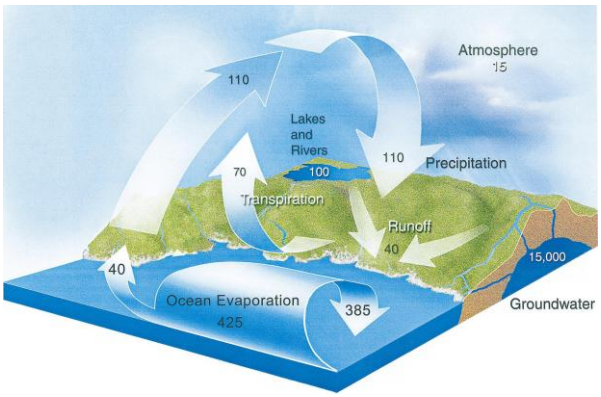

Figure 2. Hydrological cycle (Shiklomanov 1989)

Figure 2 show *hydrological cycles* the renewable freshwater cycle in units of thousands of km^3 and thousands of km^3/yr, respectively, for

pools (white numbers) and fluxes (black numbers). Total precipitation over land is; 110,000 km^3/yr. Approximately two-thirds of this precipitation is water recycled from plants and the soil (evapotranspiration is 70,000 km^3/yr), whereas one-third is water evaporated from the oceans that is transported over land (40,000 km^3/yr). Total evaporation from the oceans is; 10 times larger than the flux pictured here (425,000 km^3/yr). Groundwater holds; 15,000,000 km^3 of fresh water, much of which is not in active exchange with the earth’s surface.

Renewable fresh water comprises a subset of the solar-driven pools and fluxes in the earth’s hydrological cycle (Figure 2). Solar energy typically evaporates; 425,000 km3 of ocean water each year. Most of this water returns directly to the oceans, but; 10% falls on land. If this were the only source of rainfall, average terrestrial precipitation for the earth would be only 25 cm/yr, a value typical for deserts or semiarid regions. Instead, a second, larger source of water is recycled from plants and the soil, a direct feedback between the land surface and regional climate (Pielke et al. 1998). Important elemental cycles in these ecosystems, such as C and N, are strongly coupled to this freshwater flux, creating additional feedbacks between vegetation and climate. This recycled water contributes two-thirds of the average 70 cm/yr of precipitation that falls over land (Chahine 1992). Taken together, these two fluxes constitute the 110,000 km3/yr of renewable freshwater supply for terrestrial, freshwater, and estuarine ecosystems. Because precipitation is greater than evaporation on land, 40,000 km^3 of water returns to the oceans, primarily via rivers and underground aquifers (L’Vovich 1973, Schwarz et al. 1990). The availability of this fresh water in transit to the oceans is determined by the form of the precipitation (rain or snow), its timing relative to patterns of seasonal temperature and sunlight, and the geomorphology of a region. For example, in many mountain regions, most precipitation falls as snow during winter, and spring snowmelt causes peak flows that propagate into major river systems. Such river systems have often been modified to capture and store the pulse of spring floodwater. The retention and redistribution of this water on the landscape typically increases concentrations of ions, nutrients, and contaminants through greater contact with soils and minerals and through evaporative water losses. In some tropical regions, episodic flooding is associated with monsoons; not as much of

this floodwater is retained in dams. In other regions, excess precipitation recharges ground water or is stored in wetlands. Widespread losses of wetlands and riparian areas reduce the attenuation of high flows and enhances the transport of waterborne excess nutrients and contaminants to coastal environments (Peterjohn & Correll 1984). More than half of all wetlands in the United States have already been drained, dredged, filled, or planted (Vileisis, 1997).

The Water Cycle and Climate Change

A scientific consensus now exists that the build up of greenhouse gases in the atmosphere is warming the earth (Intergovernmental Panel on Climate Change [IPCC] 1996). The last decade of the 20th century was the warmest on record, and paleo-records indicate that the warming of the past 50 yr has no counterpart in the past 1000 yr (Crowley 2000). As the earth warms in the coming century, a general intensification of the hydrological cycle is expected to occur (Miller & Russell, 1992, Knox, 1993, Tsonis, 1996). Precipitation, evapotranspiration, and runoff are all expected to increase globally, and hydrologic extremes such as floods and droughts will probably be more common and more intense (IPCC 1996, Loaiciga, 1996). Some decreases in snow and ice cover have already been observed. Changes in biogeochemical process controlling water quality, especially C and N cycling, are likely to be coupled to these hydrological changes (Murdoch, et al. 2000).

Regional and local changes will likely be more variable and more difficult to predict. Many regions, especially temperate ones, will experience increased summer drying from greater evaporation and, in some cases, lower summer precipitation (Neilson & Marks 1994). For example, almost all general circulation models predict that southern Europe will receive less summer rainfall. In contrast, tropical regions may experience relatively small warming-induced changes in the hydrologic cycle. Uncertainties for predictions at regional scales are illustrated by large differences in future scenarios for soil moisture in the central United States, from as much as 75% drier to 30% wetter in summer, predicted by models using different assumptions and representations of hydrological processes (Hornberger et al. 2001).

Future changes in the water cycle that will be especially important for the availability of fresh water include the amount and timing of precipitation and runoff, rates of evapotranspiration, and rising sea level. Evaporative demand increases exponentially with temperature, so evaporation from the oceans and global mean precipitation should both increase as the earth warms. All general circulation models examined in the most recent IPCC (1996) assessment predict an increase in globally averaged precipitation. Recent data indicate that mean precipitation already may have increased slightly in nontropical regions (Gates 1993). Precipitation rose as much as 10–15% over the past 50 yr in the United States and Canada (Bradley et al. 1987, Lettenmaier et al. 1994) and streamflow also increased significantly during this period, especially in the eastern half of the United States (Lins and Michaels 1994).

Changes in water quantity and quality also influence habitat for aquatic biota (Naiman and Turner 2000). In aquatic ecosystems, productivity of phytoplankton and periphyton and nutrient cycling are influenced by the duration of ice and snow cover and by changes in seasonal flow regimes. Changes in C and N fluxes from rivers to coastal areas can influence fisheries by depleting oxygen in coastal waters, and may promote hazardous algal blooms that threaten human health (National Research Council 2000). The uncertainties in the predicted changes in hydrology for many regions translate to even greater uncertainties in how regional-scale biogeochemical cycles that are influenced by hydrology may change.

Conclusion

The water problems of the world's cities are manageable. But it is time to put water and sanitation high on national, regional, and international agendas. The world already has a reasonable level of knowledge, experience, and technology to solve its water problems for sustainable urban human settlements. Solutions may differ from one country to another and even from one part of a country to another, because of differing physical, climatic, economic, social, environmental, legal and institutional conditions. But in all cases, cost effective solutions will require significant additional investment funds, strong political will and appropriate capacity development at all levels.

The importance of water and the demands being placed on it to meet future challenges call for a transformation in the way water is perceived by society. Political leaders can make a start by promoting the water agenda, engaging personally in it, and identifying local water 'champions' who can promote public interest and support in the changes required.

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Paper 004

ENVIRONMENTAL EVALUATION OF THE CLOSED BASIN AS SUSTAINABLE BASIN MANAGEMENT

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ABSTRACT

Basin management requires attention to basin-wide water use efficiency and water quality management. In some circumstances, field efficiency is important because return flows degrade land and water resources. In other circumstances, any water loss is another one's recharge, and improved farm-level irrigation efficiencies often result in only theoretical, not real, water savings. Or savings in one sector are offset by wastage in another user group. An improved, customized understanding of water balances and water quality in specific basins are required, so that the benefits from often costly interventions to reduce losses are assessed in terms of the contribution to overall basin water use efficiency and water quality. Such understanding includes determining how much water can be consumptively used on a sustainable basis while still meeting environmental and other in-stream flow requirements without overexploitation of groundwater.

There are 25 main river basins in Turkey and Konya Closed Basin (KCB) is 4th biggest basin according to its precipitation area which is about 53 850 km^2. The area consists of two closed sub-basins those are referred to as Salt Lake Basin and Konya Basin. Disruption of the natural hydrological regimes and over-consumption of freshwater resources pose the principal threats to the wetlands, salt lakes and freshwater bodies. Irrigation schemes have diverted water from the streams that feed scattered freshwater resources to convert some of the salty steppes to agricultural fields. It leads to a decrease in the overall freshwater content of the lakes, wetlands and streams.

This study covers the works in the Konya Closed Basin as an example of sustainable basin management such as effective use of surface water, ground water for irrigation and water demand required by the cities in the region.

Key Words: Basin management, Konya Closed Basin (KCB), Irrigation, Water usage

INTRODUCTION

A river basin (or catchment) is the entire area drained by a river, including its tributaries. Experts agree that the best approach to conserving the world's freshwater resources is through managing river basins sustainably. It is essential to make wise choices about resource use, based on an understanding of how to maintain dynamic, living systems in the long term. Any activity that takes place in a river basin (e.g. disposal of waste water, cutting of forests) has impacts downstream. River basins are important from hydrological, economic and ecological points of view. They absorb and channel the run-off from snow-melt and rainfall which, when wisely managed, can provide fresh drinking water as well as access to food, hydropower, building materials, medicines and recreational opportunities. They also form a critical link between land and sea, providing transportation routes for people, and making it possible for fish to migrate between marine and freshwater systems. By acting as natural filters and sponges, well-managed basins play a vital role in water purification, water retention and regulation of flood peaks. In many parts of the world, seasonal flooding remains the key to maintaining fertility for grazing and agriculture (http://wwf.panda.org).

Aquatic ecosystems are closely linked together with one another and with their environment. The condition of individual ecosystems is determined by the interactions within this entire network and by anthropogenic influences. The European Water Framework Directive (The EU WFD) defines the river basin as the area of land from which all surface run-off flows through a series of streams, rivers and possibly lakes, to a particular point into the sea at a single river mouth, estuary or delta. At a closer look to the definition of the river basin given by the EU WFD, it becomes clearly that river basins have an international character and that the river basin management goes beyond the political, social or cultural boundaries.

The River Basin District is the administrative unit for river basin management and all the stakeholders within the river basin need to take an active role in this framework. According to the concept of sustainable development, it may be said that integrated river basin management represents the guarantee and the most appropriate tool to ensure the multifunctional use of water systems, paying respect to their ecological functions for the present and for the future generations. The integrated water management concept considers all the relations between the natural environment (water circuit, ecological function of water) and the human activities (socio-economic environment) that contribute to water quality deterioration, with their related elements: water demand, utilities, pollution, possibilities of recycling and reuse (Teodosiu, 2001). The integrated river basin management uses a much broader vision than traditional water management and includes pollution control and prevention, significant parts of land-use planning, agricultural policy and erosion control, environmental management and other policy areas.

The different objectives and the target areas of the two forms of management mainly give the difference between *integrated* and *traditional* water management. Traditional management focuses towards a specific and single domain of water use (water supply, pollution control, irrigation, power generation, wastewater treatment, etc) and takes care only of its specific domain. Integrated management tries to gather all these sectors into a unified framework, in which every domain has a specific importance, depending on the priorities in that river basin. All the stakeholders in the river basin district form the unified framework mentioned above. In this framework communication is the most important element, interconnecting different sectors and their specific actions (www.riverbasin.org).

Several principles are considered to be as a useful tool for the application of the integrated water management in a range of different contexts, considering also the statements in the European Water Framework Directive (Bundi, 2002):
1. *Designing water use in accordance with sustainability*. The long-term regeneration of water resources is the most important principle for all actions. New concepts and methods will include sustainability indicators and life cycle assessments.
2. *Considering the participatory decision-making processes*. The high level of complexity in water use and protection requires active and diverse participation of various interest groups, so early involvement of all groups can reduce the overall costs and shorten the planning process.
3. *Acting upon cost/benefit evaluations.* Water is accepted as an economic good and pricing is becoming an important issue. On the other hand, when evaluating different technical solutions this principle should be considered as the most important.
4. *Taking into account interactions between different spheres of interest*. The traditional antagonism between protection and usage interests of water has to be overcome and, if possible to find and apply measures in which this interest can be satisfied simultaneously.
5. *Providing flexible approaches that allow learning*. Flexible management, control and correction mechanisms are needed, since the natural and socio-economic processes are so complex, although this form of management is difficult to apply. As mentioned above, the main goal of the integrated river basin management is to ensure the "*good ecological status*" of all the water bodies within the basin, but several specific *objectives* are to be considered:
-prevention of future degradation of the environment and increasing of the quality of the aquatic ecosystems;
-promotion of sustainable development, based on the protection of available water resources; enhancing specific measures to protect the aquatic environment and minimizing the impact of pollutants on the aquatic ecosystems;
-promoting prevention and restoring measures according to the European legislation, i.e. Surface Water Directive, Bathing Water Directive, Dangerous Substances Directive, Underground Water Directive, Drinking Water Directive, Integrated Pollution Prevention and Control Directive.

The difference between a river basin and a watershed is that both river basins and watersheds are areas of land that drain to a particular water body, such as a lake, stream, river or estuary. In a river basin, all the water drains to a large river. The term watershed is used to describe a smaller area of land that drains to a smaller stream, lake or wetland. There may be many smaller watersheds within a river basin. On the other hand, an endorheic basin (also terminal or closed basin) is a closed drainage basin that retains water and allows no outflow to other bodies of water such as rivers or oceans. A terminal basin is with neither significant surface nor subsurface outflow. Water leaves the lake only through evaporation, which generally leads to higher salinity (total ionic concentration). Thus, most lakes in closed basins are either saline (total ionic concentration ›3 g/L) or are becoming so. Examples of closed basin lakes include the Aral Sea, Issyk-Kul, and Nakuru. Many lake management issues originate within drainage basins. The inflow of sediments to lakes was the most commonly cited issue for the lakes studied in the project. Introduced fauna and flora, and unsustainable fishing practices were the major issues that originated within the lakes themselves. These basins, in-lake and shoreline issues were found in both transboundary and national lakes. Global management issues were not commonly mentioned. Some issues are well-known, but have not received adequate attention, an example being dropping lake levels because of reduced groundwater flows. Other emerging issues are less well known. They include atmospheric nutrient pathways, climate change, shrinking lake size, trade globalization impacts, and environmental flows (ILEC, 2005).

MATERIALS AND METHODS

The Konya Closed Basin (KCB) covers main part of the Central Anatolia plateau and, has altitude of 950-1200 m and plain morphology. It includes 8 cities and 39 districts. Nearly 3 million people live in that basin and 45% of them are in rural areas. Density of population is 49 people per km^2 in general. Area and population of region are 7.9% and 4.5% of Turkey's area and population, respectively. In the total income of Turkey, basin supplies 9.2% income from cereals, 6.2% income from leguminous seeds and 8.5% income from industrial crops like sugar beet (www.jmo.org.tr). Also the KCB is an important area for ecosystem. The biggest lakes of Turkey are located in the KCB. The biggest freshwater lake is Beysehir Lake having area of 656 km^2 and average depth of 10 m. Second big lake is Salt Lake has an area of 1500 km^2, very shallow and is a terminal lake. It is the second most saline (32.9% salt) lake after Dead Sea in the world. Over 60% of the salt demand of Turkey supplied from Salt Lake. Other than these lakes, there are two national parks which are Beysehir Lake Park and Kizildag National Park having the area of 887.5 km^2 and 596 km^2, respectively, in the basin. (Uluatam, 1995; Pınarkaya, 2004; Tektas, 2004). The location of the KCB is illustrated in Figure 1.

Figure 1. Location of the KCB in Turkey

As revealed by analysis of its topography, the area consists of two closed sub-basins that will further be referred to as Salt Lake Basin and Konya Basin. These are two of several drainless areas of the Central Anatolian Plateau, which is itself also a closed basin (Figure 2). Each of the basins is characterized by the presence of a large lake, respectively Salt Lake and Beysehir Lake. Salt Lake is fed by three major rivers, several ephemeral streams, one man-made agricultural discharge channel and groundwater. Konya basin is fed by rivers and groundwater coming mainly from the south and by melt water and rainfall from the mountain range bordering the basin in the south. Beside the two large lakes, numerous smaller fresh water bodies, wetlands and salt steppes are present (Schipper and Schot, 2004).

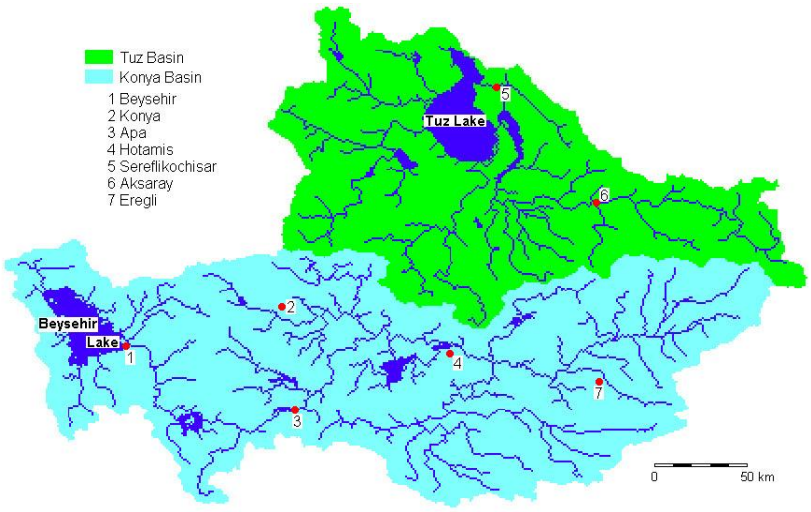

Figure 2. Salt Lake Basin and Konya Basin

RESULTS AND DISCUSSION

The Konya Plain Projects (KPP) is mainly located in the responsibility area of the fourth Regional Directorate of the General Directorate of State Hydraulics Works (DSI). It is responsible for development of land and water resources of Turkey and covers total 61,909 km^2 areas in which The Konya province have about 37,543 km^2 areas (www.dsi.gov.tr).

Surface water and ground water potential is estimated as to be 5,948.9 hm^3 per year and 1,670.9 hm^3 per year, respectively in the Konya Plain region. Agricultural land is about 2,651,178 ha in which a 1,028,830 ha may be irrigated and a 510,716 ha land can be economically irrigated. There are 11 lakes with various size, 15 dams and 19 reservoirs in the area together with 2,537.9 hm^3 water potential, totally (Cakmak and Akuzum, 1996; Cakmak, 1997; Gocmez, 2004; Celebi, 2004). Table 1 shows the surface water potential of the area.

Table 1. Annual surface water potential in the region

Name of Basins	Water Potential (hm³)	Konya (hm³)	Niğde (hm³)	Aksaray (hm³)	Karaman (hm³)
Sakarya Basin	425.5	425.5	0	0	0
Kızılırmak Basin	160.5	0	32 4	128.1	0
Konya Closed Basin	**2,537.9**	**1,694.8**	**260.7**	**304.1**	**278.3**
East Medit. Basin (Upper Göksu)	2,354.3	818.7	0	0	1,535.6
Seyhan Basin	47 .7	0	470.7	0	0
Total	5,948.9	2,9 9	763.8	432.2	1,813.9

Source: www.dsi.gov.tr

Distribution of the economically generable energy potential in the Regional Directorate according to project implementation status is as follows;
Preliminary survey and reconnaissance completed, 90,0 MW,
Under planning and final design preparation, 50,6 MW,

Final design completed and under construction, 306,5 MW,
In operation, 171,0 MW,
Total hydroelectric power potential of 618,1 MW (or 2,185,3 GWh per year) (www.dsi.gov.tr/bolge/dsi4/index.htm).

As mentioned above the KPP consists of 12 main projects including 9 big scale water projects, 2 water supply projects, energy projects, and a number of small scale surface and ground water irrigation projects. These are listed as;

1 Konya-Cumra Project,
2 Eregli Project,
3 Ilgin Project,
4 Karaman Project,
5 Ayranci Project,
6 Yunak-Akgol Project,
7 Sarayonu-Besgozler Project,
8 Aksehir-Eber Project,
9 Beysehir-Damlapinar Project,
10 Small-Scale Water Projects,
11 Konya and Karaman Cities Water Supply Projects,
12 Goksu Basin Energy Projects,

The Konya Plain area has steppe climate (there is a some temperature difference between day and night). Weather is dry and hot in the summer and severely cold in the winter. Rainfall is low and there is more snow. Flood occurs in the spring, because of melting of snow. Mean annual precipitations in Sakarya basin, Kızılırmak basin, Konya Closed Basin, East Mediterranean basin and Seyhan basin are 406 mm, 371.2 mm, 377.9 mm, 591.1 mm and 367.7 mm, respectively. Bor-Akkaya dam has the lowest mean precipitation with 224.6 mm and Beysehir-Dumanli dam has the highest mean precipitation with 1,281 mm in this region. Water and land resources development projects of the KPP are shown in Table 2 regarding with their irrigation land, water supply and energy production.

Table 2. The Projects included in the KPP

Projects	**Irrigation area (ha)**	**Water supply (hm^3/year)**	**Energy Production (GWh/year)**
Konya-Cumra Project 11 Storages, 4 HEPP	336,766		
I. Phase	57,370		
II. Phase	55,986		
III. Phase	223,410	146	147,5
Eregli Project	42,225		
Ilgin Project	17,639		
Karaman Project 2 Dams	24,700		
I. Phase	16,000		
II. Phase	8,700	22,1	
Ayranci Project	5,438		
Yunak-Akgol Project	24,520		
Sarayonu Project	5,630		
Aksehir-Eber Project	9,500		
Beysehir Project 1 dam, 3.5 km tunnel and 15.8 km derivation channel	1,020		
Small Water Projects	150,485		
Goksu Area Energy Projects 3 dams and 17 km tunnel			1,477,3

CONCLUSIONS

Some generic messages derived from literature are useful in developing a strategy about the sustainable basin management issue.

Strategies should help countries and regions move towards integrated water management and more efficient use of water resources employing the full range of policy instruments. Strategies should cover institutional, financial and technological change and promote action at all levels. The river (or water) basin should be used as the basic unit for water management. Strategies should give priority to meeting basic human needs, and take extra care to ensure access for the poor. Strategies should address the challenge of balancing the need to restore and protect ecosystems with the needs of other water users. Stakeholder participation, capacity-building, monitoring performance, and improving accountability of public institutions and private companies are all elements of an effective strategy. Strategies should respect and be adapted to local conditions.

The development of agriculture in the Anotolia is a major part of the Konya Plain Projects (KPP). The project is designed to bring along social change through agricultural development based on the management of water resources. The ultimate aims of the KPP are to complete the rural infrastructure for optimal irrigation, to supply fresh water to the cities, to ensure sustainable development in the region together with improving urban environments and quality of the city's life, creating new employment opportunities and healthy environments for human life.

Advanced technological irrigation systems (drip and sprinkler irrigation, closed pipe etc.) are necessary. In this way, it will be possible to irrigate the same amount of area by using less amount of water. In addition, water consumption in irrigation may be lessened by using better crop pattern. Water flow meters must be installed to the irrigation wells. Unregistered wells must be controlled. If possible, they must be registered or closed according to the hydro geological conditions (water balance, recharge condition of groundwater and etc.) in the basins. Groundwater used in agriculture must be priced like in drinking and domestic water consumptions. To improve the groundwater quantity conditions in these basins it is required to inspect the wells. Construction of the surface water storing structures (like dams, ponds and etc.) and use of the surface water storage systems for irrigation can decrease pressure on groundwater. Hydrological and hydrogeological investigations must be accelerated in all basins.

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Paper 010

VARIATIONS OF WEEKLY ATMOSPHERIC DEPOSITION IN ERZURUM, TURKEY

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ABSTRACT
Emissions of air pollutants is rapidly increasing mainly from antropogenic activities due to large population, a rapidly growing economy, high-energy consumption, transportation and industrialization. The two major groups of air pollutants are SOx and NOx. Their oxidations result in particulate sulfate and particulate nitrate which ultimately determine the lifetime of those pollutants in the atmosphere. Atmospheric deposition, the major removal pathway for secondary pollutants, can take place in two forms wet and dry deposition, which together is referred to as bulk deposition. This study presents the chemical composition of bulk deposition during the period of January–May 2003 in Erzurum, Turkey. The weekly bulk deposition samples were collected at three stations during period of January -May 2003. Samples were analyzed for SO_4^{-2}, NO_3^-, HCO_3^-, Cl^-, Ca^{+2}, Mg^{+2}, K^+, Na^+ in addition to pH. The pH value varied between 5.-7.9. The highest pollutant concentrations of the bulk deposition samples were determined as follows: 44,5 mg SO_4^{-2}/L, 3 mg NO_3^-/L, 26,7 mg Ca^{+2}/L, 12,7 mg Mg^{+2}/L, 5 mg K^+/L. Higher enrichment factors were found for SO_4^{-2} and NO_3^-. The source of some ionic components in the bulk deposition such as Mg^{2+} , K^+ and Ca^{2+} were found to be the terrestrial regions. Results indicated that Ca^{2+} was the dominant cation and SO_4^{-2} the dominant anion in bulk deposition samples at Erzurum. Higher correlation coefficients were obtained among the crustal ions (Ca^{+2}, Mg^{+2}, K^+). It was found a high correlations also between antropogenic ions (SO_4^{-2}, NO_3^-).

Key Words: *air pollution, atmospheric deposition, deposition rate, enrichment factor*

1.INTRODUCTION

Atmospheric deposition, the major removal pathway for secondary pollutants, can take place in two forms wet and dry deposition, which together is referred to as bulk deposition. Atmospheric deposition contributes to the chemistry of plants, soils, and surface waters, and to the cycling of nutrients in ecosystems. Therefore, the accurate quantification of wet and dry deposition is important for a wide range of ecological disciplines. Wet deposition is defined as the process by which atmospheric compounds are attached to and dissolved in cloud and precipitation droplets and delivered to the earth's surface by rain, hail or snow. Dry deposition occurs when it is not raining. Gaseous pollutants and acid aerosols are deposited when they come in contact with and stick to earth's surface. The amount of dry deposition depends on local gas and aerosol concentrations, turbulence intensities and the collection efficiency of the samplers (Staelens et al.,2005).

Several atmospheric deposition studies have been conducted in the past and present . An study on dry deposition in in Izmir (Turkey) found relatively lower enrichment factors for ambient samples and high ambient concentrations, indicating that the local soil was polluted and contributed significantly to ambient trace element concentrations (Odabasi et al., 2002). The mean value of pH in bulk deposition sampled during the summer in Alberta (Canada) varied between 4 and 6.4 (Dufour et al., 1985). In a wet deposition study in Erzurum (Turkey) during May -August mean values of pH and SO_4^{2-} were found as 6.9 and 0.11mg/L, respectively. In the same study, very high mean Ca^{2+} concentration was also observed, 70mg/L (Ocak et al., 2002a). By using Ca^{2+} as a reference element of enrichment factors, Ocak (2002b) showed in the wet deposition that Ca^{2+} was of mainly terrestrial origin. The pH of rain was less acidic (between 6.1 and 6.3) which was attributed to relatively high concentrations of alkaline particles in the atmosphere and the apparent association of SO_4^{2-} with $CaSO_4$ in Ankara, Turkey (Tuncel and Ungör, 1996; Topçu et al., 2002).

Staelens et al.(2005) compared the weekly bulk and wet-only precipitation deposition in Belgium at two sites. Averaged for both sites, bulk deposition was 129% (K^+), 84% (Ca^{2+}), 51% (Cl^-), 50% (Mg^{2+}), 46% (Na^+), 32% (SO_4^{2-}), 27% (NO_3^-), 17%(F^-), and 11% (NH_4^+) higher than wet deposition. The acidity of bulk samples was significantly ($p<0.06$) lower than the acidity of wet-only samples. Bulk NH_4^+ concentrations were only significantly ($p<0.002$) higher than wet-only concentrations at one site. Chantara and Chunsuk (2008) compared daily bulk and wet-only precipitation deposition in Thailand. The average pH of the samples from both types of collectors was 5.5. Scatter plots between log-transformed depositions of specific ions obtained from bulk and wet-only samples showed high correlation ($r>0.91$). Means of log-transformed bulk deposition were 14% (Na^+ and K^+), 13% (Mg^{2+}), 7% (Ca^{2+}), 4% (NO_3^-), 3% (SO_4^{2-} and Cl^-) and 2% (NH_4^+) higher than that of wet-only deposition. Kang et al. (2010) measured water –soluble ions (NO_3^-, NH_4^+, SO_4^{2-}) in aerosol samples collected during the period March 2002-February 2003. The geometric mean concentrations of the water-soluble ions were NO_3^- 2.98 (0.56–16.22), NH_4^+ 1.42 (0.37–6.73) and SO_4^{2-}2.47 (0.17–17.35) μg/m^3.

This work presents the maesurements and interpretations of bulk deposition collected in Erzurum during period of January-May

2003. The city is one of polluted cities in Turkey. The main source of air pollution over the city was the combustion of poor quality coal and oil for domestic heating. Main objective of this study is to examine and explain the chemical characteristics of bulk deposition in this region and to find the possible sources of the chemical constituents of the deposition.

2. SAMPLING AND METHODS

Bulk deposition includes both wet deposition and dry deposition that may fall into a collector that is kept open to the atmosphere, continually. Since bulk precipitation samplers are open at all times, an unknown fraction of gaseous and particular matter can be collected along with the rain water. Bulk deposition chemistry is very susceptible to local contamination from wind-blow dust, birds and insects,so that the choice of the sampling site is crucial. If local contamination can be disregarded, bulk deposition, probably better approximates what actually falls on the soil surface than does wet deposition (Dufour, 1985). Bulk samples were collected by using a 5L capacity polyethylene containers and a funnel of 30cm diameter in different three location in Erzurum. The collectors and funnels were mounted at a height of 2 m above the ground. This height was necessary to avoid possible sources of contamination by ground dust. The first container was used to collect bulk deposition for a one-week period. After each sampling period, the bucket was brought to the laboratory. The second container was used to collect precipitation samples. To avoid dry deposition, the lid of wet deposition collector was closed when it is not raining. Prior to installation, the bulk deposition collector was rinsed with distilled water, soaked in a nitric acid bath and then rinsed again with distilled water and dried. Six snow samples and 14 bulk samples were collected during study period. After a rain event, the sample water was removed from container and brought to the laboratory. The pH was measured immediately and then the samples were filtered with glass fiber filters (pore size 0.45 mm) and stored in precleaned polyethylene bottles in the refrigerator at 4 ^{o}C prior to chemical analysis.

For pH measurements, Hanna 8314 pH-meter, was used. Calibration of the pH-meter was always carried out before experiment, using standard buffer solutions of 4.00 and 7.00. Sulfate was determined turbidimetrically as BaSO4, with a Shimadzu UV 160-Spectrophotometer at 420 nm, providing a light path of 4–5 cm. Nitrate analysis was done in accordance with the Shimadzu Ultraviolet Spectrophotometric Screening Method at 210 nm. Concentrations of the main cations (Mg^{2+}, Ca^{2+} , Na^{+} and K^{+}) were determined with a Analyst Perkin-Elmer 360 atomic absorption spectrophotometer. HCO_3^{-} were determined by volumetric method.

The enrichment factor (EF) is a ratio used to discriminate aerosol sources (Ahmed et al., 1990; Akkoyunlu and Tayanç , 2003). This calculation, based on the elemental ratio found between ions collected in the atmosphere or in precipitation compared with a similar ratio for a reference material, provides important information on the sources of the elements of concern. In this work, an enrichment factor using a reference soil was calculated by Eq. (1) :

$$EF= (X/C)_{precipitation}/(X/C)_{reference\ material} \quad (1)$$

Where X is the concentration of the ion of interest and C is the concentrations of the reference ion.

3. RESULTS

Figure 1 illustrates pH values of 14 bulk deposition samples collected in Erzurum. pH of the individual weekly samples of the bulk ranged from 5 to 7.9 with an average of 6.6, that is higher than the neutral pH of 5.6. Strong acidic events, having pH 5 were experimented in 14-21 January 2003, and strong alkali events, having pH 7.9, took place in 14-21 April 2003.

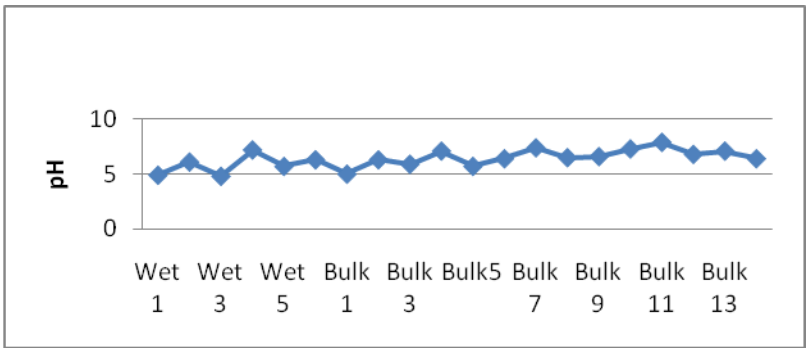

Figure 1. pH values of wet (snow) deposition and bulk deposition

Gülsoy et al. (1999) found the average value of pH in the wet deposition of Istanbul as 6.15. Akkoyunlu et al. (2003) found the average value of pH in the bulk deposition of Gebze as 6.25.

Acid materials, derived primarily from SO*x* and NO*x*, are removed from atmosphere via wet and dry processes. Gravitational settling is the primary mechanism for the removal of large particles. For smaller particles, such as anthropogenic acid aerosols formed by the transformation of gaseous material into particles, the settling velocity is smaller. The deposition velocities of calcium, magnesium, sodium and potassium aerosols are higher than that of sulfate aerosols (Akkoyunlu et al., 2003). This mechanism suggests that, higher percentage of Ca^{2+}, Mg^{2+}, Na^{+} and K^{+} ions in the bulk deposition than SO_2^{-4} is due to the dry deposition.

Arithmetic means of the concentrations of the anions and cations in the bulk deposition were calculated, separately. Results indicate the following order in the magnitude of the mean concentrations of the anions: $SO_4^{-2} > Cl^{-} > HCO_3^{-} > NO_3^{-}$. The anion that has the highest mean concentration together with the largest concentration range was SO_4^{-2}, with a mean of 10.3mg/L, a minimum of 1.9 mg/L and a maximum of 44.5mg/L. The order in the magnitude of the mean concentrations of the cations was found as $Ca^{2+} > Na^{+} > Mg^{2+} > K^{+}$. The cation that the highest mean concentration together with the largest concentration range was Ca^{2+}, with a mean of 20.4mg/L, a minimum of 15.7mg/L and a maximum of 26.7mg/L.

The bulk concentration depends on sufficiently the number of dry days during the deposition period, i.e. the larger the number of dry days the larger will be the dry deposition. In order to find daily bulk deposition rate, total amount of ions in the bulk deposition was divided by the number of the days in the deposition period and the area of the funnel. Temporal fluctuations of anions and cations in the bulk deposition rate calculated as mg/ m^2 day are depicted in Figure 2. Highest mean of deposition rate belongs to Cl as 120.6 mg/m^2.day. The order in magnitude of mean deposition rate was found $Cl^{-} > Ca^{2+} > HCO_3^{-} > SO_4^{2-} > Mg^{2+} > K^{+} > NO_3^{-}$. On 3-10 March 2003, bulk sampling period, the deposition rate reaches to its maximum for SO_4^{2-}, NO_3^{-}. This main reason of this can be the considerably high precipitation that fall on 3-7 March. Generally, it is found that the days yielding high precipitation amounts also yield high deposition rates for ions. The higher the precipitation amount, the higher can be the scavenged amount of ions in the atmosphere. This in turn can lead to higher wet deposition rates and bulk deposition rates.

Table 1 presents Pearson correlation coefficients among the values of bulk deposition rates (mg/m^2.day) of ions. Pearson correlation coefficient between SO_4^{2-} and NO_3^{-} was found as 0.93. Na^{+} and Cl^{-} have low correlation of 0.27. Correlation coefficient between calcium and sulfate have lower correlation also. Correlations coefficients between crustal ions were high in bulk deposition. Correlations between calcium and magnesium, between calcium and potassium, and between potassium and magnesium in bulk deposition were 0.78, 0.60 and 0.83, respectively.

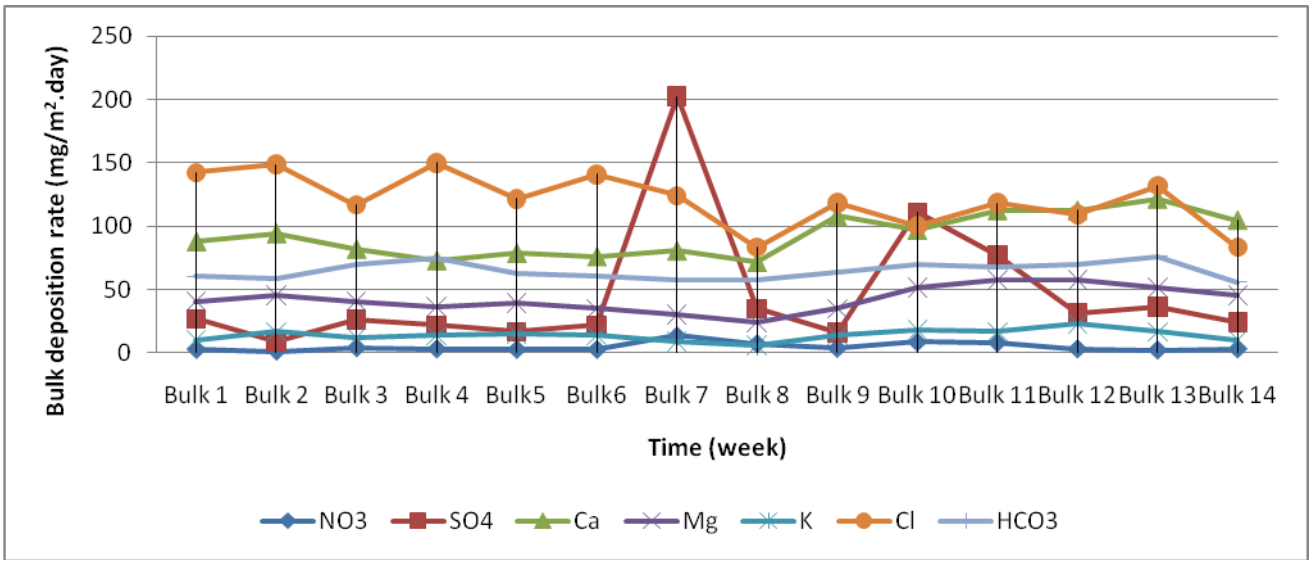

Figure 2. Weekly bulk deposition rates of ions in mg/m^2.day

Table 1. Pearson correlation coefficients between bulk deposition rates (mg/m^{2}day)

	NO_3^-	SO_4^{2-}	Ca^{2+}	Mg^{2+}	K^+	Cl^-	HCO_3^-	Na^+
NO_3^-	1							
SO_4^{2-}	**0,93**	1						
Ca^{2+}	-0,15	-0,05	1					
Mg^{2+}	-0,19	-0,06	**0,78**	1				
K^+	-0,29	-0,14	**0,60**	**0,83**	1			
Cl^-	-0,34	-0,14	-0,15	-0,01	0,21	1		
HCO_3^-	-0,16	-0,09	0,34	0,34	0,58	0,26	1	
Na^+	-0,13	-0,09	-0,15	0,08	0,11	**0,27**	-0,05	1

Enrichment factors were calculated by using Eq(1) to determine the contribution of soil to the chemical composition of bulk deposition. Calcium is chosen as the reference ion in soil material. The concentration of the ion of interest (X in the equation) and the concentration of calcium (C in the equation) in the sample were used to find the ratio for bulk deposition. A similar approach was used to find the ratio for the soil reference material. Concentrations of the ions of interest in soil were presented by Taylor (1972) at Table 2 (Satsangi et. al., 1998; Okay, et al., 2002;.Bayraktar, and Turalıoglu, 2005) An EF value much smaller than 1 or much greater than 1 is considered concentrated or diluted relative to the reference source (Okay, C et al., 2002). Mean enrichment factors(EF) ionic major components in the bulk deposition are shown in Table 3.

Table 2. The ratios of SO_4^{2-}, NO_3^-, Mg^{2+}, K^+

	SO_4^{2-}/Ca^{2+}	NO_3^-/Ca^{2+}	K^+/Ca^{2+}	Mg^{2+}/Ca^{2+}
Soil	0,049	0,021	0,50	0,56

Table 3. Mean EF ionic major components in the bulk deposition

	NO_3^-	SO_4^{2-}	Mg^{2+}	K^+

Mean	1,1	10,3	9,3	3,1
EF	2,6	10,3	0,8	0, 3

The EF of SO_4^{2-} in bulk deposition 10.3 (Table 3), suggesting that soil was not a major source of this ion. Mg^{2+}, K^+ seemed to be concentrated by soil. NO_3^- was enriched 2,6 with respect to soil, implying that soil was not the major source of this ion.

4. CONCLUSIONS

In this work, the composition of bulk deposition in Erzurum, Turkey is studied by collecting samples in the period 14 January to 5 May 2003. Concentrations of main cations Ca^{2+}, K^+, Mg^{2+}, Na^+ and main anions SO_4^{2-}, NO_3^-, Cl^-, HCO_3^- were analyzed. The average pH 6.6. The average pollutant concentrations of the bulk deposition samples were determined as follows: 10.3 mg SO_4^{-2}/L, 1,1 mg NO_3^-/L, 20,4 mg Ca^{+2}/L, 9,3 mg Mg^{+2}/L, 3,1 mg K^+/L. The source of some ionic components in the bulk deposition such as Mg^{2+} , K^+ and Ca^{2+} were found to be the terrestrial regions. Results indicated that Ca^{2+} was the dominant cation and SO_4^{-2} the dominant anion in bulk deposition samples at Erzurum. Higher correlation coefficients were obtained among the crustal ions (Ca^{+2}, Mg^{+2}, K^+). It was found a high correlations also between antropogenic ions (SO_4^{-2}, NO_3^-).

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Paper 011

Factors Affecting the Sustainability of Medicinal and Aromatic Plants in Köprülü Kanyon National Park, Turkey

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Abstract

Koprulu Kanyon is one of the largest national parks with a high diversity of medicinal and aromatic plants (MAPs) in Turkey. Local communities gather MAPs to provide for their subsistence needs (e.g. food and primary medicine) as well as to generate cash income to lift their lives out of poverty. However, the lack of a comprehensive management mechanism for controlling the wild-collection of these species threatens their long-term sustainability. However, the sustainable wild collection of these species is necessary to meet the needs of present and future generation – the essence of sustainable development. In view of this desired goal, the purpose of this study is to evaluate the factors and also interrelationship among those factors that directly and/or indirectly affect the sustainability of MAPs in Köprülü Kanyon National Park. The conceptual framework for sustainable use of natural resources developed by the World Conservation Union Sustainable Use Specialist Group was adapted to the study to assess the factors affecting the sustainability of MAPs in the national park. The results of this analysis revealed that population, institutional (formal and informal), and economic factors and interrelations among them directly and/or indirectly influence the sustainability of MAPs in the national park. Assessment of the factors showed that a powerful management plan and permanent monitoring mechanism are needed to achieve the long-term conservation and sustainability of MAPs. Finally, possible conservation options and instruments are examined for promoting and ensuring the long-term sustainability of MAPs in the national park.

Key Words: Medicinal and aromatic plants, sustainable use, conservation, Köprülü Kanyon National Park

1. Introduction

Medicinal and aromatic plants (MAPs) have been used to provide essential ecosystem goods and services for human well-being from prehistoric times up to the present. For example, WHO (2002) remarks that the majority of the world's population, particularly in developing countries, still depends on traditional medicine systems. In developed countries, traditional medicine has also been popular as an alternative treatment system, and there has been recognition of the benefits of herbal products. Local communities (particularly poor and landless people in developing countries) gather MAPs to generate income, and thereby to improve their livelihoods. Moreover, MAPs are utilized in a variety of sectors, such as cosmetic, perfume, dyes and in home gardens. The value of MAPs for human well-being is very high and therefore demand for those species has increased at global level. This demand has created an international market, but also has begun to threaten the existence of approximately 4,000 species. Some of the reasons for this are overexploitation, destruction of natural habitats, land conversion, lack of property rights, lack of regulations and standards for sustainable harvesting from the wild and generally the absence of a policy framework (Schippmann et al., 2002; Hamilton, 2003; Medicinal Plant Specialist Group, 2007). However, providing for and promoting the long-term sustainable use of MAPs is necessary for meeting the needs of present and future well-beings. This is not an easy task to achieve as long as the factors (e.g. population, economic) affecting the sustainability of MAPs and the interrelationships among those factors are not controlled. Within this context, Köprülü Kanyon National Park in Turkey can serve as an instructive case study.

Köprülü Kanyon is one of the largest national parks in Turkey. The area was designated as a national park on 12 December 1973 due to its outstanding natural and geomorphologic features as well as its cultural assets (IUCN, 1990; Antalya Orman Bölge Müdürlüğü, 1993). The national park comprises the whole range of vegetation zones from thermo-Mediterranean to alpine environment; the flora is therefore very rich (Ayaşlıgil, 1987). The dominated flora comprises various MAPs such as oregano (kekik) (*Origanum minutiflorum* O. Schwarz & P.H. Davis), salvia (sage) (*Salvia tomentosa* Miller) and mountain tea (*Sideritis condensate* Boiss. Heldr. Apud Bentham). According to the results of the recent research (Özçelik *et al*., 2006), the national park comprises about 40 endemic taxa and

110 economically important plants, including MAPs**.** The analysis of this data shows that about 76 MAPs grow in the national park.

The diversity of MAPs in the national park has provided important economic revenue for the local people, particularly in the forest villages (e.g. Ballıbucak, Çaltepe and Altınkaya) where people's dependence upon the natural resources is high due to a lack of employment opportunities. Therefore, the wild-collection of MAPs has been one of the major economic activities of the local people to provide for their subsistence needs (e.g. food, herbal tea, traditional medicine) as well as to generate income to improve their livelihoods (Cetinkaya, 2009). However, the lack of a management mechanism for those species threatens their long-term conservation and sustainability. Protection of those species is vital for ensuring the conservation of biodiversity and sustainable use of natural resources in the national park. In light of this, Köprülü Kanyon has been selected as one of the sites for the project "Biodiversity and Natural Resource Management Project", financed by the Global Environmental Facility (GEF) and having the aim of developing a model for the conservation and sustainable use of natural resources (Arancli, 2002). However, in the scope of the project a management mechanism to control the wild-collection of MAPs have not been designed and implemented with the aim of achieving the long-term conservation and sustainability of those species as well as to provide flow of a stable income for the local communities. In view of the desired goal, the purposes of this paper is to analyze the factors that directly and/or indirectly affect the management mechanism dealing with controlling the wild-collection of MAPs in Köprülü Kanyon National Park as well as the interrelationship among those factors are examined. Based on this analysis, possible conservation options and instruments are recommended for and promoting and ensuring the long-term sustainability of MAPs.

2. Materials and methods

2.1. Study area

The study area "Köprülü Kanyon National Park" is located in the western part of the Taurus Mountains between the elevations of 110 m to 2500 m on a very heterogeneous geomorphologic structure. It is situated between (31^0 03^1 31^{11}-31^0 14^1 00^{11} longitude east and 37^0 87^1 36^{11}-37^0 25^1 11^{11} latitude north). It encompasses 37 000 ha and lies 90 km north-east of the city of Antalya in the Mediterranean region (Orman Bakanlığı, 1971).

2.2. Method applied

Providing and promoting the sustainability of MAPs in Köprülü Kanyon National Park depends upon the challenge in which way and rate we should use MAPs while conserving them. Edwards and Musiti (2001) state this approach as the essence of sustainable use of natural resources. Design and implementation of a management mechanism is a priority as regards controlling the wild-collection and marketing of MAPs. Accordingly, the desired goal, which is providing for the sustainability of MAPs, could be achieved by regulating the factors that affect the sustainability of MAPs and the interrelationships among those factors. The factors and interrelationships among them are analyzed by adapting the conceptual framework prepared by the World Conservation Union - Sustainable Use Specialist Group (IUCN SSC) (Edwards and Musiti, 2001; Zaccagnini et.al., 2000). According to this concept, there are diverse factors that affect the sustainability of renewable resources. However, ecology, economics, population and institutions are key factors that affect the probability of a use being sustainable or not. Based on these considerations, the conceptual framework for Köprülü Kanyon National Park is illustrated in Figure 1.

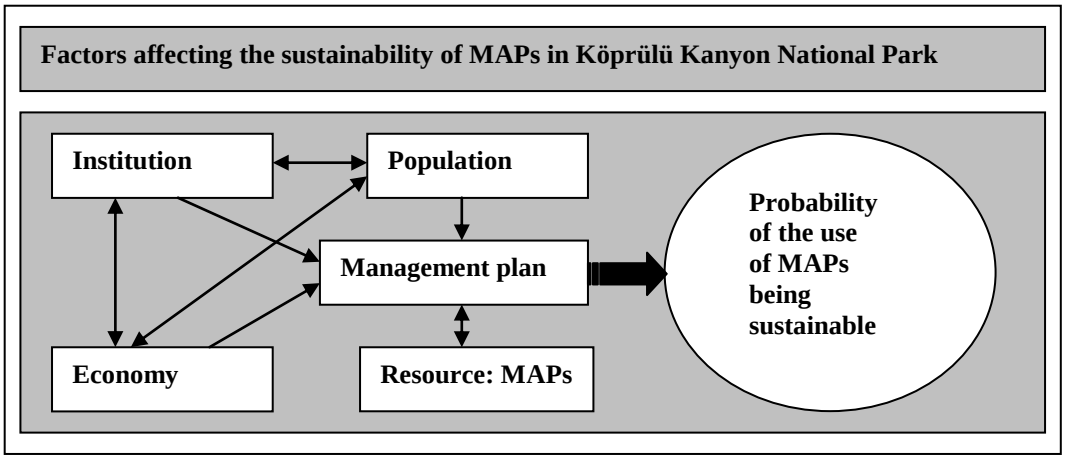

Figure 1. Assessment of the factors affecting the sustainability of MAPs in Köprülü Kanyon National Park

Assessment of Figure 1 shows that the conditions of the factors and interaction between them affect the management plan, and thereby the sustainability of MAPs in the national park. Within this context, a powerful management mechanism is necessary to control and regulate those factors. Moreover, establishment of a permanent monitoring system in the scheme of the management plan is also essential for strengthening the feasibility of the sustainability of MAPs, as the factors determining the sustainability of those plants can change in a positive or negative way over time. The factors and interrelationships between them should be monitored to collect feedback data for the management plan, thereby enabling appropriate decisions and actions to be taken on time by the National Park Authority.

In relation to the above, fieldwork was conducted in the national park in July 2006 in order to collect data relevant to the selected factors. The fieldwork was carried out in a number of selected pilot villages (Eskibeydilli, Çaltepe, Ballıbucak, Çukurca, Karabük and Altınkaya). The major reasons for selecting these villages were their proximity to the natural habitats of MAPs, their potential for the use of MAPs, and their geographical remoteness from the local centre (i.e. Beşkonak). Accordingly, data relevant to the factors was collected by interviewing village heads and organizing a number of group meetings with the local people, both male and female, in the selected villages (Cetinkaya, 2009). Species samples were also collected and identified by using the national park's flora inventory list (Özçelik et al. 2006).

3. Results

The natural resource, population user, economic and institutional factors affecting the sustainability of MAPs in Köprülü Kanyon National Park and the interrelationships between those factors are discussed in turn.

Ecological factor (Natural resource: *Medicinal and aromatic plants)*

The results of the surveys conducted in the 6 villages showed that 20 MAPs are harvested from the wild for commercial and non-commercial purposes in Köprülü Kanyon National Park. MAPs are the living natural resources that are harvested by the local communities to derive a benefit such as food and generation of income. A set of ecological factors such as conservation status of the species, abundance and regeneration of the species, habitat quality of the target populations, and harvest rate and frequency reflect whether the wild-collection of MAPs is conducted in a sustainable manner in the national park. Integration of the indicated ecological data into the management plan for the target species is crucial at policy-development and also decision-making processes to control the impacts of population, institutional and economic factors (Cetinkaya, 2009). For example, harvest rate and frequency within the context of population factor directly affect the sustainable wild-collection of MAPs in terms of causing the decline in the species and deterioration of their natural habitats. In addition, the economic (e.g. increased market demand) and institutional (e.g. lack of principles to regulate the wild-collection) factors directly influence the factor of population. For example, the local people can over-harvest the target species in line of market demand when the management plan and a set of principles for regulating the wild-collection are absent. Accordingly, the factors of economic, population and institutional factors are interrelated. This interrelation can be controlled in the framework of the management plan for the target species.

Population factor

Population can be defined as that portion of the human population that directly uses natural resources (Zaccagnini et.al., 2000). The characteristics of the local people and their relationship to the sustainable use of MAPs can be represented by several aspects such as land ownership, access to resources, population structure (e.g. gender) and population income (e.g. degree of dependence upon the resources). This factor is directly interrelated with the institutional (both formal and informal institutions) and economic factors. For example, increased market prices set by the human population can lead to the over-exploitation and also the high degree of dependence upon the target species. In this case, the factors of institutional, economic and population are interrelated.

Economic factor

The economic aspect of the relationship between MAPs and the local communities can be expressed in terms of economic valuation of the target species (e.g. percent of income generated per capita). For example, increased market prices for the traded species can trigger the local communities to over-harvest the species from the wild. Within this context, the economic factor is interrelated with the population factor. However, market prices are often decided by some rules developed by human population. In this case, the economic factor is interrelated with the institutional factor. Therefore, within the framework of the management plan for the target species, tradable quotas should be implemented to keep the sustainability of the species at ecosystem level and also to control the impact of the economic factor.

Institutional factor
The existence and effectives of institutions will establish principles to use and/or harvest natural resources in a sustainable manner and also develop the mechanisms of distributing benefits obtained from the use of resource (Edwards and Musiti, 2001; Zaccagnini et.al., 2000). Thus, institutions can enforce the local communities and trading companies with the requirement of sustainable use of MAPs in the national park. Within this context, the factor of institution is closely interrelated with the population and economic factors. For example, the signing of international Conventions such as the Convention on Biological Diversity (CBD), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Bern Convention reflects the efforts of the Government of Turkey to develop a solid institutional mechanism for the sustainable use of natural resources. In addition, recognizing the local communities are the first managers of MAPs, informal institution that regulates access to the resources plays a significant role in the sustainable use of the resources. Adoption of the informal institutions into the management plan will reflect the degree of participation of the local communities into legislation pertaining to the sustainable use of MAPs. Considering the interrelation between the factors of population and institution, the adoption of the informal institutions into the management plan can also assist in controlling the impacts of population factor on the resources collected from the wild.

3. Conclusion
Providing and promoting the sustainability of the wild-collection of MAPs in Köprülü Kanyon National Park are a dynamic management process and its effectiveness can be measured overtime. The effectiveness of the sustainability of target species can be measured through periodically comprehensive data collection that should be adapted in the management plan. Therefore, setting up a permanent monitoring system is necessary for providing a powerful management mechanism, and thereby monitoring the factors affecting the sustainability of those species. In this way, the adverse effects of the factors can be controlled by the National Park Authority. On the other hand, there are a number of external factors (e.g. low level of decentralization, lack of qualified personnel and overlapping jurisdiction among the Ministries of Environment and Rural Affairs) that indirectly affects the sustainability of MAPs in the national park. These factors derive from the socio-political conflicts of the country and are beyond the National Park Authority's control. The adverse effects of those factors can only be minimized by strengthening legal, socio-political and institutional reforms at national, regional and local levels.
A number of international organizations [The Medicinal Plant Specialist Group (MPSG) of the Species Survival Commission (SSC), IUCN; Bundesamt für Naturschutz (BfN), WWF Germany and TRAFFIC Germany] worked together to develop *International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants* (ISSC-MAP) to help users, collectors, and managers to understand and comply with the conditions under which sustainable collection of these resources can take place. The purpose of the ISSC-MAP is to ensure the long term survival of MAPs populations in their habitats, while respecting the traditions, cultures and livelihoods of stakeholders. Accordingly, the objectives of this standard are to provide a framework of principles and criteria that can be applied to the management of MAP species and their ecosystems; to provide guidance for management planning; to serve as a basis for monitoring and reporting; and to recommend requirements for certification of sustainable wild-collection of MAP (Medicinal Plant Specialist Group, 2007). Adoption of this international standard into the National Biodiversity Conservation Strategy can serve as a positive instrument to provide for and strengthen the sustainability of MAPs at national and local levels. For example, maximum allowed collection quantities for the target species will contribute to regulating collection intensity and species regeneration (Criteria 1.3 of the Principle 1) – one of the fundamental criteria of Principle 1 "wild collection of MAP shall be conducted at a scale and rate and in a manner that maintains populations and species over the long-term". This standard is a potential instrument to design and implement the management plan for the target species in the national park.

Community-based small-scale cultivation of MAPs should be supported for generating alternative income for the local communities as well as for strengthening the conservation of those species. For example, the local people in the villages of Çaltepe and Çukurca have tried to cultivate some of the oregano/kekik species (e.g. *Origanum minutiflorum* O. Schwarz & P.H. Davis, *Origanum onites* L., *Satureja cuneifolia* Ten and *Salvia tomentosa* Miller) in the vicinity of their own homes. Successful results were achieved in the cultivation of those species. However, low prices for those species due to the length of the trade chain have led to a halt in cultivation. In this context, the National Park Authority ought to play an important role in improving market conditions by providing direct access to the markets, and thereby eliminating the number of middlemen in the trade chain. Moreover, possible alternative economic incentives (e.g. eco-labelling of products) should also be supported for ensuring the conservation of wild populations and reducing the dependence of the local people on wild-collection. Moreover, the development of a GEF Small Grants Programme (SGP) can be a crucial direct incentive, as United Nations Development Program (UNDP) offers the SGP grant through GEF to provide financial and technical support to projects that contribute to the conservation and sustainability of natural resources while enhancing the livelihoods.

Ensuring the sustainability of MAPs can be the responsibility of the National Park, Authority individuals and communities. All decisions and actions regarding this challenge will affect the lives of the local people. Therefore, a participatory approach should be implemented at community level and the participation of other related groups, such as landowners, stakeholders and trade companies,

should be ensured in order to achieve the long-term effectiveness of the sustainability of MAPs in the national park.

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Paper 013

Potential Challenges for Sustainable Landscape Design in Northern Cyprus

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Abstract

The purpose of this study is to examine sustainable landscape design approaches for semi-arid regions in the case of Northern Cyprus. The rural landscapes of the region have been altered and degraded particularly due to the severe impacts of drought and water shortage. Therefore; when dealing with sustainability issues in Northern Cyprus, a holistic approach is needed for management of the problems indicated in the rural landscapes in the region. Within this context, the concept and scope of sustainable landscape design are examined in the first section of this study. This assessment shows that sustainable landscape design in Northern Cyprus can only be achieved if the five pillars proposed (environmental, economic, social, political and aesthetic sustainability) are considered in the process of design. Such a multidimensional approach can help increasing the quality of environment as well as living standards of local people. In the second section, establishment of a strong relation between landscape ecology "science of environment" and landscape design "art of environment" for achieving a reliable balance between ecological processes and spatial patterns is discussed. This discussion revealed that an eco-aesthetic approach and creation of multifunctional landscapes can help achieving the desired balance. In the final section, potential challenges for sustainable landscape design (e.g. minimization of energy use, water and waste management) have been studied for Northern Cyprus.

Keywords: Sustainable landscape design, Northern Cyprus, semi-arid, sustainability, green economy

1. Introduction

The global population growth and the need for more land have led to the conversion of native ecosystems to croplands and urban settlements. That means, we live in a world where only a small percentage of land remains relatively unused today. These areas should be protected for their vital ecological functions (Lovell and Johnston, 2009). Despite all efforts, dramatic threats have been continuing on environment and natural resources since Stockholm-1972, Rio-1992 and World Summit on Sustainable Development Johannesburg-2002. Since those summits, new and urgent challenges have emerged that directly threaten local populations, regional ecosystems, national economies, and thus the planet itself. The goals of Agenda 21 and the Johannesburg Plan of Implementation – the outcomes of the summits – and the Millennium Development Goals that covers common issues of these summits have been jeopardized. This situation illustrates a serious failure to integrate environmental, social and development priorities into global economic policy (Stakeholder Forum, 2009). For example; Sozen (2005) emphasizes that we are moving away from the goal of sustainability. As a result of such an attitude, dangerous climate change has not been averted, desertification has not been slowed, and the global loss of biodiversity has not been curbed (Stakeholder Forum, 2009). Therefore; concrete actions are needed more then ever for minimizing the threats on the environment as well as for controlling the relevant impacts of socio-economic crises at global level. The needs for such actions and the world economic crisis in 2008 have resulted in the call for another Summit in 2012.

One of the fundamental themes of Summit 2012 is 'Green Economy' that addresses reducing the impacts of global economic crisis by linking proposed strategies with priorities in climate change, protection of ecosystems and natural resources. Green economy focusing on the low-carbon can also create new jobs and accelerate the transition to a more consistent economy (United Nations Global Combat and HSBC Global Research, 2009). Therefore, international and national legislations and agendas require new arrangements to support and encourage environment friendly and economically viable new approaches in all relevant fields including landscape design. Such policies and relevant arrangements should particularly be emphasized in more sensitive and fragile regions such as semi-arid zones and especially in island ecosystems where people may face the severe impacts of serious drought, water shortage and risk of fire. Within this context, Cyprus Island – typically a semi-arid Mediterranean island – can serve as a case.

Cyprus, located in the Eastern Mediterranean, is the third largest island in the region. The climate of Cyprus is in general at the drier end of the Mediterranean-type climates. The island has diverse landscapes due to climatic variations, geological features and its proximity to Asia, Africa and Europe. Over a period of more than 10,000 years, anthropogenic influences through burning, grazing, cutting, terracing and cultivating degraded the Mediterranean native forest into maquis, garigue and similar vegetation covers, and converted the land into agricultural and pastoral landscapes (Delipetrou et al., 2008). The rural landscape is dominant and represents a mosaic of natural and semi-natural habitats. The landscape of lowlands is dominated by Mediterranean shrubs 'maquis' in addition to olive and carob plantations. Drought, salinisation, water shortage, erosion and deforestation are the major factors that have led to alteration and degradation of cultural landscapes in the island. In this study we tried to examine sustainable landscape design approaches in semi-arid regions in the case of North Cyprus. Firstly, the concept and scope of sustainable landscape design are being examined to emphasize the integration of science and art for improving the quality of life. Secondly, establishing strong relations between landscape ecology 'science of environment' and landscape design 'art of environment' for achieving a reliable balance between ecological processes and spatial patters is discussed. Finally, a sustainable landscape design approach has been studied for North Cyprus.

2. The Concept and Scope of Sustainable Landscape Design

The term 'sustainability' refers to the development that 'meets the needs of the present without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development (WCED), 1987). Sustainability is a wide common goal for humanity and increasingly becoming dominant in design and planning. And, it has also been integrated into landscape design. 'Sustainable landscape design' refers to an interdisciplinary approach that integrates the science and art of studying and influencing the relationships between spatial patterns and ecological processes (Chen and Wu, 2009). Theories and practical applications in sustainable landscape design generally focus on the issues such as efficient use of rainwater, respond properly to climate change, and contribute positively to the overall goal of sustainability (Zass-Bangham, 2009). Sustainable landscape design and planning can be developed and maintained if the three pillars of sustainability – environment, economy, and society – are simultaneously considered (Chen and Wu, 2009). However, many authors also draw attention to a fourth dimension of 'political sustainability', referring to governance mechanisms that support development mechanisms (Selman, 2008). As designers emphasize more attention on the need of aesthetic aspects, 'aesthetic sustainability' should also be considered in sustainable landscape design.

Environmental sustainability in landscapes design particularly refers to the ecological aspect of landscapes (Selman, 2008) and related to landscape ecology (Hobbs, 1997; Lovell and Johnston, 2009). Soil well-being (e.g. retaining soil moisture and nutrients), hydrological systems, impacts of vegetation on microclimate and atmospheric carbon level (Selman, 2008) are important ecological issues to achieve sustainability in landscape design. Such knowledge can be produced in landscape ecology 'science of environment' and put into practice in landscape design 'art of environment' which is a common ground for scientists and practitioners to bring scientific knowledge into decision-making (Nassauer and Opdam, 2008). Thus, ecological principles should be considered in landscape design to provide continuation of both natural and cultural landscapes and their ecological functions.

Economic sustainability in landscape design can be expressed as the maintenance of attractive scenery to support tourism and recreation (Selman, 2008). Maintenance of natural and cultural landscapes should make the local area attractive for outsiders and provide benefits for local people by creating jobs, tackling local markets and supporting environmental practices. Such an approach can be referred as greening economy which is the heart of economic sustainability in landscape design. Thus, environmental friendly practices such as organic agriculture and use of local materials should be encouraged to ensure cost-effectiveness in rural landscapes.

Social sustainability in landscape design is related to active participation of all relevant stakeholders in decision-making, social learning and improving well-being processes (Selman, 2008; Van Mansvelt and Van der Lubbe, 1998). Awareness programs for the stakeholders about the values of landscapes and the contributions of sustainable landscape design to these existing values should be supported.

Political sustainability in landscape design is related to effective governance structures. Major ones include: European Landscape Convention that is embedding the planning, protection and management of landscapes by 'strengthening institutional frameworks' and 'creating an inclusive, people-centered approach' and the EU Water Framework Directive is also establishing catchment-scale governance (Selman, 2008).

Aesthetic sustainability in landscape design is an important issue in terms of visual quality of landscapes. There is a long tradition of valuing landscapes for their 'natural beauty'. However, aesthetic choices are socially dynamic; therefore, they often vary with time and place (Selman, 2008). Significant visual features of landscapes should be protected for the reasons of cultural heritage and visual quality.

3. Relations between Science of Environment and Art of Environment

Landscape ecology studies patterns, processes and changes at various scales. Time and space affect ecological processes such as movement and distribution of populations. Therefore, both time and space are important aspects in the field of landscape ecology. Basically, landscape ecology focuses on landscape structure - the spatial relationship between landscape elements or patches; landscape function - the interaction between these spatial elements; and landscape change - the alteration in structure and function occurring through time (Hobbs, 1997). Landscape functions provide specific services, often referred to as 'ecosystem services' (Lovell and Johnston, 2009), including supportive (e.g. nutrient cycling), provisional (e.g. food), regulative (e.g. climate and flood) and cultural (e.g. visual quality and recreation) services (Millennium Ecosystem Assessment, 2005). Understanding this system is essential for rational land use planning, management of biodiversity conservation (Hobbs, 1997), and sustainable landscape design.

Design can be defined as any intentional change of landscape patterns for the purpose of sustainable benefiting from ecosystem services while meeting societal needs and respecting societal values. Design is a common ground for scientists and practitioners to bring scientific knowledge into decision making about landscape changes. Thus, landscape design improves the contribution of landscape science in society and enhances the saliency and legitimacy of landscape ecological scientific knowledge (Nassauer and Opdam, 2008). However, a large gap remains between the growing body of research in landscape ecology and application of this information in the design of landscapes (Lovell and Johnston, 2009). Thus, there is a great need for enhancing the connection between landscape ecology and landscape design.

We should link landscape design and ecology in order to bridge ecological functions (e.g. biodiversity, ecological health and ecosystem services) and aesthetic functions (visual & aesthetic quality, aesthetic experience) of landscapes. Human cannot directly sense ecological quality and aesthetic experience may not reflect ecosystem health or ecological quality. However, people should become aware of the ecological qualities of the landscapes in addition to their aesthetic impressions. This can be defined as ecological – aesthetic approach. According to Gobster et al. (2007), aesthetic experiences can promote and sustain healthier ecosystems, and thus indirectly promote human health and welfare. A complementary relationship between aesthetic pleasure and ecological health in the landscape is desirable. Another approach can be the creation of multifunctional landscapes to bridge the gap between landscape

ecology and design by offering specific design guidelines based on environmental, economic, social (Lovell and Johnston, 2009), political and aesthetic dimensions. Consequently, landscape design should give priority to the creation of patterns that would maintain and enhance ecosystem structures and functions in Northern Cyprus.

4. Potential Challenges for Sustainable Landscape Design in Northern Cyprus

Cyprus Island has been facing problems such as drought, water shortage, and soil salinisation. Considering the undesirable impacts of these problems, an environmentally sustainable landscape design approach should be prepared and implemented in North Cyprus. This approach should aim to minimize the amount of water use by using native and adaptive exotic plant species of the Mediterranean region. Within this context, major practical solutions are discussed below.

Minimization of energy consumption

Cyprus Island has long sunny days throughout the year. This situation provides great opportunities for heating water by solar energy. Efficient technologies and methods must replace conventional heating and cooling systems which are responsible for high energy consumption. Thus, innovative techniques based on efficient use of solar energy should be developed and implemented in order to minimize energy consumption in North Cyprus.

Regulation of high local temperature

Selection of native plant species and amendment of soil quality are the major issues within this context.

- Selection of native plant species: One of the most important issues of landscaping in semi-arid regions is choosing the plant species which are tolerant to drought and saline environmental conditions. Selection of right plants can help to save water and spend less time to manipulate the landscape in North Cyprus. The priority should be given to use native trees, shrubs and herbaceous plants. In addition; as different plants usually have different water requirements, we should group them accordingly in the planning and design stages.
- Amendment of soil quality: Soils in semi-arid regions are generally poor in nutrients; therefore, quality of the soils should be increased by using organic compost and mulch in North Cyprus. Both methods can regulate the soil moisture and temperature, to nurture the soil and increase its quality, to slow down water and hold it on the landscape, and to decrease surface erosion.

Water management

As water shortage is a major problem in North Cyprus, individual water-use habits need to be changed and water conservation and reclamation methods must be developed at community level. Major solutions within this context are discussed below.

- Rainwater harvesting can be implemented to capture and reuse rainwater in terms of applications of sustainable landscape design in North Cyprus. Thus, we can collect rainwater from impervious surfaces and store it for later use by this technique. Major benefits of this technique for the island can include: providing inexpensive supply of water, reducing surface water run-off, contamination of surface water and erosion, and preventing flooding. On the other hand, drip irrigation is an effective system for home gardens. The advantage of drip irrigation is that there is little water loss due to evaporation or runoff.
- Graywater treatment and reuse: Graywater generally refers to untreated water from washing machines, bathtubs, showers, bathrooms, toilet and kitchen sinks. Such water needs to be biologically treated in a sewer or other ecological treatment systems. It is important to identify the various qualities of graywater depending on its source or origin. In a properly designed, nutrient recycling, wastewater treatment system, much of this water can be reused on the landscape outside and in toilets inside (Roley, 1992). Development of such systems in North Cyprus is needed for the conservation and efficiently use of water resources.
- Establishing terraces: By sculpturing the landscape as terraces, precipitation can be slowed down along natural patterns of the topography; thus infiltration can be increased and erosion risks can be decreased in North Cyprus. The primary objective of the establishment of terraces can include the conservation and enhancement of water supplies and restoration of the landscape.

The successful application and maintenance of the solutions discussed above can contribute to the environmental (e.g. climate regulation), social (e.g. increase of awareness on the values of landscapes), economic (e.g. support for cost-effective landscape practices), aesthetic (e.g. preservation of natural beauty) sustainability in North Cyprus. However, relevant policies and regulations should be integrated to strengthen the sustainable landscape design approach at upper level. Within this context, the European Landscape Convention and the European Union Water Framework Directive should be integrated and implemented. On the other hand, waste management and integrative transportation systems are the two important issues that need immediate solutions. Both themes are discussed below.

Waste management

Waste management is a key issue in all types of development. Therefore, a waste management program should be developed and implemented in North Cyprus for reducing the amount of waste requiring disposal (backyard composting for organic wastes and recycling programs for items such as paper, metal cans, glass and plastic) and maximizing the ability to reuse and recycle of such wastes.

Development of a transportation system

It is difficult to talk about any efficient public transportation system in North Cyprus. Therefore, private car ownership is reached to unbelievable figures. Such a system adversely affects the environment. There is an urgent need for designing and implementing a transportation system in North Cyprus. The system should focus on pedestrian friendly development including walking and riding opportunities.

5. Conclusion

The global environmental problems and economic crisis have resulted in seeking new sustainable approaches such as green economy – that is; a radical change from industrial economy towards ecological economy is needed. Such challenges are particularly important for regions where fragile island ecosystems under serious threat. Within this context, environmentally sustainable landscape design approaches should be adapted and maintained in North Cyprus. Such initiatives and attempts should try to integrate environmental, economic, social, aesthetic and political aspects of the landscape mosaics; support studies in the field of landscape ecology and transfer gained knowledge in landscape design.

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Paper 014

FLORISTIC AND CHOROLOGICAL RECORDS FOR MONOCOTS OF THE LAKE SHKODRA

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Abstract
Flora of the freshwater wetlands ecosystem of Lake Shkodra is very rich. About 236 aquatic and wetland plant species and subspecies, of them 112 Monocots were reported. New floristic and chorological records regarding to the monocots of Lake Shkodra and Delta Buna basins during our field trip were observed. Altogether, 5 plant species and 2 subspecies of Monocots are reported and discussed, of which 3 species and 2 subspecies: *Carex michelii* Host 1797, *Juncus sphaerocarpus* Nees 1968, *Najas flexilis* (Willd.) Rostk. & W.L.E. Schmidt 1824, *Carex viridula* subsp. *oedocarpa* (Andersson) B.Schmid 1983 and *Romulea linaresii* Parl. subsp. *graeca* Béguinot 1907 are new for the flora of Albania, while 2 species: *Schoenoplectus litoralis* (Schrad.) Palla and *Elodea canadensis* Michx for first time from Delta Buna were reported.*Romulea linaresii* subsp. *graeca* is an endemic of the Aegean Islands to West Turkey, while *Najas flexilis* is rare in the European portion of its range and is strictly protected by Appendix I of the Berne Convention. The variability of the certain taxonomic characters, life forms, preferred habitat and actual knowledge for the most of them are presented. Also, the distribution of all species was mapped on 10 x 10 sq. km and shown in a UTM grid system.
Key words: Monocots, plant species, subspecies, endemic, wetland, Lake Shkodra, Albania.

Introduction

More than 200 species and subspecies have been added to the inventory of Albanian vascular plants since the publication of the four volumes of *Flora of Albania* (Paparisto *et al.* 1988; Qosja *et al*. 1992, 1996; Vangjeli *et al*. 2000). The main contributions have been made by Barina & Pifkó (2008a, 2008b); Barina *et al.* (2009; Desfayes (2004); Kashta & Rakaj (2003); Malo & Shuka (2008); Mullaj & Tan (2010); Mullaj *et al*. (2010); Rakaj (2006, 2009a, 2009b); Rakaj & Kashta (2007); Rakaj & Rostanski (2008); Shuka (2008, 2009), Shuka & Tan (2009); Shuka *et al*. (2010); Tan & Mullaj (2000a, 2000b, 2000c). However, the vascular flora of the country is still incompletely known, while distribution and ecology of many species require further investigation.Flora of the Lake Shkodra-Delta Buna, as many Albanian regions is very rich. About 236 aquatic and wetland vascular plants species and subspecies, of them 112 Monocots from Lake Shkodra were reported (Dhora & Rakaj 2010).
In this paper 7 new records are presented of which 3 species and 2 subspecies have not previously been recorded for the country.

Material and Methods

The result of the present contribution on Lake Shkodra and Delta Buna flora is based mainly on personal investigations and collecting plants material during 2009-2010 and partly on the material stored in herbarium of University of Shkodra.
Investigation area includes Lake Shkodra, Kosan, Kamice, Jubice, Delta Buna, Domen and Rezervat of Velipoja. The collecting sites are arranged in the list and on the maps.
The determination, synonyms, life forms, distribution and a short description of each plants species was done according to Albanian field guide (Demiri, 1983; Vangjeli *et al*. 2000); European Flora vol. 5 (Tutin *et al*. 1980) and other literature source (Casper & Krausch, 1981; Govaerts, 2010) as well as on the base of our field trips.
On the basis of relevant distribution data, all investigated species are mapped on 10 x 10 sq. km and shown in a UTM grid system. The specimens are deposited in Shkodra University herbarium.

Results and Discussions

Altogether 7 aquatic and wetlands vascular plant species and subspecies of Monocots, of which 3 species: *Carex michelii* Host 1797, *Juncus sphaerocarpus* Nees 1968, *Najas flexilis* (Willd.) Rostk. & W.L.E. Schmidt 1824 and 2 subspecies: *Carex viridula* subsp. *oedocarpa* (Andersson) B.Schmid 1983 and *Romulea linaresii* Parl. subsp. *graeca* Béguinot 1907 new for flora of Albania are reported.

Cyperaceae

1. ***Carex michelii* Host**. Syn. Pl.: 507 (1797).

Synonyms: *Carex rostrata* Hoppe ex Schkuhr.
Lake Shkodra: Kosan, in wet meadows and flooded plains, in a distinctly open trees and shrubs composed by *Fraxinus angustifolia*, *Ulmus minor*, *Rubus fruticosa*, Rakaj, May 2010 (Fig. 1, 2a).
New for the flora of Albania
It's a perennial, cesspit herbaceous. Flowers: April-May.
Lifeform: Hemicryptophytes or rhizome geophytes.
Distribution: Europe to NW. Iran.

2. ***Carex viridula* subsp. *oedocarpa* (Andersson) B.Schmid**, Watsonia 14: 316 (1983).

Synonyms: *Carex oederi* subsp. *oedocarpa* Andersson; C*arex flava* subsp. *Oedocarpa* (Andersson) P.D.Sell in P.D.Sell & G.Murrell; *Carex demissa* Hornem. in G.C.Oeder & al.
Lake Shkodra: Kamice, Kosan, in marshes and very wet meadows, Rakaj, July 2010 (Fig. 1, 2b).
New for the flora of Albania.
It's a perennial, cesspits herb to 40 cm, forms distinctive low yellow-green tufts with leaves and stems spreading out in all directions. Female spikes not or shortly stalked (close enough to touch the stem), mostly less than twice as long as broad, usually 3 altogether, the top two often almost globular and usually overlapping, the third somewhat distant. Only 1 male spike on most stems, with a stalk at least 3 mm long and sometimes up to 25 mm long.
Lifeform: Hemicryptophytes or rhizome geophytes
Distribution: Macronesia, NW. Africa, Europe to W. Himalaya.

3. ***Schoenoplectus litoralis* (Schrad.) Palla**, Bot. Jahrb. Syst. 10: 299 (1888)

Syn. *Scirpus litoralis* Schrad.
Rezervat of Velipoja, Delta Buna: in the swampy places near the coast, in flooded areas and marshes, Rakaj, July 2010 (Fig. 1,2). Demiri (1983) discussed it without specified any exact location, while Vangjeli et al. (2000) have not included it in recent Albanian Flora. Desfayes (2004) reported it 10 km south of Tirana and 10 km south of Fier. This first record in Delta Buna confirms its presence in Albania.
Lifeform: Hemicryptophytes or rhizome geophytes. (Fig. 1, 2c)
Distribution: Old World to C. Pacific.

Hydrocharitaceae

4. ***Najas flexilis* (Willd.) Rostk. & W.L.E. Schmidt**, Fl. Sedin.: 382 (1824).

Synonyms: *Caulinia flexilis* Willd.; *Fluvialis flexilis* (Willd.) Pers.
Lake Shkodra: Kosan, in a small bay, in clear water and rich in lime to depths 0.7m, Rakaj, July 2010 (Fig. 1,2). It was reported from Montenegrin part of Lake Shkodra (Šmarda 1968).
New for the flora of Albania.
It is an underwater plant with lots of thin branches and leaves. Leaves 2-3 cm, elongated, thin and pointed and have finely toothed edges. The base of each leaf that wraps around the stem is rounded, not jagged and square. It's an annual aquatic herb. Flowers July-September (Fig. 1, 2e).
Lifeform: Hydrothermophytes.
Distribution: Temp. Northern Hemisphere. It is a rare species in the European portion of its range and is strictly protected by Appendix I of the Berne Convention.

5. **Elodea canadensis *Michx.*,** *Fl. Bor.-Amer. 1: 20 (1803)*

Synonyms*:* Serpicula occidentalis *Pursh*, Serpicula canadensis *(Michx.) Eaton;* Udora canadensis *(Michx.) Nutt.*
Delta Buna: in shallow running waters, with slow moving water. Rakaj, July 2010 (Fig. 1, 2f).
Vangjeli *et al*. 2000 mention it only from Tushemisht, Pogradec (Lake Ohrid) as exact location. This was first time recorded in Delta Buna (female plants only).
Lifeform: Hydrochameophytes.
Distribution: Native to most of North America (S. Canada to U.S.A.), but widely naturalized in the British Isles and Europe.

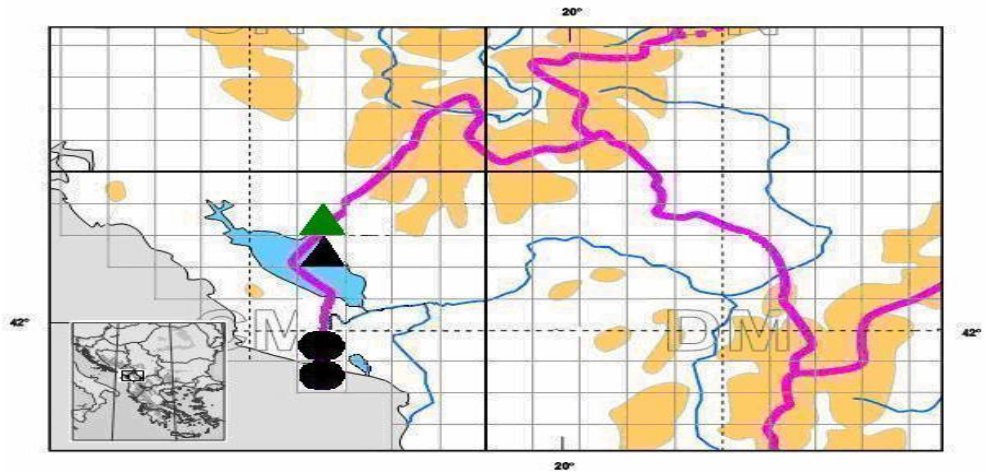

Figure. 1. Distribution of *Romulea linaresii* Parl. subsp. *graeca* Béguinot (green triangle), *Carex michelii* Host, *Juncus sphaerocarpus* Nees, *Najas flexilis* (Willd.) Rostk. & W.L.E. Schmidt, *Carex viridula* subsp. *oedocarpa* (Andersson) B.Schmid (black triangle) and *Schoenoplectus litoralis* (Schrad.) Palla and *Elodea canadensis* Michx (black circle) in the Lake Shkodra-Delta Buna.

Iridaceae

6. ***Romulea linaresii* Parl. subsp. *graeca* Béguinot**, Bot. Jahrb. Syst. 38: 325 (1907)

Synonyms: *Romulea graeca* .

Malesia e Madhe: Rreze Vreshtit (Bajze), 2 km on the west Lake Shkodra (Hoti Bay), in Phrygana, in open trees and shrubs composed by *Quercus pubescens, Fraxinus ornus, Paliurus spina-christii, Punica granatum, Pyrus amygdaliformis, Rubusulmifolius*; in rocky (calcareous) and humid places, Rakaj, April 2009, 2010 (Fig. 1, 2g).

New for flora of Albania.

It is a geophytes bulb plant high 5-12 cm. Its root contains a small bulb 8-12 mm and 1-2 violet flowers on the top of stem, with blusters veins. The perianth of flowers is smaller compare to other species of genus *Romulea* (10-20 mm), style is shorter then anthers. Leaves are narrow and filiformes (thread-like), about 0.2 x 20 cm. Fruit is an ovoid capsule, till 1 cm long. Flowers: February-March.

Lifeform: Tuber geophytes

Distribution: Aegean Islands to W. Turkey.

It was considered an endemic of the Aegean Islands to West Turkey, but was reported from Montenegro (Hadžiablahović & Bulić 2004).

Juncaceae

7. **Juncus sphaerocarpus *Nees,*** Flora 1: 521 (1818).

Synonyms: *Tenageia sphaerocarpa* (Nees) Rchb.; *Juncus tenageia* var. *sphaerocarpus* (Nees) Cariot & St.-Lag.; *Juncus tenageia* subsp. *sphaerocarpus* (Nees) Trab. in J.A.Battandier & al.

Lake Shkodra: Kamice, Kosan, in alkaline wet meadows, on the lake edges, Rakaj, July 2010 (Fig. 1, 2d).

New for flora of Albania.

It's an annual, cesspit herbaceous. Flowers: July-October.

Lifeform: Thermophytes.

Distribution: C. Europe to NW. China, Medit. to NE. Trop. Africa and W. Himalaya.

Conclusions

1. Altogether 7 aquatic and wetland vascular plant species and subspecies of the Monocots for first time in the Lake Shkodra and Delta Buna are reported.
2. Three species and two subspecies are new for the flora of Albania: *Carex michelii*, *Juncus sphaerocarpus*, *Najas flexilis*, *Romulea linaresii* subsp. *graeca* and *Carex viridula* subsp. *Oedocarpa*.
3. *Romulea linaresii* subsp. g*raeca* is endemic of the Montenegro to West Turky, while *Elodea canadensis* is an invasive species native to North America.

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Paper 017

Heavy Metals from Solid Waste and Its Bioremediation

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ABSTRACT
In most of developing countries, solid wastes are being dumped on land without adopting any acceptable sanitary land filling practices. Precipitation that infiltrates the solid wastes disposed on land mixes with the liquids already trapped in the crevices of the waste and leach compounds from the solid wastes. The leachate thus formed contains dissolved inorganic and organic solutes. In course of time, the leachate formed diffuses into the soil and changes the physico-chemical characteristics of water.
Leachate from a solid waste disposal site is generally found to contain major elements like calcium, magnesium, potassium, nitrogen and ammonia, trace metals like cadmium, copper, chromium, nickel, lead and organic compounds like phenols, polyaromatic hydrocarbons, acetone, benzene, toluene, chloroform etc. Uncontrolled heavy metal containing leachate to the environment can be detrimental to humans, animals and plants.

This study is a review about impact of leachate charasteristics on water quality and public health. Also, natural treatment methods of heavy metals in aquatic environment is evaluated. The treatment methods include the use of microorganisms, biomass and live plants. Protozoans have been found to be present in and metabolizing leachate effluents contaminated by toxic metal ions such as Cu^{+2}, Hg^{+2} Ni^{+2} Pb^{+2} Zn^{+2} and Cd^{+2} and toxic compounds. The long-term survival of protozoa in media containing relatively high concentrations of heavy metal ions shows that these organisms have strategies to tolerate, resist or detoxify organic substances and heavy metals. Heavy metals act as toxic when exceeding the limit tolerated.

Key words: *solid wastes, leachate, heavy metals, public health, natural treatment, protozoa*

1. INTRODUCTION

The consumption of available resources has resulted in municipal solid waste (MSW) from industrial to domestic activities, which affect human health. Improper management of solid waste areas has resulted in serious ecological, environmental and health problems. Such practices contribute to widespread environmental pollution as well as spread of diseases. Health deterioration, accidents, flood occurrences and environmental pressures are a few of the negative effects of MSW. Other environmental effects include pollution of surface and subsurface waters, unpleasant odors, pest infestations and gas explosions. Municipal solid waste is a major environmental

problem in Turkey and in many developing countries. The problem of solid waste management is an increasing issue in Turkey. Household solid waste generation is 0,88 kg day−1 per person in Van, also municipal solid waste generation is close to 1 kg day−1 where more than 25 million tons of municipal solid waste is generated every year in Turkey (TUIK 2008).

2. SOLID WASTES, LANDFILL LEACHATE AND ITS TREATMENT

Most of the solid waste is illegally dumped in the MSW dumping areas. If the solid waste generated from industrial and agricultural activities are included, this amount increases to at least 40–50 million tons per year in Turkey. Therefore,the management of solid waste, particularly MSW, has been one of the most important environmental issues of Turkey. Solid waste disposal methods are a major public concern in Turkey. Majority of the municipal solid waste disposal sites are still open dumps. Landfilling has been the main method of municipal solid waste (MSW) disposal in most countries and Turkey. Only seven cities have regular sanitary landfills used to dispose municipal solid wastes and more than 12 landfills are in the construction stage (Bakıs and Tuncan, 2010). The composition of waste deposited in landfills is mainly determined by the consumption habits and waste management systems of the society in question. In addition to MSW, municipal landfills often contain daily cover materials (e.g., surplus soils and composted sludges), which are used to minimise gas emissions (e.g., methane and odours), and leachate volume as well as littering in the local environment. Furthermore, in many landfills during their period of operation (typically 20–30 years) some areas have been used for the disposal of specific materials such as sewage sludge, ash, asbestos material or dead animals (Sormunen et al, 2008).

Leachate generation is an unavoidable problem associated to landfills, and water pollution by leachate has been historically a major environmental concern. Many factors, e.g., annual precipitation, surface runoff, infiltration, evaporation, evapotranspiration, mean ambient temperature, waste composition, waste density, initial moisture content, depth of the landfill, interact to produce variable quantity and quality of leachate from landfills Leachate is formed when moisture content of waste exceeds the field capacity, defined as the total amount of moisture that can be retained in a waste sample subject to the downward pull of gravity. The precipitation is the principal source of moisture in landfills. While some part of this moisture forms surface runoff, some part returns back to the atmosphere directly with evaporation/ evapotranspiration. The rest adds to the moisture storage that is the water content absorbed and held by capillary in the waste and intermediate cover layers. Whenever moisture exceeds the field capacity of the waste material, it percolates through the waste. The moisture storage continually changes, i.e., increases due to infiltration and decreases due to evaporation/evapotranspiration. Leachate quantity is a function of the initial moisture content and water input, and the rate of leachate flow varies significantly throughout the year (Durmusoglu and Yılmaz, 2006). Similarly, leachate quality changes over time, because, as a landfill becomes older, there is a shift from a relatively short aerobic period to a longer, anaerobic decomposition period (Diamadopoulos, 1994).

Leachate generation is an unavoidable process in landfills, and may occur despite of isolation methods such as clay caps, slurry walls, or geosynthetic cover systems. Application of such isolation methods may only slow the rate of leaching, thus, leachate collection and treatment are still necessary. Most of the treatment processes for wastewater treatment could be adapted for leachate treatment. The potential methods are transferring (off-site treatment), biological (aerobic, anaerobic), and physico-chemical (precipitation, oxidation, adsorption, stripping, reverse osmosis) (Ozturk et al., 2003; Rivas et al., 2004). Leachate quality is dependent on the age of the landfill and stages of degradation of the waste in the landfill and contains varying amounts of organic matter (measured as chemical oxygen demand (COD), range 140–152 000 mg/l), inorganic macrocomponents (e.g., ammonium–nitrogen (NH_4–N) range 50–2200 mg/l; chloride (Cl) range 150–4500mg) and smaller amounts of heavy metals such as Cd, Cr, Cu, Pb, Ni and Zn (Sormunen et al, 2008). Under normal landfill operational conditions, heavy metals are strongly retained, due to their binding to organic matter and precipitation, e.g. as poorly soluble sulphides under the reducing conditions usually found in MSW landfills. However, some low levels of metals do leach out, and these may increase, e.g. in periods where disturbances of masses allow oxygen into the system (Øygard et al., 2007). The concentrations of metals in the leachate, which can vary widely from the microgram to the milligram per litre concentration, are commonly determined for surveillance purposes as total acid-soluble content. Usually metals are found at moderate concentration levels in municipal landfill leachates. Typical values are in range: Cd 2-20μg/L, Ni 100-400 μg/L, Zn 500-2000 μg/L, Cu 20-100 μg/L, Cr 100-500 μg/L and Pb 50-200 μg/L, but higher concentrations may appear (Jensen and Christensen, 1999). The concentration of heavy metals from 20 German landfills by the averages of methanogenic phase leachates show major variations. The average metal concentrations are fairly low. A survey of 106 old Danish landfills showed that metal concentrations for old landfills are also low ; 0.006mg Cd/L, 0.13mg Ni /L, 0.67mg Zn/L, 0.07mg Cu/L, 0.07 mg Pb/L and 0.08 mg Cr/L (Christensen et al., 2001). Heavy metals present in the form of free cations or in labile complexes (which can easily dissociate) will generally have a more harmful effect on aquatic organisms than metal in non-labile complexes, since the free metal form is both very mobile and can easily absorb onto, pass into, the tissue of marine organisms (Øygard et al., 2007).

The leachate quality plays a key role in choosing the method and level of treatment. According to Diamodopoulos (1994), physico-chemical treatment is not appropriate to treat leachate from young landfills (first several years of operation) since this young leachate is derived from complex biodegradation organics and simple dissolved organics. The high but readily biodegradable organic content of leachate from young landfills makes it amenable to biological treatment (Bagchi, 1987). Since the concentration of several parameters contained in young leachate can inhibit biological processes, a physico-chemical pre-treatment of this type of leachate was considered

as the most popular method in order to meet the standard limits for discharge (Tatsi et al., 2003). In addition to their use as a pre-treatment technique, physico-chemical processes are effective in the treatment of stabilized leachate from old landfills (Tatsi et al., 2003; Rivas et al., 2004). Since old leachate contains refractory organics generally formed by bacterial or chemical processes, it is more amenable to treatment using physico-chemical processes rather than biological. It is apparent that neither biological nor physico-chemical treatment processes separately achieve high removal efficiencies and the treatment processes are site specific since the leachate composition varies from site to site with seasonal variations.
Leachates from active and closed municipal solid waste (MSW) landfills can be a major source of contamination to groundwater and surface waters. Toxicity of leachate was reported using multiple bioassays. Genotoxicity is one of the most dreaded effects of leachates for future generation. Heavy metals and organic pollutants, which are potentially harmful to crops and microorganisms in soil. Contaminated crops reduce quality of the feed and food. Recent analysis found an association between the location of landfills and the risk of congenital anomalies. Water contamination is one of the main causes of health problems in human beings. About 2.3 billion peoples are suffering from water related diseases worldwide.

3. HEAVY METAL BIOREMEDIATION

Recently, microbial bioremediation has emerged as an alternative technique to such traditional chemical treatments (Rehman et al., 2008b). Microbial metal bioremediation is an efficient strategy because of its low cost, high efficiency, and eco-friendly nature. Microbiological detoxification of polluted water is economical, safe, and sustainable (Rehman et al., 2010a). Studies on the interactions of microorganisms with heavy metals have had increasing interest in recent years. Some of these studies have dealt on elucidation of different metal resistance mechanisms, interactions and processes, especially those used by bacteria, protozoa and fungi. Studies have shown that these potential microbial consortia are versatile for remediation of heavy metals contaminated water and wastewater, thus have high significance for environmental cleanup. (Akpor and Muchie 2010) In contrast to bacteria, yeast and fungi, ciliates(a group of protozoa) are unicellular organisms without a cell wall which may result in a slower or less effective response, in the vegetative stage. (Gutiérrez et al., 2003)

In the process of bioremediation for cleaner environment, microorganisms (instead of chemicals) are being used for decontamination and detoxication.(Haq et al., 1998) Microorganisms have a high surface area-to-volume ratio because of their small size and therefore provide a large contact area that can interact with metals in the surrounding environment. (Rehman et al., 2008a). Microorganisms have a high affinity for metals and can accumulate these metals by a variety of mechanisms, a property that has been exploited to remove metals from polluted industrial and domestic effluents on a large scale. The uptake of metals by live cells has become one of the most attractive means for bioremediation of industrial wastes and other metal polluted environments. (Rehman et al. 2008a) The tolerance of protozoa toward toxic metals suggests the possibility of their exploitation in bioremediation, perhaps in cooperation with other microbial populations. These organisms have strategies to tolerate, resist or detoxicate organic substances and heavy metals. (Haq et al., 1998) Metal bioaccumulation has been reported as the main mechanism of resistance to heavy metals in ciliates. This property makes protozoa excellent candidate for exploitation in metal detoxification and bioremediation. (Rehman, 2008a)

Metals can produce directly or indirectly, by the production of reactive oxygen species, remarkable alterations on proteins, DNA and cellular lipids that can generate cell death by necrosis or apoptosis , if they are not controlled by cellular antioxidant defences. These defences may be enzymatic (antioxidant enzymes, such as; glutathione peroxidase, catalase or superoxide dismutase) or non-enzymatic (glutathione and metallothioneins, which have a protective effect against oxidative stress). (Gutiérrez et al., 2003) Unlike other pollutants, metals cannot be degraded but the cleanup usually requires their removal. (Rico, 2009)

Metallothioneins (MTs) present in all animal phyla, plants, eukaryotic microorganisms, and cyanobacteria. Metallothioneins (MTs) are well-known low molecular weight (6–7 kDa), ubiquitous, cytoplasmic, cysteinerich proteins, which have the capacity for high affinity binding of heavy metal ions. MTs may have important biological functions; e. g. trace metal homeostasis, a protective role against excess reactive heavy metal ions, free radical scavengers, and as reservoirs of essential metals which can be donated to other metalloproteins and protect the cell against intracellular oxidative damage. their biosynthesis is greatly enhanced by metal ions, certain hormones (e.g. cytokinines, growth factors) and many other chemicals. (Boldrin, 2003) Metallothioneins act as biological chelators of heavy metals by forming metal-thiolate bonds with their numerous cysteine residues. The functions of metallothioneins have been proposed to involve roles of metal metabolism such as transpot, storage and especially detoxification of heavy metals.

One of the six basic heavy metal resistance mechanisms present in micro-organisms and higher eukaryotic organisms, is the intracellular sequestration (bio-accumulation) of the metal by chelating proteins or peptides (metallothioneins (MTs), phytochelatins, glutathione) or other molecules (polyphosphates) to prevent interactions with metal-sensitive cellular targets. There are two types of peptide molecules with heavy metal binding capacity that generally involved in the cellular metal detoxification: (a) enzymatically

biosynthesized molecules, such as glutathione or phytochelatins, and (b) proteins encoded by genes, such as MTs, which all present numerous free –SH groups (from cysteine (cys) residues) that constitute reactive groups for chelating heavy metals. (Gutie´rrez et al., 2009) Ciliates can be valuable microorganisms to detect and detoxicate pollutants (such as heavy metals) in environmental samples. It has been found that ciliated protozoan exposed to heavy metals are able to synthesize MTs, suggesting that also in these organisms, MTs play a role in heavy metal homeostasis and detoxification. (Donderoa et al., 2004) Among the six possible well-known microbial heavy metal resistance mechanisms, at least three may be present in ciliates; bioaccumulation (the best studied), a probable active export (supported by the large numbers of genes encoding membrane transporters found in ciliate genomes) and biosorption (present in ciliate resting cyst forms) (Gutie´rrez, 2009). The main defence mechanism, in ciliates, against heavy metal toxicity is the induction of metallothionein biosynthesis, and it has been reported that metallothioneins are also induced by oxidative stress inducers (Rico, 2009). Intracellular sequestration is the accumulation of metals within the cytoplasm by protein (MTs) binding to prevent exposure to essential cellular components. The survival of Euplotes mutabilis (a ciliate protozoa) in industrial wastewater containing high concentrations of heavy metals (cadmium, lead, copper and chromium) have been evaluated in the past. (Akpor and Muchie 2010) E. mutabilis showed tolerance against cadmium (22 µg/ml), chromium (60 µg/ml), lead (75 µg/ml) and copper (22 µg/ml). In addition, it was observed that after 96 h inoculation of the E. mutabilis in the medium containing 10 µg/ml of metal ions, the live protozoan could remove 97% of lead and 98% of chromium from the medium. Euplotes mutabilis grown in the medium containing Cu^{2+} (5 µg/ml) has been reported to reduce 60% of copper from the medium after 48 h, 82% after 72 h and 95% after 96 h. (Rehman et al., 2007)/

A ciliate, Vorticella microstoma, has been reported to tolerate Cr^{6+} at a concentration of 260 µg/ml, and has the ability to reduce 48% of Cr^{6+} after 192 h in a culture medium containing 100 µg/mL of Cr^{6+}. This property makes protozoa excellent candidate for exploitation in metal detoxification and bioremediation. (Muneer et al., 2009) Besides this, V. microstoma decreased 72% of Cd^{2+}, 82% of Cu^{2+}, 80% of Ni^{2+}, and 74% of Hg^{2+} from the medium after 96 h of incubation. Multiple heavy metal uptake ability of V. microstoma can be exploited for metal detoxification and environmental clean-up operations. Also V. microstoma actively contribute to the amelioration of the effluent quality, since the majority of them feed upon dispersed bacteria. (Rehman et al., 2009)

Stylonychia mytilus showed tolerance against Zn^{2+} (30 µg/mL), Hg^{2+} (16 µg/mL) and Ni^{2+} (16 µg/mL). S. mytilus reduced 91% of Cd^{2+}, 90% of Hg^{2+} and 98% of Zn^{2+} from the medium after 96 h of incubation in a culture medium containing 10 µg/ml of the respective metal ions. Besides this, this ciliate could also remove 88% of Cu^{2+} and 73% Ni^{2+} from the medium containing 5 µg/ml of each metal after 96 h. S. mytilus was found to resist Pb^{2+} up to a concentration of 60 µg/ml. The Pb-resistant ciliate could also tolerate Cu^{2+}, Cr^{6+} and Cd^{2+} at the maximum concentrations of 20, 30 and 23 µg/ml, respectively. The live S. mytilus growing in medium containing lead (10.0 µg/ml) could reduce 80% (867 cells/ml) of lead from the medium after 48 h, 84% (1,142 cells/ml) after 72 h and 88% (1,458 cells/ml) after 96 h, respectively. Likewise, live ciliate reduced 52% (700 cells/ml) chromium from the medium after 48 h, 76% (1,250 cells/ml) after 72 h and 80% (1,492 cells/ml) after 96 h, respectively. The ability of Stylonychia to take up variety of heavy metals from the medium could be exploited for metal detoxification and environmental clean-up operations . Stylonychia has also been reported to actively take up Pb^{2+} from the medium. The protozoan culture grown in medium containing lead (10 µg/ml) could reduce 80% of lead from the medium after 48 h, 82% after 72 h and 86% after 96 h, respectively. (Rehman et al. 2009) S. mytilus could remove 88% Pb^{2+} and 80% Cr^{6+} from the medium after 96 h of incubation. (Rehman et al., 2007). Paramecium caudatum was found to tolerate Ni^{2+}, Cu^{2+}, Hg^{2+}, Zn^{2+}, and Cd^{2+} at a concentration of 18, 15, 17, 15 and 14 µ g/ml, respectively. P. caudatum removed 95% of Zn^{2+} and 78% of Hg^{2+} from the medium containing 10 µg/ml of the respective metal ions after 96 hours of incubation. The protozoan could also remove 94% of Cu^{2+}, 82% of Cd^{2+} and 76% Ni^{2+} from the medium containing 5 µg/ml of each metal after 96 hours, respectively. (Rehman et al., 2010 b).

4. HEAVY METALS ON HUMAN EFFECT

The main threats to human health from heavy metals are associated with exposure to lead, cadmium, mercury, copper and nickel. Cadmium compounds are currently mainly used in re-chargeable nickel–cadmium batteries. Cadmium emissions have increased dramatically during the 20th century, one reason being that cadmium-containing products are rarely re-cycled, but often dumped together with household waste. People may be exposed to potentially harmful chemical, physical and biological agents in air, food, water or soil. However, exposure does not result only from the presence of a harmful agent in the environment. The key word in the definition of exposure is contact (Berglund et .al., 2001).

Cadmium (Cd): Inhalation of cadmium fumes or particles can be life threatening, and although acute pulmonary effects and deaths are uncommon, sporadic cases still occur. Cadmium exposure may cause kidney damage. The first sign of thte renal lesion is usually a tubular dysfunction, evidenced by an increased excretion of low molecular weight proteins [such as β2 microglobulin and α1-microglobulin (protein HC)] or enzymes [such as N-Acetyl-β-D-glucosaminidase (NAG)]. It has been suggested that the tubular damage is reversible, but there is overwhelming evidence that the cadmium induced tubular damage is indeed irreversible (Washington, 1992). WHO estimated that a urinary excretion of 10 nmol/mmol creatinine (corresponding to circa 200 mg Cd/kg kidney cortex) would constitute a‘critical limit’ below which kidney damage would not occur. An excess risk of kidney stones, possibly related to an

increased excretion of calcium in urine following the tubular damage, has been shown in several studies (Hellström, 2001).

Mercury (Hg) : Acute mercury exposure may give rise to lung damage. Chronic poisoning is characterized by neurological and psychological symptoms, such as tremor, changes in personality, restlessness, anxiety, sleep disturbance and depression. The symptoms are reversible after cessation of exposure. Because of the blood–brain barrier there is no central nervous involvement related to inorganic mercury exposure. Metallic mercury may cause kidney damage, which is reversible after exposure has stopped. It has also been possible to detect proteinuria at relatively low levels of occupational exposure. Metallic mercury is an allergen, which may cause contact eczema.

Lead (Pb): The symptoms of acute lead poisoning are headache, irritability, abdominal pain and various symptoms related to the nervous system. Lead encephalopathy is characterized by sleeplessness and restlessness. Children may be affected by behavioural disturbances, learning and concentration difficulties. In severe cases of lead encephalopathy, the affected person
may suffer from acute psychosis, confusion and reduced consciousness. People who have been exposed to lead for a long time may suffer from memory deterioration, prolonged reaction time and reduced ability to understand. Individuals with average blood lead levels under 3 µmol/l may show signs of peripheral nerve symptoms with reduced nevre conduction velocity and reduced dermal sensibility. If the neuropathy is severe the lesion may be permanent. The classical picture includes a dark blue lead sulphide line at the gingival margin.

Nickel (Ni): The adverse health effects of nickel depend on the route of exposure (inhalation, oral, or dermal) and can be classified according to systemic, immunologic, neurologic, reproductive, developmental, or carcinogenic effects following acute (01day), subchronic (10-100 days), and chronic (100 days or more) exposure periods. The most common harmful health effect of nickel in humans is an allergic skin reaction in those who are sensitive to nickel. The metal is not only an allergen but also a potential immunomodulatory and immunotoxic agent in humans (Das and Buchner.et.al., 2007).

Acute toxicity (01 day): The immediate symptoms include headache, vertigo, nausea, vomiting, insomnia, irritability, which usually last a few hours, followed by an asymptomatic interval of 12 h to 5 days. Then delayed symptoms appear-tightness of the chest, nonproductive cough, dyspnoea, cyanosis, tachycardia, palpitations, sweating, visual disturbances, vertigo, weakness, and lassitude (Sunderman,et.al.,1975).

Chronic toxicity (>100 day): Most chronic inhalation exposures involve occupational exposure to nickel dust or nickel vapors resulting from welding nickel alloys. Generally, chronic inhalation exposure to nickel dusts and aerosols contribute to respiratory disorders (Patterson and Armstrong, 1976).

Copper (Cu): Death from ingestion of copper salts has been reported after as little as 2 grams of cupric sulfate (Stein.et.al.,1976). Immediate deaths are caused by central nervous system (CNS) depression and shock. Later deaths (after 24 hours) are caused by hepatic and renal failure (Jantsch.et.al., 1985). Deaths have also been reported as the result of the use of water with dissolved cupric sulfate in religious rituals (Akintowa,et.al., 1989). The poisoned individuals ingested approximately 20 grams each of cupric sulfate dissolved in "spiritual water" at a concentration of 100 g/LThe symptoms exhibited by these individuals included toxic psychosis, profound greenish vomiting, hemolytic anemia and jaundice. Death occurred within eight days after ingestion (Nicholas and Brist, 1968).

5. CONCLUSIONS

Leachate from a solid waste disposal site is generally found to contain major elements like calcium, magnesium, potassium, nitrogen and ammonia, trace metals like cadmium, copper, chromium, nickel, lead and organic compounds like phenols, polyaromatic hydrocarbons, acetone, benzene, toluene, chloroform etc. Uncontrolled heavy metal containing leachate to the environment can be detrimental to humans, animals and plants. Protozoans have been found to be present in and metabolizing leachate effluents contaminated by toxic metal ions such as Cu^{+2}, Hg^{+2} Ni^{+2} Pb^{+2} Zn^{+2} and Cd^{+2} and toxic compounds. The long-term survival of protozoa in media containing relatively high concentrations of heavy metal ions shows that these organisms have evolved strategies to tolerate, resist or detoxicate organic substances and heavy metals. This property makes protozoa excellent candidate for exploitation in metal detoxiification and bioremediation. Heavy metals act as toxic when exceeding the limit tolerated.

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INDOOR AIR QUALITY IN FREESTALL DAIRY HOUSING IN AUTUMN AND THE EFFECTS OF GAS EMISSION ON ENVIRONMENTAL POLLUTION

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ABSTRACT

Ambient air quality is one of the important factors for human being and animals in livestock building which must be taken consideration meticulously. Manure of animal has many organic compounds that may be decomposed at different climatic condition. Mineralization period may be affected by environmental conditions. This study has been carried out to determine climatic parameters (temperature, relative humidity) concentration of harmful gases (NH_3, CH_4, H_2S) occurring in barn and O_2 level. They have been measured in freestall dairy houses in autumn season (16-30 November) of 2007 in Konya-Turkey where little data is currently available. The air quality parameters have been measured by using data logger and multi-gas monitor during 15 days for freestall dairy housing.

In this study, hydrogen sulphide and methane emission values have been measured between 0 and 0.17 ppm/h and between % 0 and % 3.5, respectively. Because most dangerous gas is H_2S and CH_4 in livestock buildings, then NH_3 follows. Ammonia emission level has been between 0.6 and 3.2 ppm/h in experimental periods. Oxygen level has not been at critical level for livestock buildings and sometimes changed about 1%.

As a result, the effects of harmful gases occurring in barns on animal health and air quality of environment have been endeavored to determine. However, we tried to investigate effect of air quality parameters on dairy cattle and people that work in barn, and environmental pollution.

Key words: Air quality, ammonia, methane, freestall housing, livestock building, hydrogen sulphide.

1. INTRODUCTION

Agriculture is a major source of gaseous emissions contributing to air pollution and climate change. This sector represented 96% of the total French ammonia (NH_3) emissions, 78% of the nitrous oxide (N_2O) emissions and 70% of the methane (CH_4) emissions in 2004 (CITEPA, 2005a,b). Atmospheric ammonia emissions are responsible for several adverse effects on natural habitats in Europe (Grennfelt and Hultberg 1986, Bobbink et al. 1998). Livestock production is deemed to be the greatest contributor of anthropogenic ammonia emissions in Europe and Canada (ECETOC 1994, Kurvits and Marta 1998). However, very few field measurements have been done in Turkey. Several large-scale studies measuring ammonia, methane, hydrogen sulphide emission rates and oxygen level from dairy livestock buildings have been conducted in the other country (Europe and in the United States of America), where climate,

ventilation method or livestock management practices usually differ from those in Turkey.

Livestock animals typically use less than 30% of the nitrogen they ingest, which leaves 50–80% to be excreted in urine and 20–30% in feces. Urea is the source of 97% of all nitrogen contained in urine (McCrory and Hobbs 2001). Transformation of urea into ammonium ions is dictated by ureic activity, where urease enzymes contained in feces can readily decompose the urea in urine. Therefore, limiting contact between feces and urine should limit ammonia emission rates. Furthermore, ureic activity increases exponentially with increasing temperature. Ureic activity is also negligible at temperatures below 10 °C (Rotz 2004). This can occur rapidly during short-term manure storage in dairy buildings, with complete conversion of urea into ammonium within a few hours. The following environmental and manure physico-chemical parameters affect ammonia volatilization rates from livestock production infrastructures: Temperature and speed of air just over the manure surface (Kroodsma et al. 1993, Ni 1999). Furthermore, very few studies indicated the procedures used to evaluate the accuracy of building ventilation flow rate measurements or gaseous ammonia concentration measurements in livestock buildings. Yet, no standardized procedures exist for these matters in agricultural air quality studies (Aneja et al. 2007).

Environmental pollution is an important issue that threatens human life. Chemical composition of air in the media of production and growing of animal food indirectly affects human health as well as air quality in the media people lives directly affects their life. Harmful gases raised in livestock building adversely affect animal products and the health of the people who work in livestock buildings. Additionally, the harmful gases threaten health of animals living in this environment, so that animal production reduces. Spreading of these gases to surrounding area of livestock building indirectly causes environmental pollution (Uzal Seyfi and Dursun 2011).

In this paper, ammonia, methane, hydrogen sulfur emission rates level from freestall dairy livestock buildings in Turkey and oxygen level, temperature and relative humidity value in there are presented. These values will serve as a starting point for hazardous gas emission inventory for agriculture.

2. MATERIAL AND METHODS

2.1. Housing and Animal

In this investigation, freestall dairy housing in Konya (Turkey) was studied to determine air pollutant parameters and effect of environmental condition on these parameters in dairy livestock buildings for the time period between 16 November and 30 November 2007. Data of air pollutant and climatic condition parameters were collected from the farm with the equipment steeled suitable position in farms (Figure 1). Air condition measurements were done in resting area of the freestall dairy housing. The details of the experimental housing plan view and measurement devices are shown in Figure 1 for freestall dairy barn. Freestall barn had 70 dairy cattle in total of 150. In barn facilities, stall width, stall length, feeding length, courtyard area stocking density, feed alley width were 1.15 m, 2.30 m, 0.8 m per cow, 16.40 m^2 per cow, 4.40 m, respectively.

All animals were fed with a mixture of corn silage and grass silage and concentrated feed and hay supplemented with concentrate. Dairy cattle got their feed twice a day and forage was swept towards the feeding place twice a day.

2.2. Observation Periods and climatic data collection

Digital temperature-humiditymeter were utilized to determine climatic data in the companies (temperature measurement range: -40 ºC, +100 ºC, resolution: 0.03ºC, precision: ±0.3 ºC; relative humidity measurement range: 0-100 % rh, resolution: 0.4 %, precision: ±3 %, Hobo Data logger, Onset Computer Corporation, USA). Climatic devices were located slightly above cow level and taped to a pole protected from direct sunlight. Measurement values were recorded every 1 h on a data logger from 9 different points in open freestall barn during examination. Multi-gas monitor were used to measure NH_3, CH_4, H_2S and O_2 in different parts of the barn (measurement range and resolution: 0-30 % and 0.1 % for O_2, 0-100 % and 1 % for CH_4, 0-100 ppm and 1.0 ppm for H_2S, 0-50 ppm and 1.0 ppm for NH3. Working condition of this device should be between -20 °C and 45 °C temperature and 0 % and 95 % relative humidity).

Temperatures, humidity, NH_3, CH_4, H_2S and O_2 have been measured in the barn systems, in which the study has been done, in order to determine the variation in air quality. Temperature and humidity values have been continuously measured from different parts of the barn (Figure 1) during the study. Parameters of air quality (NH_3, CH_4, H_2S and O_2) have been recorded with 5 minutes intermittence during 15 experimental days (16-30 November 2007) considering the methods used in the research (Gay et al. 2003). Air quality measurements have been conducted in different positions in order to reach real values (Figure 1). Measurement points for air quality parameters and other parameters was defined as 2.5 m above surface of dairy house (in level animal but not be reached by dairy cattle) by Robarge et al. (2002) and Walker et al. (2006).

All data obtained from barn has been computed separating 24 time periods according to day time. Time period of 1 h from 12:01

pm to 1:00 am has been considered as 1 hour.

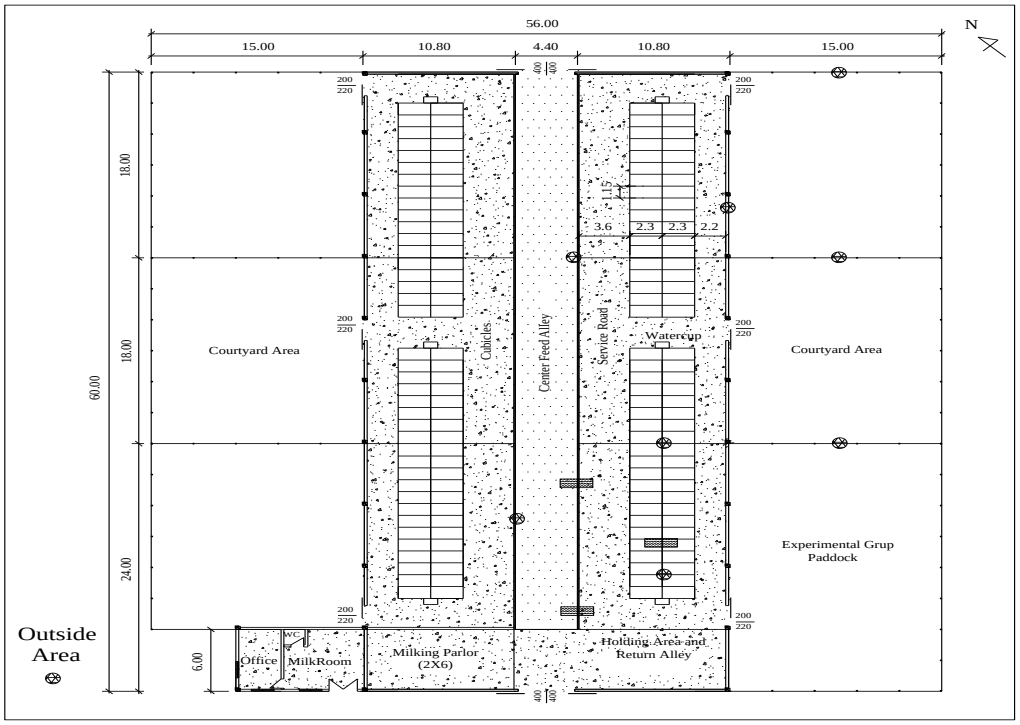

Figure 1. The plan view of freestall dairy housing (m) and air conditions measurement points

3. RESULTS AND DISCUSSION

There was a special climatic characteristic in the study area that the winter period is very cold with temperature sometime -10 ^{o}C and summer period is very hot (some times over 30 ^{o}C) and dry. Relative humidity is high during winter period (about 85 %), but it is low in summer time about 30 %. Winter period is windier. Other hand, there is about 10 ^{o}C difference in daily between day and night time. Changing temperature daily affects the other meteorological characters, too. Mostly, closed livestock buildings were preferred in the region against too negative effect of daily and seasonal changing meteorological character of atmospheric conditions (Uzal Seyfi and Dursun 2011). Recently open loose and freestall dairy livestock buildings were started to use in Konya city, Turkey (Uzal 2008). In this study, climatic and environmental conditions were measured to research relation between air pollutant emissions and atmospheric conditions in autumn.

An inventory of emissions of CH_4, NH_3 and H_2S from manure management was measured in livestock buildings (Claudia and Daniel 2009, Groot Koerkamp et al. 1998, Demmers et al. 2001, Aneja et al. 2007, Gay et al. 2003, Arogo et al. 2003, Hafner et al. 2006). Environment of many livestock housings is not suitable for dairy cattle welfare. Therefore, measurements of air quality in around animal houses are very important. Recently, some applications for dairy cattle as Freestall Housing System and Loose Housing System or Semi-Open Loose Housing System are put into practice in Turkey. Freestall housing was investigated in this study. Environmental quality of these housing systems is better than traditional ones.

When we look at the measurement of concentration of air quality parameter, H_2S was very low or lover than measurable level in freestall dairy cattle barn in experiment periods. NH_3 was mostly over measurable level and sometimes very high which may affect cattle health. CH_4 was measurable level. Oxygen level was not critical level for livestock buildings and sometimes changed about 1%. Inside temperature of measurement period was between 3°C and 13 °C value. Relative humidity was appropriate during experimental period.

Hourly distributions of NH_3 emission from freestall dairy housing and interior temperature in the study during experimental period (16-30 November) are given Figure 1. The minimum and maximum indoor concentrations measured for the entire sampling period were as follows: 0- 7.29 ppm (29.11.2007 hour 17:00) NH_3. When we look at the measurement of concentration of NH_3 during experimental period, it was observed that NH_3 emission reach higher level after evening milking. This situation was because of highly usage resting area of dairy cattle during evening feeding periods.

Hourly distribution of average NH_3 emission and interior temperature profile at freestall dairy housing are given Figure 2. Generally, inverse relationship between NH_3 and temperature between 04:00 and 12:00, 17:00 and 21:00 is shown (Figure2). However, it is observed that NH_3 increase with the increase of temperature between 12:00 and 16:00. The reason of that, nearly % 98-100 of cows feed in feeding area adjacent the resting area after milking. The situation causes accrue of NH_3 concentration though decrease of temperature in resting area (experimental area). What's more, it is determined that maximum value of NH_3 concentration is measured at 18:00 as 3.11 ppm. That there is an important relationship between NH_3 and temperature has been reported by Uzal Seyfi et al. (2010). Minimum value of NH_3 emission from freestall dairy housing during experimental period is measured in 12:00 a.m. as nearly 0.68 ppm. NH_3 concentration during long time periods has been reported as 20 ppm by (Wathes1994). Maximum level of NH_3 concentration during the research is observed as 7.29 ppm. The indoor concentrations of NH_3 measured in the study are appropriate conclusions reported by Wathes (1994).

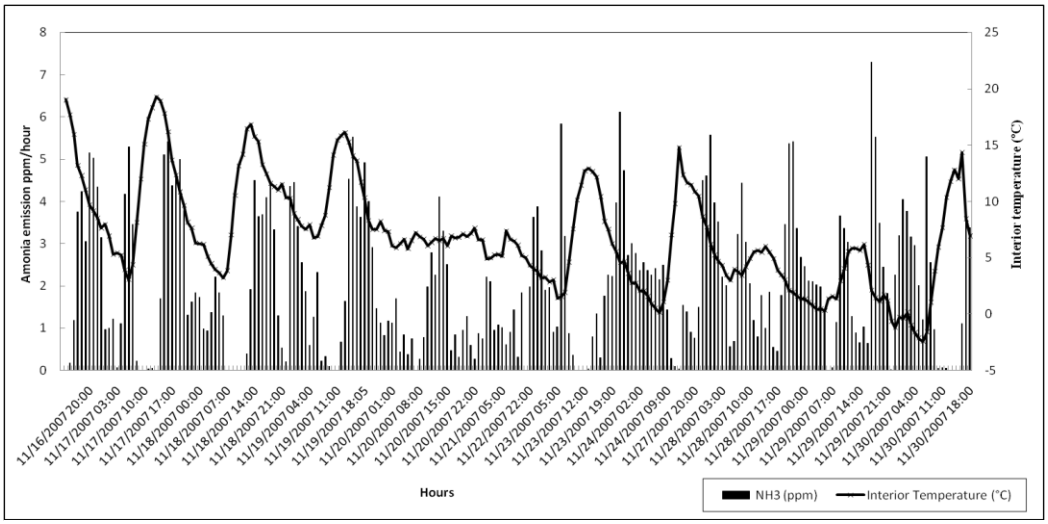

Figure1. Hourly distribution of ammonia emission from freestall dairy housing during experimental period

Hourly distribution of hydrogen sulphide emission from freestall dairy housing and interior temperature in the study are given Figure 3. H2S emissions are measured very low values. The minimum and maximum indoor concentrations measured for the entire sampling period were as follows: 0.008-0.17 ppm (11.17.2007 hour 11:00) H2S. Hourly distribution of averaged hydrogen sulphide emission from freestall dairy housing and interior temperature in the study are given Figure 4. H2S concentration is observed in some times of experimental days while it is not observed in some hours of these days. Particularly, it is observed that it reached maximum value (almost 0.02 ppm) in hour 11:00. Time-weighted average exposure values 10 ppm; short-term exposure values 15 ppm not to be exceeded for H2S in dairy cattle houses (Occupational Health and Safety Act, Ontario, 1986).

Hourly distributions of CH_4 emission from freestall dairy housing and inside temperature in the study during experimental period are given Figure 5. The minimum and maximum indoor concentrations measured for the entire sampling period were as follows: % 0-3.44 (17.11.2007 hour 11:00) CH_4. When we look at the measurement of concentration of CH_4 during experimental period, directly relationship between CH_4 and temperature is shown. However, it was observed that CH_4 emission was not sometimes measured. This situation was because of lower temperature.

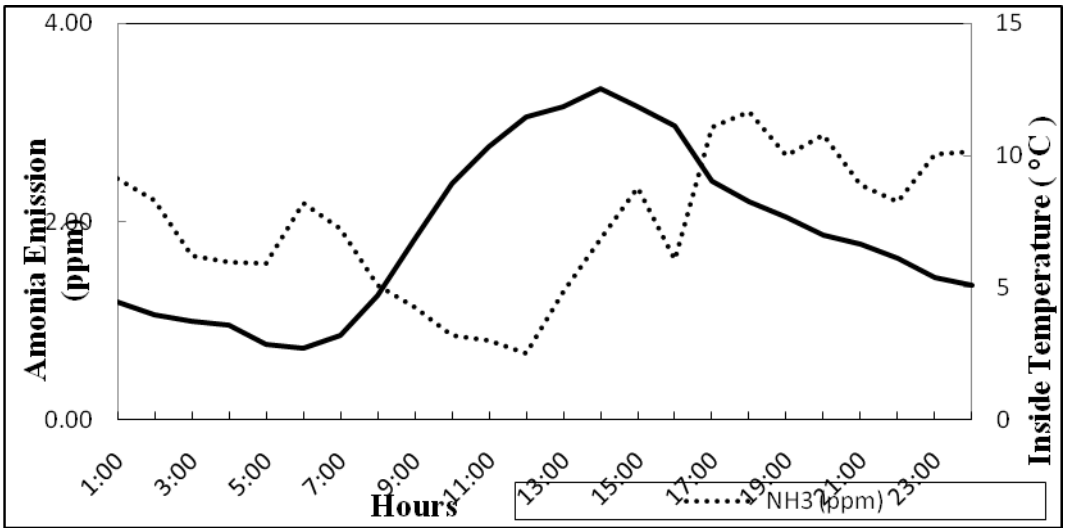

Figure 2. Hourly average ammonia emission and interior temperature profile at freestall dairy housing

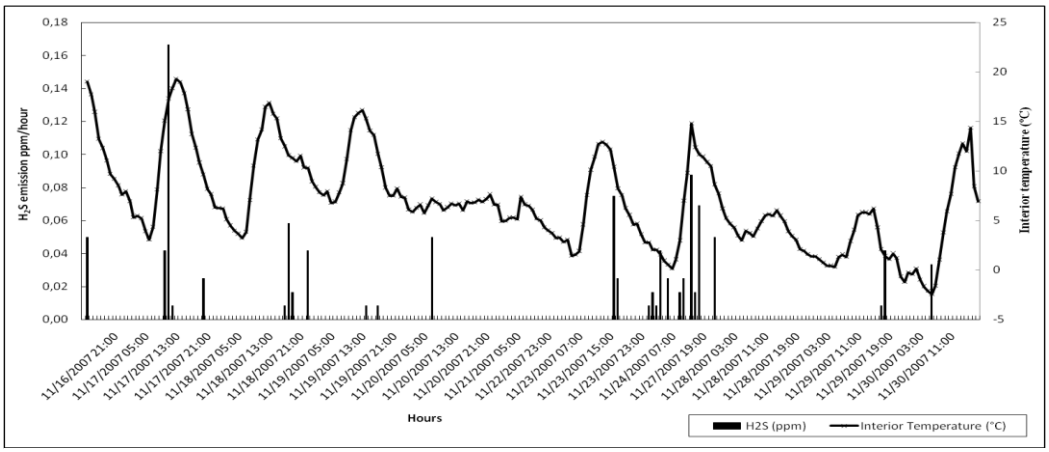

Figure 3. Hourly distribution of hydrogen sulphide emission from freestall dairy housing and interior temperature

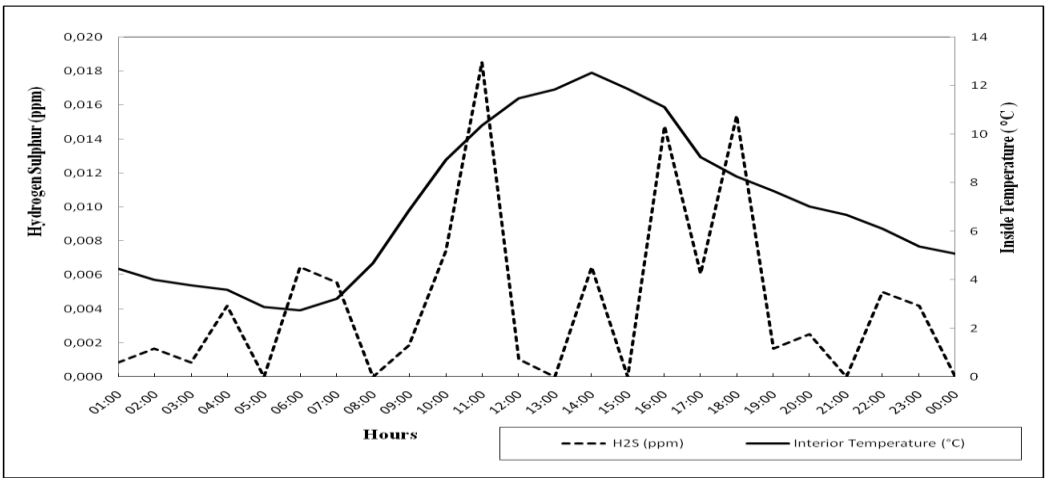

Figure 4. Hourly distribution of average hydrogen sulphide and interior temperature profile at freestall dairy housing

Hourly distribution of average CH_4 emission and interior temperature profile at freestall dairy housing are given Figure 6. Averaged CH_4 emission was observed between % 1.08 and % 1.46 values. CH_4 emission was measured higher than % 1.3 between 6:00 and 23:00 hours while it was measured between % 1.0 and % 1.1 values at nighttime (hours 00:00-5:00).

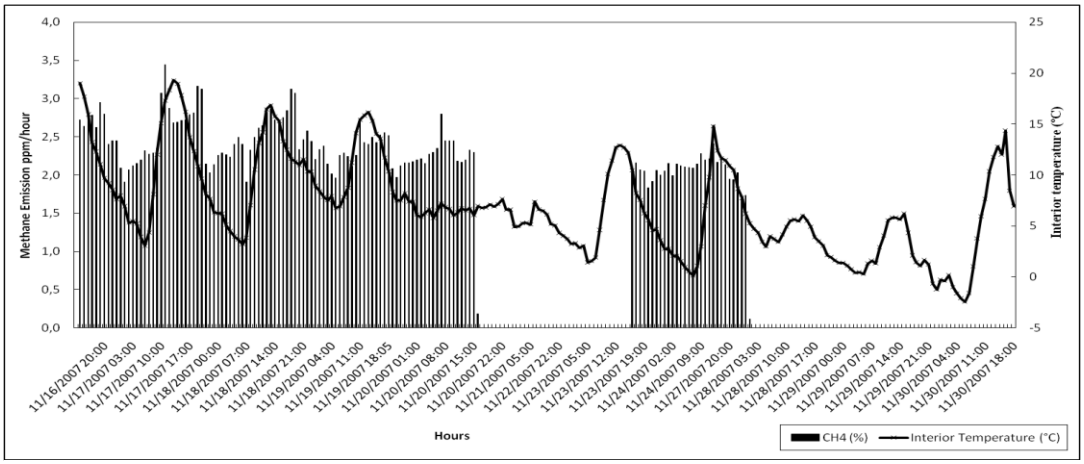

Figure 5. Hourly distribution of methane emission from freestall dairy housing and interior temperature

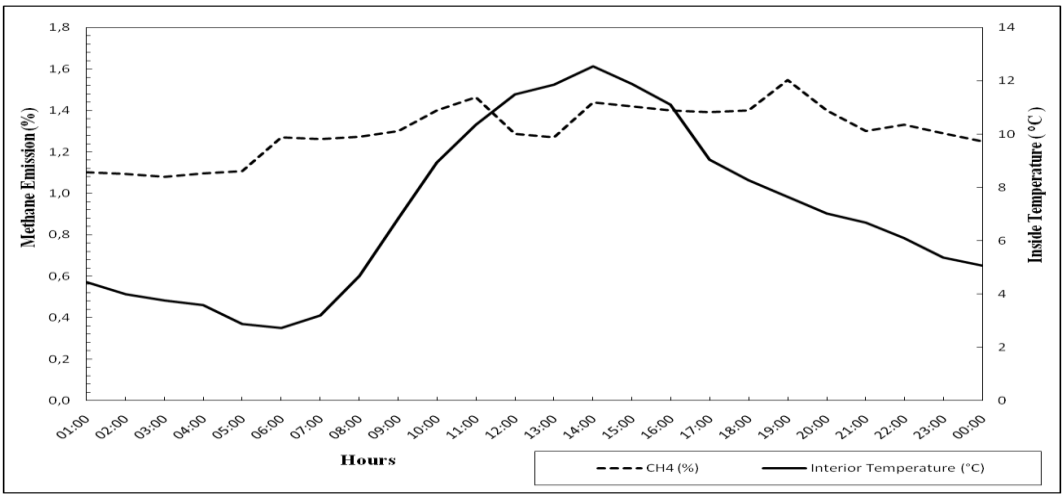

Figure 6. Hourly distribution of averaged methane and interior temperature profile at freestall dairy housing

Hourly distributions of average oxygen and interior temperature profile during experiment period are given Figure 6. O_2 level is observed between % 20.68 (hour 06:00) and % 20.86 (hours 14:00-15:00) value during experimental period. Measured O_2 values are find appropriate for dairy cattle (Wathes 1994).

Hourly distribution of average interior temperature and relative humidity profile at freestall dairy housing during experimental periods are given in Figure 8. Generally, interior temperature value is measured between 5 °C and 13 °C during experimental periods. Appropriate of this values for dairy cattle have been reported by Mutaf and Sonmez (1984), Demir (1992), Blowey (1994) and Spiers (2003). However, inside temperature values are observed less than 5°C between 01:00 and 07:00 hours. Generally, interior relative humidity values in the study change between % 60 and % 85. Suitable of this values for dairy cows have been reported by (Bickert ve ark. 1995, Ekmekyapar 1991). However, relative humidity values are observed less than % 60 at 15:00 and observed higher than % 85 between 00:00 and 08:00 hours. That relative humidity values occur less than % 60 and higher than % 85 are an undesirable situation for dairy cattle.

Cleaning manure should be paid attention to keep harmful gases at low levels in livestock housing. Moreover, ventilation of barns should be paid attention, too. Otherwise, these harmful gases not only affect animals and people working in barns but also cause environmental pollution. Most important part (80 % - 90 %) of greenhouse gases is composed of the gases which come out in barns.

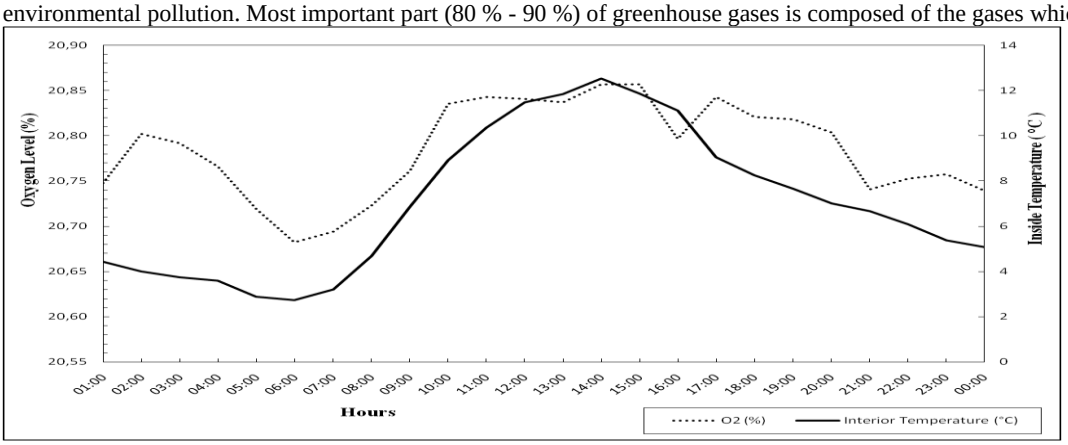

Figure 7. Hourly distribution of averaged oxygen and interior temperature profile at freestall dairy housing

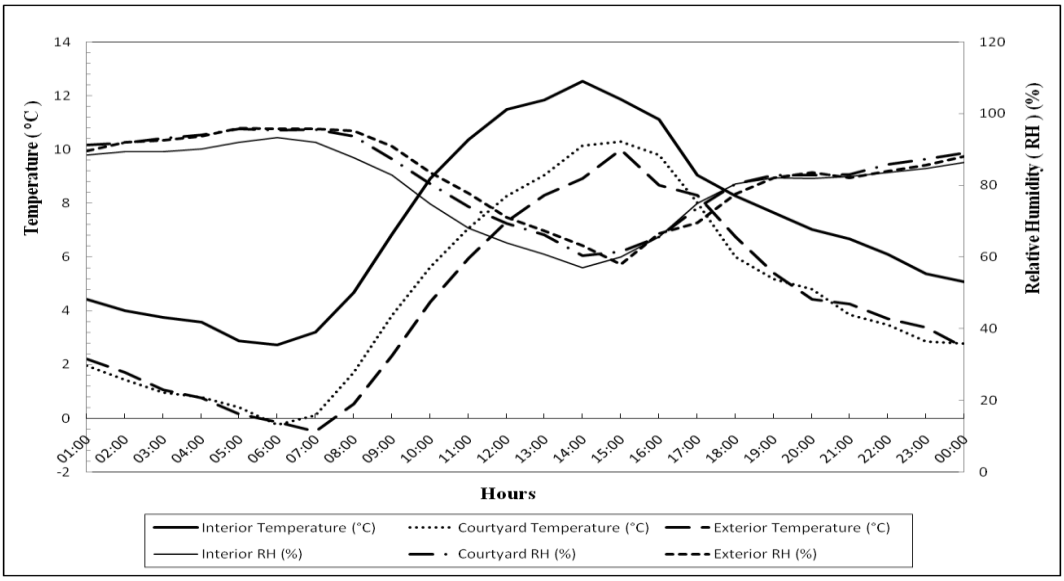

Figure 8. Hourly distribution of averaged interior, courtyard and exterior temperature and relative humidity profile at freestall dairy housing

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Paper 025

THE MICROBIOLOGICAL SURVEY OF RAW MILK IN SOME PLACES OF MILK COLLECTION IN ALBANIA

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ABSTRACT

The aim of this study is the microbiological survey of raw milk in some places of milk collection in Albania in 2010. The quality of raw milk is very important for the quality of market milk or other product like cheese, yogurt. In this study we have analyzed the raw milk for total aerobe mesophilic bacteria and coliforms. We have used the Plate Count Agar for detection of total aerobic mesophilic bacteria and VRBA (Violet red bile agar) for coliforms. With these microbiological analyses we have compare the quality of our samples with the microbiological standards for total bacterial count and for total coliform count. The microbiological standard for the total bacterial count is $<1x10^6$ cfu/ml, and the microbiological standard for total coliform count is $<5x10^2$ cfu/ml. From five places of collection that we have analyses, only two places were in good quality within microbiological standard. From the results of these analyses we have the conclusion that the raw milk in these places is not in a good quality and there is much to do with the hygiene in these places or with the health of the cows.

Key words: microbiological survey, raw milk, quality, milk collection, Albania.

1. INTRODUCTION

The number and types of microorganisms in milk immediately after production (initial micro flora) directly reflect microbial contamination during production, collection and handling.
A useful indicator for monitoring the sanitary conditions present during the production, collection and handling of raw milk is the "total" bacterial count or standard plate count (SPC) (JABLONSKI, et al., 1997, MARTH, E. H 1998).

Incidences of coliforms in raw milk have received considerable attention. This attention is partly because of their association with contamination from a fecal origin and the consequent risk of other pathogenic, fecal-associated microorganisms being present and partly because of the spoilage their in milk can produce at ambient temperatures (KRAMER, J., CANTONI, C. 1994).

It is now well recognized that the presence of coliforms in raw milk is not evidence of direct fecal contamination and should not be relied upon to detect inadequate udder cleaning prior to milking (ROBINSON, R. K. 1990, 2002).

Coliforms can rapidly build up in moist, milky residues (biofilms) on milking equipment and then become a major source for contamination of the milk being collected (PRESCOT, M.L.,.HARLEY, J.P, KLEIN, D.A. 2005)

The aim of this study is to evaluate the microbiological quality of raw milk in some places of collection of raw milk in Albania in 2009. The quality of raw milk is very important for the quality of market milk or other product like cheese, yogurt.

In this study we have analyzed the raw milk for total aerobe mesophilic bacteria and coliforms.

2. MATERIAL AND METHODS

In this study we have analyzed five different places of collection of raw milk. A total of 50 raw milk samples were taken and submitted for microbiological analyses for the total colony count and for total colony count. 5 samples from each place were analyzed for total bacterial count and for total colony count.

The samples were randomly selected. They were packed in sterile tubes, placed in an isothermic container, and transported under cooling conditions (4-8^{o}C) to the Department of Food Control at the Food Safety and Veterinary Institute, Tirana. Each product consists in 5 unit of 150ml. The same day of their arrival at laboratory, microbiological analysis of the samples, was carried out.

To carry out the laboratory test were used International standard method as ISO method 7218-1985. Each analytical sample, consisted of 25 ml milk, was homogenized with 225 ml Buffered Peptone Water (Merck 1.07228.0500), in a horizontal mixer type "Stomacher 400" for 2 minutes.

We have used the Plate Count Agar for detection of total aerobic mesophilic bacteria and VRBA (Violet red bile agar) for coliforms.

After are done the following dilutions with same diluent. A loopful from each dilution was streaked on plate count agar or Violet red bile agar) and incubated for 48 h-72 h at 30^{o}C respectively. After the 48-72 hours incubation at 30^{o}C we have done the numeration of the colony. Microorganisms failing to form colonies, of course, are not counted.

3. RESULTS AND DISCUSSIONS

The microbiological standard for the total bacterial count is <100000 cfu/ml, and the microbiological standard for total coliform count is <500 cfu/ml (Richard K.Robinson, 2002). From five places of collection that we have analyses, only two places were in good quality within microbiological standard.
The results for five places of collection of raw milk are in figure 1 and figure 2.

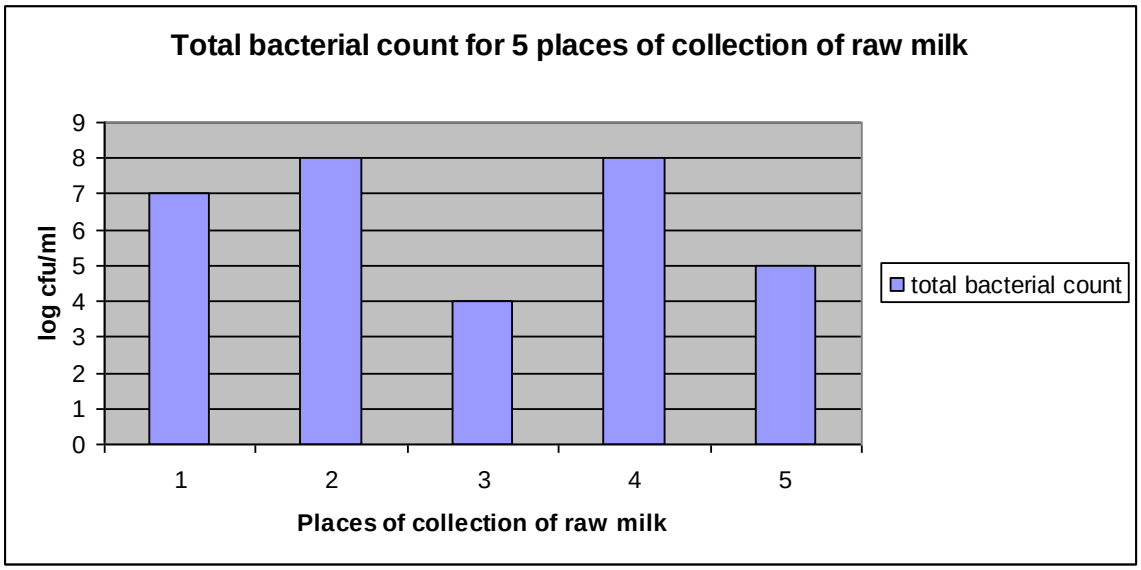

Figure 1. The results of analyses for total bacterial count for five places of collection of raw milk (6 log cfu/ml is the microbiological standard for the total colony count for raw milk)

From five places of collection that we have analyses for total colony count, only two places were in good quality within microbiological standard. The places 2 and 4 are with high number of total bacterial count.

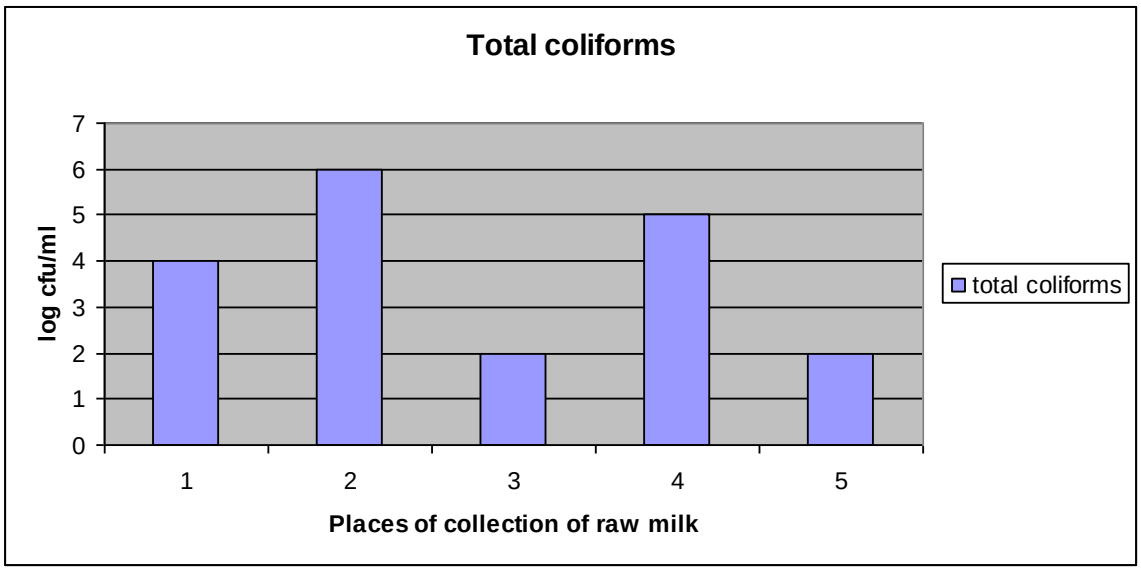

Figure 2. The results of analyses for total coliforms for five places of collection of raw milk (2 log cfu/ml is the microbiological standard for the total colony count for raw milk).

From five places of collection that we have analyses for coliforms, only two places were in good quality within microbiological standard and these places were the same places that were within the microbiological standard for the total bacterial count. The places 2 and 4 are with high number of coliforms.

Relatively low coliform counts in milk do not necessarily indicate effective cleaning and disinfecting of equipment. However, a sporadic high coliform count could be related to an unrecognized coliform mastitis condition in the dairy herd (ZOTTOLA et al., 1993; TIECCO, G., 1990).

4. CONCLUSIONS

From the analyses of total colony count of raw milk in the collection places of the milk we have the conclusions that most samples of milk were with high number of total colony count and coliforms that means serious deficiencies in production hygiene.
However, udder disease remains widespread because of the presence of mastitis-associated microorganisms.
Because for the product like cheese, yogurt, butter or cream is very important the quality of the raw milk, an attention will be having for the cheese made with the milk no pasteurized.
As a result, the microbiological quality of raw supplies produced under apparently good sanitary conditions and stored under adequate refrigeration may produce off-flavors, yield poor product, and present a risk of food-borne infections to the consumer.
In Albania have to make the automatic milking no more by hands, because this increase the number of total colony count and coliforms too.

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Paper 030

Analysis of climatic changes based on indicators of temperature extremes in the Balkan and the Mediterranean region.

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Abstract

Realization of this study is based on research and processing of climatic temperature indicators reflected in materials science in 2008. After receiving the data, processing is done on the basis of deductive logic, based on environmental arguments which are changing due to climate change impacts. Space climate change affects countries and regions around the globe. This overview on the ends of the temperature indicator for Balkan and Mediterranean countries, gives us an opportunity to pass on to deeper studies, because the impact of climate change on physical and biological environment has no borders. The risk of global climate change is becoming increasingly apparent, there is a true need to focus on efforts to limit greenhouse gases and to minimize this issue the impacts on climate change. Lower extremity temperatures ranging up to - 32 ^{0}C station Rozaje, Montenegro and high ends of the temperature station Kebili +50 ^{0}C.
Keywords: *temperature, climate change, extremes, impact, station*

Indruction

Global warming in the earth's surface has been evident in the recent decades (C. Gregory Knight., 2008). Therefore, the World Meteorological Organization (WMO) and the Environment Program of the United Nations (UNEP) noted an intergovernmental body on Climate Change (IPCC) in 1988 and on 1992 in Rio de Janeiro. There was signed a Framework Convention of the United Nations climate change (United Nations Framework Convention on Climate Change (UNFCCC)), also known by the name, Rio "conventions. Signatory countries agreed that the identification of controlling GHG emissions in the atmosphere, at potential risk to prevent the global climate system (H. Mankolli., 2006). For the purpose of implementing activities, different groups are formed in order to assess the GHG emissions in the atmosphere, and how they affect climate change, consequences, predictions for the future situation and the measures to be taken (Williams, J., et al. 2007). Intergovernmental Panel Climate Change (IPCC) have come to the conclusion that the earth is already warmed by 1 ° F more than the past century, "the evaluation of the data suggests that there is a human hand impact on global climate". IPCC has estimated that global temperatures will rise 2- 6.5 ° F to 100 years. The difference of temperature since the ice age until today is about 9 ° F. There is the assumption that we will influence the heat up to 3.5° F by 2100, which will be a rapid rate of climate change that Earth has passed the last 10,000 years, while in which modern civilization has experienced growth. Heating of this period will greatly influence our lives as temperatures will rise. Also structural changes of sea level rise (due to melting of glaciers), the impact on our health, life in the forest and agricultural products. The world population is expected to reach 9 billion by 2050 and food production to support this population needs to

increase by at least 60% while maintaining the natural resource base and the environment (World Bank 2008). The decrease in productive land from urbanization, the reduction in irrigable land due to water scarcity and groundwater salinization, competition for use of crops for biofuels and the increasing cost of inputs (e.g. fertilizers, fuel, pesticides and herbicides) suggest that agriculture needs to be much more efficient in its use of land, water and energy in order to meet the food security requirements of the rising world population. This is true without the complicating factor of climate change. According to the World Development Report (World Bank 2010), food production will be required to increase by 1.8% per annum between 2005 and 2050 rather than 1% per annum if there were no impact of climate change. This puts tremendous pressure on dry land agriculture to increase the efficiency of use of precipitation and nutrients (Neil C., et al 2011).

Methods and data

Today there are high tech devices for measuring and sophisticated methods for assessment of climate change. But to make estimates and statistics for the future development of global warming is a very tricky job because a lot depends on the natural and anthropogenic factors. IPCC proxime the year 2100 in which are described 6 possible scenarios: The concentration of CO2 will increase to 90% under the scenario of soft, 250% scenario even more severe as compared with concentrations in 1750. Global land temperatures from 1990 to 2100 could rise 1.4 to 5.8 ° C. It is anticipated that in the past few decades have increased from 0.1 to 0.2 ° C every decade. Average global sea level could rise by 9 to 88cm in the period from 1990 to 2100. But climate change and the consequences will not be unilateral and uniform across the surface of the earth. It is expected that measures of ice and blankets of snow in the northern hemisphere will decrease slightly while in the southern hemisphere will increase because the distribution of rainfall (Lehner, B., et al.2001). The methodology used is that the evaluation of extreme temperatures in some countries of the Mediterranean and Balkan region. Mathematical refinements and graphical methods allow the assessment of the impact of climate change. Indicators have been taken in some countries in the region based on three checkpoints. Selection refers to the distance, height above sea level and extreme values of minimum and maximum temperature. The data obtained for 11 countries, with 3 control points in the Mediterranean region and the Balkans, for extreme values of temperature, Table no.1. perform some mathematical calculations. We are able to find the absolute difference in temperature, average temperature extremes, and the annual amount temperature for each station and place of the region. These data are being compared between nearby countries and regional indicators for temperature indicator, give us the opportunity to issue results if we change the climate in the region and where is this impact.

Table no.1. The data of minimal, maximal, average, amplitude and sum temperature on the same stations by countries, Mediterranean and Balkan Region.

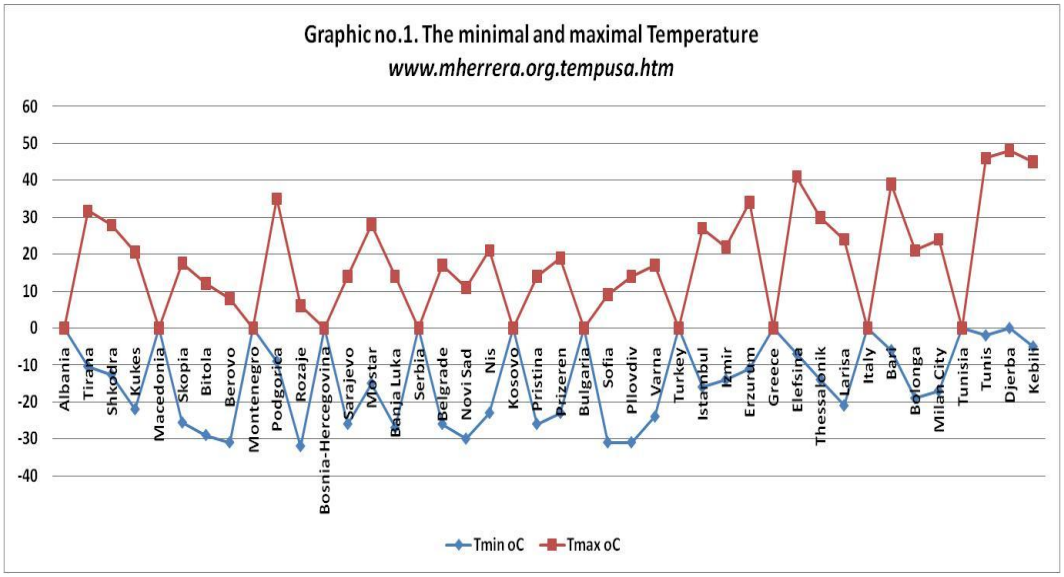
No. of Stations	Country	Tmin oC	Tmax oC	Average temp.	Amplitude temp.	Sum of temp.
1	Albania					
	Tirana	-10	42	16	53	5785.25
	Shkodra	-13	41	14	53	5091.75
	Kukes	-22	43	10	65	3741.25
2	Macedonia					
	Skopia	-26	43	9	69	3212
	Bitola	-29	41	6	70	2190
	Berovo	-31	39	4	70	1460
3	Montenegro					
	Podgorica	-9	44	18	53	6387.5
	Rozaje	-32	38	3	70	1095
4	Bosnia-Hercegovina					
	Sarajevo	-26	40	7	66	2555
	Mostar	-15	43	14	58	5110
	Banja Luka	-27	41	7	68	2555
5	Serbia					
	Belgrade	-26	43	9	69	3102.5
	Novi Sad	-30	41	6	71	2007.5
	Nis	-23	44	11	67	3832.5
6	Kosovo					
	Pristina	-26	40	7	66	2555
	Prizeren	-23	42	10	65	3467.5
7	Bulgaria					
	Sofia	-31	40	5	71	1642.5
	Pllovdiv	-31	45	7	76	2555
	Varna	-24	41	9	65	3102.5
8	Turkey					
	Istambul	-16	43	14	59	4927.5
	Izmir	-14	36	11	50	4015
	Erzurum	-11	45	17	56	6205
9	Greece					
	Elefsina	-7	48	21	55	7482.5
	Thessalonik	-14	44	15	58	5475
	Larisa	-21	45	12	66	4380
10	Italy					
	Bari	-6	45	20	51	7117.5
	Bolonga	-19	40	11	59	3832.5
	Milan City	-17	41	12	58	4380
11	Tunisia					
	Tunis	-2	48	23	50	8395
	Djerba	0	48	24	48	8760
	Kebili	-5	50	23	55	8212.5

Sources: *www.mherrera.org.tempusa.htm*

Result

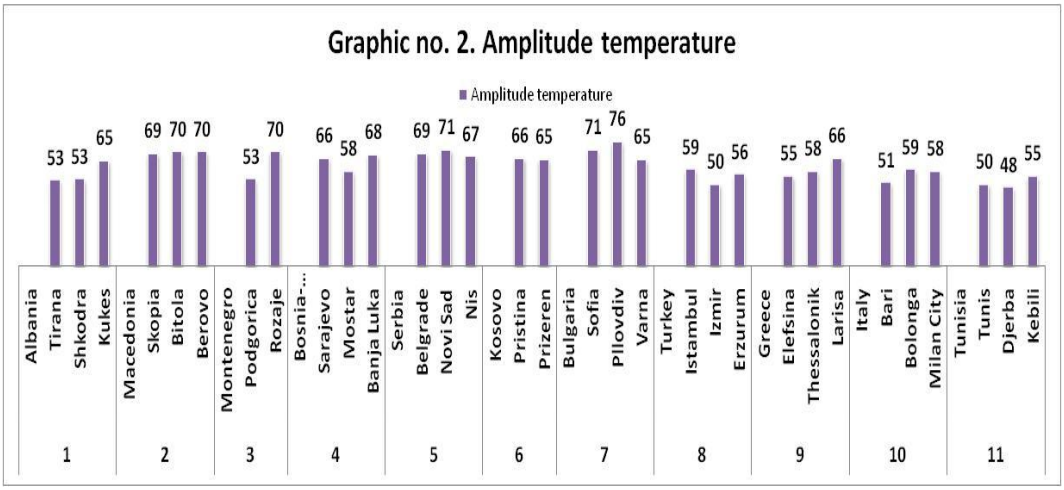
Temperature measurements have been dating ever since 1861. At the end of the twentieth century, global average surface temperature of Earth has increased by 0.2 to 0.6 °C. The last decade has been warmer so far with 1861 onwards. Global temperatures in the Earth's surface have been increased from 0.15 to 12.05 ° C every decade since 1979 onwards, since the satellite recording began. Global warming is directly proportional to the enhancement of heat radiation that causes GHG. As a result of global warming and melting of the icy measures, the sea level rose by 10 to 20cm in the twentieth century. The concentration of CO_2 in the atmosphere starting in 1750 increased by 31%. Imagine that this year's CO_2 concentration has been unchanged for several million years. Approximately 75% of additional CO_2 emissions are caused by human factor (anthropogenic emission) in the last 20 years of dedicated burning of fossil fuels (oil, coal, etc.).. The rest is mainly due to the reduction of forest areas. Atmospheric concentration of methane (CH_4) has increased by 151% compared to 1750 and has a tendency to increase. From 1750 and onwards the concentration of nitrogen dioxide (N_2O) has increased to 17% and goes on growing. Ozone (O3) in the stratosphere (15-40km from the earth surface) causes cooling of the earth's surface, but ozone in the troposphere (immediately above the surface) also participates in the glassy effect of the garden which impacts the climate change on

ecosystems. In Albania there is a narrow spread of aster zone around Albanian subsp. Paparistoi, (Albanian Asters) are isolated from each other in a single area in the forest clearances of Divjaka located on both sides of the road that leads to the beach of Divjaka. Measures to involve a substantial part of these clearances within enclosures with wire should be a short term priority. By analyzing the maximum and minimum temperatures, presented in chart no.1. we show that the countries included in the study had significant changes only in terms of minimum temperatures. Absolute minimum temperature values are from zero °C to Djerba Tunisia, in minus 32 °C to Rozaje-Montenegro. With extreme values appear Sofia, Pllovdi, in Bulgaria to 31 °C. Given that low temperatures are correlated with the coldest month of winter, it seems that the effect of climatic changes in the Mediterranean and Balkan region, has to do with minimum temperatures. Unlike the situation with maximum temperatures, which are isolated country of Tunisia, where the extreme temperature values are evident in the summer and Elefsina in Greece, other countries, like Italy, Albania, Montenegro, Turkey, Greece, Macedonia, Bulgaria, extreme values of temperature fluctuations are minor. This shows that climate change has the effect of weak links with high temperatures in the region of analysis. They fluctuated in the ranges from 36-38 °C to 41-42 °C.



Sources: *Processed data in Microsoft Exel, 2011*

Indicator included in the study is the amplitude of extreme temperatures. Mathematical processing values are shown in figure no.2. There is a change from 48-50 °C to 70-71 °C us. Ampplituda is the evaluation of climate sustainability of a country. Referring to the values of the region shows that the countries we are not under the effect of climate ndrryshimeve. Fluctuations are continuous boundary values ranging from 2 °C to 13 °C .



Sources: *Processed data in Microsoft Exel, 2011*

Conclusions

No trouble for eve dentations of regional and local problems of the first signs of global climate change. Populations that burn a huge amount of fossil fuels lead to the immediate cutting of large parts of forests worldwide. The concentration of CO2 and other greenhouse gases in the atmosphere rise, before preparing climate change. Significant impacts on forests' health provide drinking water resources and agricultural productivity as a result of climate change. The faster the rate of climate change it will be the less time for ecological and socioeconomic systems there will be to adapt to the projected potential without or beyond the places we intervallic time between cause and effect and between effects and improvements, a path of prudent action is the observed rate of change. To identify indicators of climatic extremities for minimum and maximum temperature is an opportunity to explain the regional and global climate change. Lower extremity temperature ranging up to - 32 °C station Rozaje in Montenegro and high ends of the temperature station Kebili +50 °C. As a result the risk of global climate change is becoming increasingly apparent, and that is a real need to focus on efforts to restrict the issue of the greenhouse gases and to minimize impacts on climate change. The analysis of the temperature values lower and higher extreme of the Mediterranean and Balkan countries, nxjerim conclusion that the impact of global climate change seems to mismatches extreme low temperature. Countries with similar climatic parameters have higher volatility. Impact of global climatic changes related to extreme values of high temperature is in the lower limits. The countries of the region represent continuity and stability climate.

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Paper 49

THE PRESENCE OF HEALTH EDUCATION ISSUES INTEGRATED WITH ENVIRONMENTAL EDUCATION IN THE CURRICULA OF UNIVERSITY OF SHKODRA

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Abstract

Besides environmental education that is compulsory already in our Albanian educational system, Health Education is also a very important column for the education of students, which deals with their daily life and the preservation of the life quality for each individual. School and university is considered one of the main actors for the environmental education in Albania, therefore giving information on environment and health issues should be perceived and considered as a very important duty with practical value and it should be in the attention of all pedagogical staff in all schools in the country. The purpose of this qualitative and theoretical research was to evaluate the progress of integrated Environmental and Health Education in the Albanian University educational system and especially in the curricula of University of Shkodra. This research presents the way of treatment of knowledge and education about the environment and health through the curricula of compulsory subjects and secondarily through different projects that relate the health with the education. Based on this research's findings, recommendations are given on intervening in the existing curricula regarding environmental and health education. This will provide a future generation that takes a good care of themselves by preserving the environment in which they live.

Key words: health education, environmental education, health issues, curricula, environment

Material and methods

In this article we have use the archive dates of the university of Shkodra , the registers in years. We have analyses the educational programs of the subject and received the opinions of the pedagogues who have taught this subject in their reciprocal branches.

Introduction

School is the most natural and the most favorable environment for health education and health promotion. Health promotion and health education in schools sets out from the need to create a setting in which pupils,

students, teachers and parents work and live in a healthy manner. Since 1950`s, schools have been a popular setting for health promotion and health education. (1) Early programs focused on teaching children and students about health and its determinants, but the importance of enabling them to develop the skills to resist unhealthy lifestyles was soon recognized. The Ottawa Charter for Health promotion (2) drew attention to the effect of the environment on health and health promotion and to the importance of developing personal skills. It was clear that the school, in conjunction with the family, was one of the key settings where individual and social development occurred. In 1990`s, many countries in the European Region started to introduce radical changes to their education and healthy system. These rapid changes, particularly in the countries in transition, presented challenges and new opportunities and started to address such issues as: how to school setting can be conductive to the development of healthy lifestyles, how it contributes to creating and maintaining the health of its staff, pupils, students, parents and local communities. The health promoting school is based on a social model of health. At the heart of this model is the young person. Healthy, well educated young people can help to reduce inequities in society, thus contributing to health and wealth of the population at large. The health promoting and educating school is constantly strengthening its capacity as a healthy setting for living, learning and working. The health education engages health and education officials, teachers, teacher's unions, students, parents, health providers and community leaders in efforts to make the school a healthy place. The curriculum provides opportunities for young people to gain knowledge and insight and to acquire essential life skills. The curriculum must be relevant to the needs of young people, both now and in the future, as well as stimulating their creativity, encouraging them to learn and providing them with necessary learning skills. The curriculum also is an inspiration to teachers and others working in the school. It also acts as a stimulus for their personal and professional development. (3) School health promotion and education interventions could be effective in transmitting knowledge, developing skills and supporting positive health choices. But the evidence indicated that programs were most effective when they were comprehensive, linking the school with agencies and sectors dealing with health, and where they continued for several years. Attention needed to be given to training teachers for health promotion and health education.(4)

Results and discussion

In the following tables are shown 12 branches from 3 faculties and the topics which deals with environmental education and health education.

Faculty of social science

Branches	Hours of curriculum	Subject	Hours	rapport l/s	ECTS
1. Geography	1904	Natural resources and risks	30	2/1	4
		The Region and Sustainable Development	24	2/1	3
2. Journalism and communication	1800	Essayistic	30	1.5/0.5	3
		Public right	60	3/1	
		The right for information and communication	30	1.5/0.5	3
Faculty of Natural science					
Branches	Hours of curriculum	Subject	Hours	rapport l/s	ECTS
3. Physic	1865	Environmental physic	39	2/1	4
		Biodiversity	39	2/1	4

4. Biology-chemistry	1885	The bases of ecology	70	1.5/1	7
		Hygiene	42	2/1	4
		Protection of the Environment	22	1.5/1	3
		Biodiversity	42	2/1	4
5. Nursing	2084	All subjects and practice	833/451/800	76/53 + practice	180
6. Physiotherapy	2100	All subjects and practice	800/400/900	76/53 + practice	180
7. Obstetric	2104	All subjects and practice	713/471/800	76/51.5 + practice	180
Faculty of Education					
Branches	Hours of curriculum	Subject	Hours	rapport l/s	ECTS
8. Teachers for elementary	2170	Development Psychology and special education	70	3/2	7
		Global education	45	2/1	4
		Take care (safety, hygiene, health)	32	1.5/2.5	3
		Didactics on physic education and games	60	0.5/3.5	5
9. Teachers for pre elementary	2062	Development Psychology and special education	75	3/2	8
		Psychology of personality	39	2/1	4
		Take care (safety, hygiene, health)	30	1.5/0.5	3
		Global education	60	2/2	5
10. Psychology	2010	Human ecology	45	2/1	4
		Development Psychology	90	2/1	8
		Mental health	90	4/2	8
		Psychology and stress management	90	4/2	8
		Psychotherapy	90	2/1	8
		Formation psycho pedagogic	90 4/2	4/2	8
		Psychological consultation	60	3/1	6
		Formation sociologic	90	4/2	8
		behavior organization and ethics	90	4/2	8
11. Social work	2040	Human ecology	45	2/1	4
		Social education	90	4/2	8
		Development Psychology	90	4/2	8

		Formation sociologic	90	4/2	8
		Mental health	90	4/2	8
		Psychotherapy and consultation	90	4/2	8
		Methodic of social work	90	4/2	8
12. Education physic & Sports	2052	Human Anatomy and injury	101	4/3	10
		Human physiology, physic activity, functional control	75	3/2	8
		Biomechanics and public health	105	4/3	8
		Professional orientation, health and activity physics	84	1/5	8
		Physiotherapy	60	1/1	3
		Tourisms - regeneration	25	practice	2

Not only the curricula of nursing, obstetrics and physiotherapy branches are related directly with the health education, but also the others branches programs and curricula's are appropriated with the subjects about the health education.
There are several hours of lectures and seminars linked with the risks of anthropogenic impact on the environment and others with the pollutions caused from the substances and the consequences on the health of peoples.
On the branches of Nursing, physiotherapy and obstetric **90%** the hours deals with public health and directly with the impact of pollutants and conditions of the environment on health, their prophylaxis and treatment. In the same way the school plays the role of the education for public health. **50%** of hours are practices and seminars on the regional hospitals and all the institutions of public health.
On biology branch apart of fundamental ecology, **27%** of lectures and seminars deals with environmental education and health education, management of natural resources and the impact of development of the people`s life.
An importance role has the health education on the branches of teachers for elementary and pre elementary schools. So **20%** of lectures deal with environmental education and health education. Since they are children's people need to know the important role of clean environment, hygiene, clean nutrition's and health life style.

Conclusions

Health education has the potential to empower pupils, students, parents, teachers and health professionals to achieve and have control over their health.
There are many different programs in schools, mainly focused on disease prevention and health intervention, including intensive health educational programs.
Special attention must be done in health sector – educational, sector civil - civil society relationships.
Further participatory research is crucial in development in health education and health promotion.
More changes in curricula's and the implementation of cross curricula in several branches of our faculties is needed.
More practice and projects are necessary to change the behaviors of pupils related to the environment and health.

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Paper 50

CLIMATE CHANGES IMPACTS ON THE ALBANIAN COAST AND ADAPTATION CHALLENGES

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ABSTRACT

The Drini and Mati River Deltas (DMRD) are 2 of 3 deltas found on the northern Adriatic coast of Albania. River deltas are a distinct feature of the northern coastal region which extends from the Albania-Montenegro border in the north to the Rodoni Peninsula in the south. The DMRD harbors significant biodiversity values, and this is recognized under the National Biodiversity Strategy and Action Plan (NBSAP, 1999). Three main types of habitat are found between the2 deltas: (i) marine, (ii) wetlands including estuarine, riverine, lacustrine and palustrine, and (iii) non-wetland habitats including forests, shrubs and open fields where traditional agriculture is practiced.

The projected temperature increase (about 1.8°C and 3.2°C by respectively 2050 and 2100, especially higher in summer) and precipitation decrease (about 8% and 16%, by 2050 and 2100) is likely to have as consequence *milder winter, warmer springs, hotter and drier summer and drier autumn*. More hot days and hot waves, frequent and intensive drought (with increased fire risk) are expected.

These changes in climate are expected to place additional stress on marine and littoral biodiversity as well as livelihoods of local communities. Sea level rise (projected to increase from 18 cm to 59 cm, up to 2100), more frequent and intense floods, aggressive erosion, frequent inundation and longer submersion of low lying coastal areas could affect life cycles of species and pose risks of habitat loss and fragmentation of a unique compound ecosystem consisting of sandy dunes, lagoons and coastal wetlands. Agriculture and tourist infrastructure are prone to flooding caused by storm surges (like in December-January in 2009 and 2010).

To increase the adaptive capacity of ecosystems and livelihood, a set of on-the ground adaptation measures, such as coastal dune habitat restoration, modification of DMRD protected area network planning and coverage, and other landscape-wide adaptation policy measures are planned to be implemented within

the frame of the project "Identification and implementation of adaptation response measures in the Drini-Mati River deltas" (GEF/UNDP).

Key words: climate change, scenarios, vulnerability, adaptation

1. INTRODUCTION

The Drini and Mati River Deltas (DMRD) are 2 of 3 deltas found on the northern Adriatic coast of Albania, the third one being the delta of the Ishmi River. River deltas are a distinct feature of the northern coastal region which extends from the Albania-Montenegro border in the north to the Rodoni Peninsula in the south – a total length of 54 kilometers. Of the three deltas, the Drini is the largest and most complex, consisting of a compound system of sandy belts, capes, bays, lagoons and island areas (fig.1). Three main types of habitat are found between the 2 deltas: (i) marine, (ii) wetlands including estuarine, riverine, lacustrine and palustrine, and (iii) non-wetland habitats including forests, shrubs and open fields where traditional agriculture is practiced. The DMRD provides wintering ground for the globally endangered pygmy cormorant (*Phalacrocorax pygmaeus*) and over 70 other species of waterfowl and water bird with a total population of some 180,000 individuals. The Drini delta is an internationally recognized Important Bird Area (IBA). A recent study has revealed that the Patok lagoon, within the Mati Delta, serves as an important feeding area for globally endangered loggerhead turtles (*Caretta caretta*), with over 300 turtles tagged in this area over the last two years. Forests in the DMRD harbor several medicinal and aromatic herbs. Several areas within the DMRD (Lezha administrative region) have been identified as priorities in the NBSAP.

Based on assessments of climate change impacts, including variability, the DMRD has been identified as a critically vulnerable region of the country. Sea level rise, more frequent and intense floods, frequent inundation and longer submersion of low lying coastal areas could affect life cycles of species and pose risks of habitat loss and fragmentation of a unique compound ecosystem consisting of sandy dunes, lagoons and coastal wetlands. Rising temperatures will affect the composition and distribution of species both in marine and terrestrial ecosystems of DMRD. Climate change, including variability, could thus undermine biodiversity conservation efforts under the protected area regime in the DMRD, unless the system fully accommodates mid to long term alterations in the protected area coverage and management strategies in response to climate-related stress. Currently, there are no efforts underway to address climate change impacts on the DMRD ecosystem.

Fig.1- Map of the project area

2. MATERIAL AND METHODS

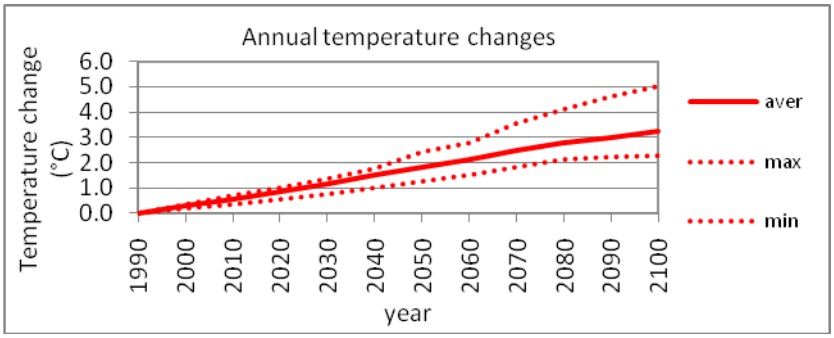
This paper will present the work done by the DMRD project to evaluate climate change risks aiming at implementation of adaptation. Based on the existing data on climate assessment and their current impacts evaluation on different economical sectors, the project has developed a methodology for risks assessment on DMRD area and economical sectors by climate change impacts. This assessment is done close with community stakeholders, national and international experts' team and good collaboration with other similar project in abroad.

This assessment was a baseline for further steps on evaluation of the adaptation measures proposals. All the proposed measures are discussed in a wide collaboration with stakeholders and community in different workshops and meetings. The participants have been involved in a risk assessment process presenting their

consequences from the climate change impacts and have made the adaptation proposals after a good understanding of the current and future situation in their zone.
They have analyzed the different adaptation measures according to the toolkit proposed by the project and with help of the experts' team of it. Now these proposed adaptation measures are subject to the cost/benefit analyze and will come through a round table with local and central government to provide some new project proposals and also in a time implementation decision maker process.

3. RESULTS

The project "Identification and implementation of adaptation response measures in the Drini-Mati River deltas" (GEF/UNDP) has developed the climate scenarios for the area of DMRD. Based on expected climate changes projected by scenarios it is expected to:



a) The increase up to 3.2°C in the annual temperature and sea level up to 38cm by the year 2100. Also the increase of number of days with temperature >35°C and the heat wave are expected to increase.

Fig. 2 - Annual temperature projections related to 1990, DMRD area

b) Regarding to the annual precipitation is likely to reduce up to 15.5% by the year 2100 and the increase of frequency of intensive precipitation.

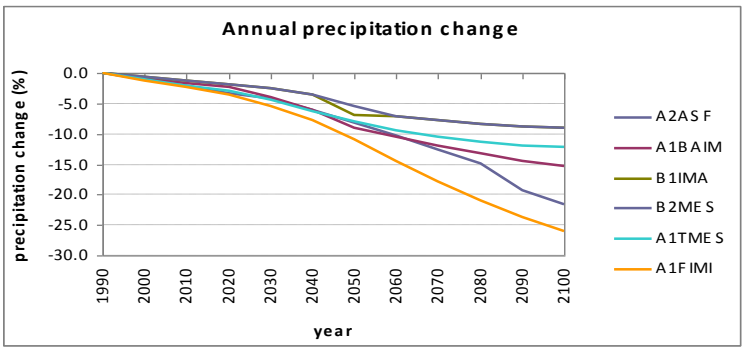


Fig. 3 - Projections of annual precipitation (%)

These scenarios are taken into account from the experts' team of the project to evaluate the current status of the climate impact in the area and also to assess the expected climate change impacts on biodiversity, water resources, agriculture and tourism and population. All these information is been used by the project staff and

community to work together for risks assessment to climate change impacts and consequences. They have provided in their studies the maps habitats map (fig. 4) and flooding maps (fig. 5).

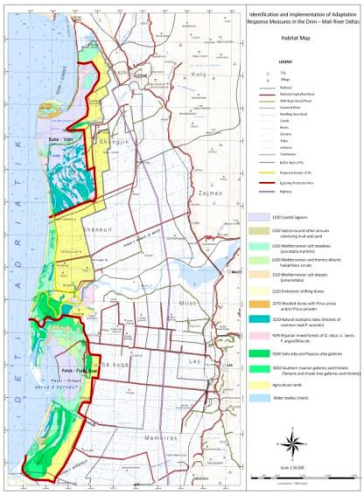


Fig.4 - The distribution of habitat types in DMRD area

Fig. 5 - The flooded area for the all the Sea setups of +0.5m (blue), +1.00m (Red), + 2.00m (green), + 3.00m (green transparent).

Lezha region is dominated by rural communities and agriculture as a mainstay of economy. The agriculture is one of the sectors that will be indicated by climate change. By the comparison of climate data (temperature, rainfall, extreme cases etc), it is seen that there is a relationship between some noticed climatic anomalies and wheat yield anomalies in the same period, and positively. Visible drop of wheat yield coincides with the same period of the heat noticed in 1968-1970. Heat wave has affected wheat in its decrepitating phase, decreasing the yield.

Also the tourism is another important sector in Lezha region. Currently, the most dynamic feature in some coastal sectors is the predominance of erosive processes over the accumulative ones. As a result, beaches of great tourist potentials are being eroded and natural and cultivated vegetation is being damaged (pine forest of Kune).

The consequences of these unstudied human interventions were catastrophic for Patoku beach, which almost disappeared completely, while Mati started to create a new littoral cordon and beach in the south of its delta. Almost all the road and tourist infrastructure of Patoku beach, which was constructed during the 70-s of XX^{-th} century was destroyed. In some other cases, the constructions are made on Drini and Mati riverbeds, narrowing the riverbeds, causing flow problems and favoring overflows. Hence these constructions are continuously risked by floods. The concentration of population in the low coastal area (where land price is lower) is completely spontaneous. Settlements, infrastructure, tourism objects, socio-economic facilities, fields, pastures, etc., are completely exposed to floods that might be caused by sea level rise and river flooding by intense rainfall.

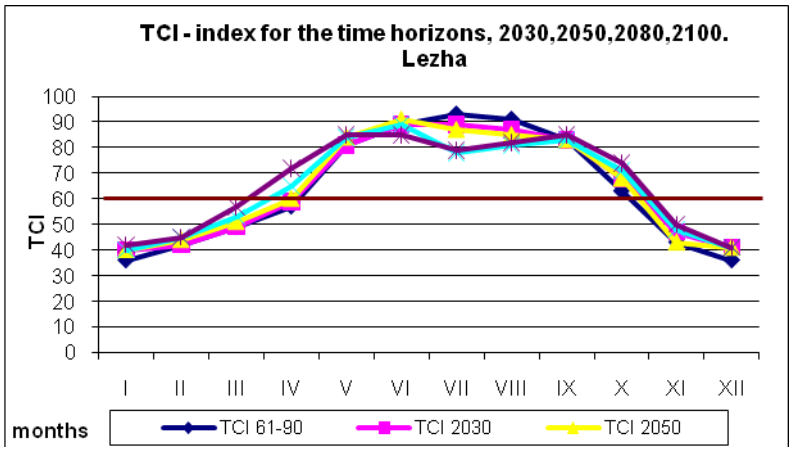


Fig. 7 - The TCI monthly values in different time horizons, Lezha

As a result of optimal temperatures, in 2009 in Shëngjin and Kune the tourist season has begun in the middle of June, two weeks before comparing to previous years. This means an increase of the tourists' number, employment and local incomes. Based on the methodology has been calculate the TCI index for the Lezha zone in order to have a currently situation related to the climate and tourism. The tourism climate index (TCI) is used to explore the impacts of climate change on climate resources for tourism in Lezha.

Risks were identified through a workshop-based consensus building process undertaken. A total of 42 climate change risks were identified and evaluated. Of these 40 per cent were rated as extreme risks, 29 per cent high, and 31 per cent medium. No low level risks were identified. This is significant, in that all risks identified were assessed as requiring some form of management intervention.

Risks with the highest priority (extreme) in the area DLDM, identified by the project in broad cooperation with the local community, include:

- Risks to the environment / infrastructure built by man, such as:
  - Public works damage (utility) as a result of floods and prolonged humidity, including pipes and drainage channels
  - Damage to buildings and dwellings valued cultural / heritage, because of flooding.
  - Pressure to existing structures due to greater solar radiation.
  - Faster corrosion of structures due to increasing carbon dioxide and sodium chloride (specifically within the coastal zone) in the atmosphere.
  - Key road damage and flooding from solar radiation.

- Risks to the natural environment.
  - Reduce the ability of ecosystems resilience to stress.
  - Increased pressure in the dunes systems.
  - Increased ecological disturbances.
  - Damage to the habitats.
  - Penetration of salt water in wetlands and groundwater.
  - Coastal erosion and flooding.

- Loss of biodiversity and extinction of species, as was the reduction of social environments that result from them.
  - disappearance of populations / species
  - The addition of invasive species

Importantly, of the risks identified, an overwhelming proportion (95 per cent) either currently have no controls in place to manage them, or there are 'guidance tools' in place (for example guidelines or policies) but no management action. This fact points to a very significant adaptation challenge – both to support the implementation of existing management approaches and to develop new approaches.
The outputs of the risk assessment were analyzed in the final phase of the risk assessment process – risk treatment (also known as adaptation). An Adaptation Plan was developed for each of the three Communes in the DMRD. The Adaptation Plans were developed through the rapid assessment of strategic level adaptation options in a workshop-based consensus building process. Adaptation planning outputs from each Commune were evaluated to identify regional similarities and adaptation actions that will benefit coastal management and climate change adaptation nationally.
The output of this process is an Adaptation Plan and Adaptation Plot for the three Communes in the DMRD. The Adaptation Plans contain a large number of adaptation options and actions. Most important measures to be taken by central and local government by 2015 are:

1. Building integrated monitoring system for assessing climate change.
2. Restoration and nourishment of the beach.
3. Construction and maintenance of flood protection embankment on marine and river.
4. Restoration of wet land and their protection from the flood tide.
5. Restoration of sand dunes.
6. Maintaining communication channels lagoons

These adaptation measures are now subject to the broad discussion to define the project proposals and also the time frame of their implementation.

4. CONCLUSIONS

We are facing a scenario not too far from us, rather climate change is occurring, and their influence on all of us is growing. Floods and marine storms frequent in recent years are a visible indicator of these changes. These impacts and the added pressures on the area as other intensive erosion, salt water penetration in groundwater, pollution or urban construction in the protected area, make the risk not only the ecosystems of protected areas, but also important economic activities as agriculture and tourism.
All these events are expected to affect the life cycles of living things and to risk the loss or fragmentation of a complex and unique ecosystem, consisting of sand dunes, lagoons and coastal swamps. But not only ecosystems are in danger. Socio-economic activities in areas surrounding protected areas are expected to be affected by the effects of climate change.
The proper risks assessment analyze and the defining of the proper adaptation measures is a challenge for the researcher and also for the central and local government to face to climate change impacts in right way and time and to be prepared for the expected future developing the adaptation strategy and including this into development plans of the region ensuring the sustainable development and also decreasing of the affects to climate change.

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Paper 058

Natural ecosystems in the world: some problems and solutions

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ABSTRACT

Because different geographic areas on Earth differ so mach in their abiotic and biotic components, we can easly place them in broad categories. The two largest categories are broken down in this way: Ecosystems that are based on land are called biomes, while those in aqueous environments are known as aquatic life zones. Aquatic ecosystems are categorized primarily by the salinity of their water-freshwater and saltwater ecosystems fall into separate categories. Land environments are separated into biomes based on their climate. There are population-limiting factors that are purely the result of the size of the population itself. For example, in many populations of species in nature, birth and death rates are influenced by the density of the population.Other density-dependent factors that influence population size are increased predation; competition for food or living space; disease; and build-up of toxic materials. Some population-limiting factors operate independently of the population size. These density-independent factors will change population's size regardless of whether the population is large or small. Independent factors include fire, storms, earthquakes, and other catastrophic events.

Key words: ecosystem, abiotic and biotic components, population, dependent factors, Independent factors

INTRODUCTION

This study is a review about ecosystems in world and problems on the time. Determination a definition of environment, environment is a set of conditions:

physical (solar light, temperature, precipitation, atmospheric pressure, etc..)
chemical (presence or absence of organic mater, concentration of inorganic mater)
biological (micro-or macro organisms) , bodies that dictate plant life and animals.

Climate change and ecosystems: Change of atmospheric conditions and its relationships with lithosphere, hydrosphere and biosphere. Atmosphere as a complex chemical factory with many little-understood chemical reactions. Changes in greenhouse gases, variable temp, and water vapor.

Reducing the overall global average (GHG's emission) should be 5.2% in the period from 2008 to 2012, while for large GHG producers in particular: the European Union (EU) 8%, U.S. 7%, Japan 6%. Some countries such as Even Australia can increase GHG's emission data for the EU (European Union) is the average, while each member country will have specific task (different). Kyoto Protocol (1997). Several atmospheric gases: CO_2, CH_4, CFCs trapping more heat and warming up the lower atmosphere, similar to the effect of a greenhouse.

RESULTS

Climate change and climatic elements in ecosystems. Climatic elements which determine ecoclimate an area are combined with each - other. All and their interaction provide contours of sustainable climate indicators. Ecoclimatic Indicators:

- Sun light, lux
- Temperatures o C
- Rainfall mm / t
- Humidity% relative air
- Wind m / s
- atmospheric pressure

The change of part in Europe

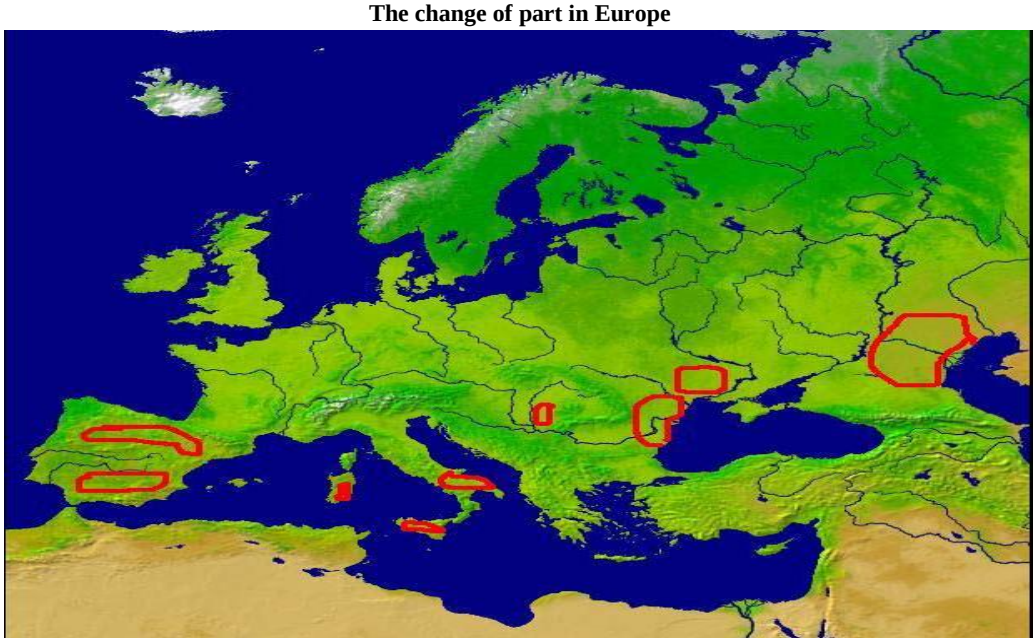


Figure 1.The desert zone in Europe, year 2008

Temperature of Earth: Are three factors effect:

- The amount of sunlight received,
- The amount of solar energy reflected and absorbed,
- The amount of heat retention by atmosphere.

Earth: Absorbing the short wavelength solar energy, then radiating longer wavelength IR radiation

The change on Arctic Sea ecosystem

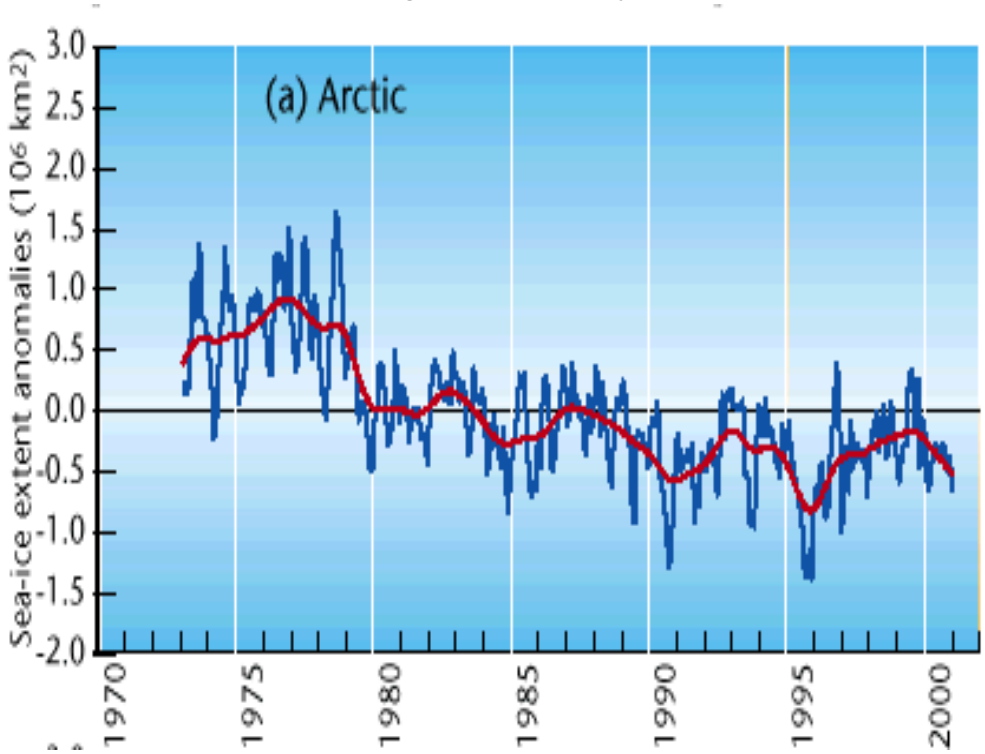
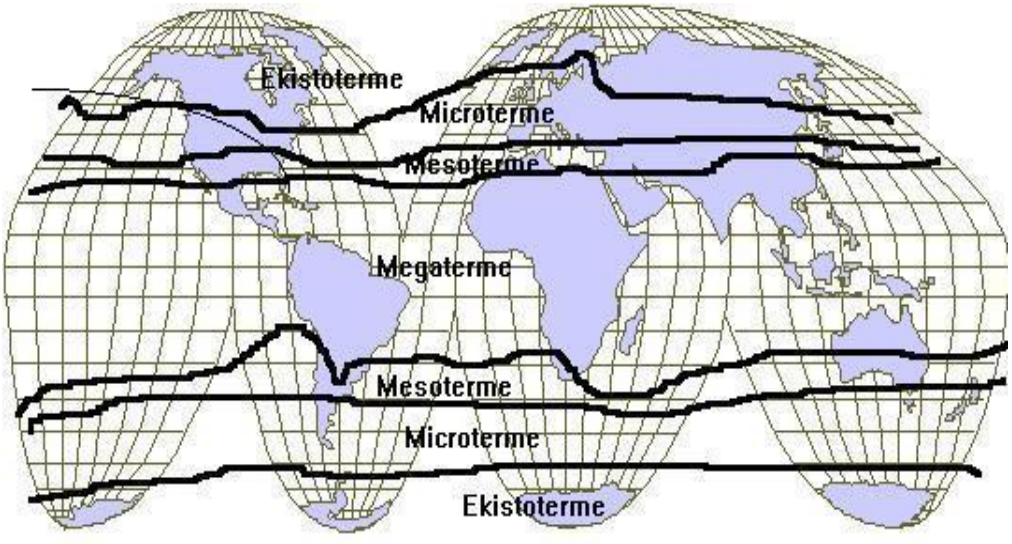


Figure 2. Arctic sea ice extent anomalies (1970-2002).

Global warming: Greenhouse effect on ecosystems:

- In aquatic environments (ice digestion, reduced water sources)
- Production decline in ecosystems.
- Rarity of plant and animals species.
- Extinction of plant and animal species.
- Problems of geology of the planet
- Community health problems.
- Increasing the number of fires

Factor THERMAL INFLUENCE



Figyre 3. The zonality plant in thermal regime in global ecosystem

CONCLUSIONS

- The concentration of CO2 and other greenhouse gases in the atmosphere rise, before preparing climate change.
- Significant impacts on forests' health provide drinking water resources and agricultural productivity as a result of climate change.
- The faster the rate of climate change it will be the less time for ecological and socioeconomic systems there will be to adapt to the projected potential without or beyond the places we intervallic time between cause and effect and between effects and improvements, a path of prudent action is the observed rate of change.
- To identify indicators of climatic extremities for minimum and maximum temperature is an opportunity to explain the regional and global climate change
- Global warming and climate change caused by air and water pollution
- Global warming and climate change is a global issue, thus requires global efforts in order to reduce its impacts on the economy, social and environment.
- Climate change are a challenge to human impact in ecosystems
- Spatial control over the environment
- Control regions based on the implementation of environmental laws
- Forecast evaluation and prevention of climate change

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Paper 062

Effect of naphthalen acetic acid (NAA) concentration in the rooting of vegetative cuttings of *Thuya occidentalis* "Emeraud"

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ABSTRACT

Thuya occidentalis "Emeraud" is one of the most used evergreen ornamental plants for decoration of parks and gardens. The paper presents the influence of different concentrations of NAA in the rooting of vegetative cuttings of *Thuya occidentalis* "Emeraud". The experiment was carried out in the flower's greenhouse of the experimental base of Department of Horticulture at the Agricultural University of Tirana. Vegetative cuttings of thuya were treated with rooting hormone NAA in seven different concentrations: 0, 1000, 2000, 3000, 4000, 5000 and 6000 ppm. There was estimated the annual and three year average percentage of rooted cuttings treated with different levels of NAA concentrations. The experiment results showed that the concentration of rooting hormone NAA affects the rooting ability and increase the rooting percentage of cuttings. Specifically, the average percentage of rooting of untreated cuttings was 20%, while the average percentage of rooting of cuttings treated with NAA with different concentrations varies from 23 to 45.6%. In all treated variants, the rooting percentage was higher than the control, V_1.
Statistical analysis of results confirms with mathematical accuracy the fact that there are differences between the variants, which means that the level of the NAA concentration affects the rooting percentage of vegetative cuttings of thuya.
Statistical index of variants (the NAA concentration) was F = 57.90605. This value is greater than the value F-crit = 3.325835. At the same time, the value of propability P-value = 4.66E-07 (equivalent to $1/4 \times 10^7$) was smaller than confidence level $\alpha = 0.05$.
With the increase of NAA concentration from 1000 ppm to 4000 ppm, the rooting percentage increases from 20% to 45.6%, while the increase of NAA concentration over 4000 ppm (5000 ppm and 6000 ppm) was not accompanied with the increase in the rooting percentage. So, the optimal concentration of NAA is 4000 ppm.
Key words*: cuttings, NAA, percentage, propagation, rooting, treatment, thuya "Emeraud".*

INTRODUCTION

Thuya Occidentalis "Emeraud" is one the most used ornamental plants for decoration of parks and gardens (Susaj, L. & Gj. Jaku, 2008). Thuya is an evergreen plant, with a very slow growth, which produces low vigour seeds, so for its propagation are used vegetative cuttings (Susaj, L., 2009). According to their origin, thuyas divide in two groups: *Thuya occidentalis*, which develops a crown at 15 m high and 4-6 m wide, and *Thuya orientalis*, which develops a crown at 8 m high and 3-4 m wide (Vuksani, Gj., 2004; Group of authors, 1996).
From *Thuya occidentalis* was isolated the clone with limited growth, called *Thuya occidentalis* "Emeraud", which develops a dense crown in pyramidal shape 4-6 m high and 1.5-2 m wide (Bertolami, A., 2004).
Thuya occidentalis "Emeraud" can be used for decoration of parks and gardens exposing it as individual plants or in groups with 3-4 plants together (Susaj, L., 2010). Propagation of this plant by means of seeds is tardy and difficult because of small seed quantity and seeds low germination ability. This is one of the reasons of vegetative propagation using vegetative cuttings taken from the end bottom parts of lateral branches (Susaj, L., 2009).

Every plant tissue, cambium, epidermis, parenchyma, etc, can form roots if there are fulfilled appropriate environmental conditions and if there is a certain level of growth regulators (plant hormons) (Hartman, H. T. & D. E. Kester, 1990).
High hormon concentrations provoke the cambium and pericycle cell division from where starts the root producing process. Roots originated from vegetative plant's parts under the hormon effect of are similar to roots produced in natural way (Hartman, H. T. & F.T. Davies, 1990).
For rooting acceleration are used growth regulators which take part in the group of auxins. In vegetative propagation practices there are used two types of auxins, indole-3-butyric acid (IBA) and naphthaleneacetik acid (NAA). For woody parts and plants which root with difficulty can be used high auxin concentrations, but very high concentrations can act as rooting inhibitors (Rama, P., 2010).

MATERIALS AND METHODS

In this study there were used oneyear vegetative cutings of the ornamental plant *Thuya occidentalis* "Emeraud", 10-12 cm long. The experiment was carried out during 2008-2010 at the flower's propagation greenhouse on perlite supporter with bazal heating of the experimental base of Horticulture Department at the Agricultural University of Tirana.
The air greenhouse temperature was keept at 25-28^{o}C, bazal perlite temperature 17-18^{o}C, and air humidity 95%. For the induction of cuttings rooting was used naphthaleneacetic acid (NAA) in seven concentrations (variants): V_1 – 0 ppm NAA (untreated cuttings), V_2 – 1000 ppm NAA, V_3 – 2000 ppm NAA, V_4 – 3000 ppm NAA, V_5 – 4000 ppm NAA, V_6 - 5000 ppm NAA, and V_7 - 6000 ppm NAA.
For each variant there were used 100 vegetative cuttings in distance 10 cm between rows and 5 cm between cuttings, sowing two hundred vegetative cuttings/m^2. The ends of vegetative cuttings were plunged in a prepared NAA solution for 5-6 seconds, and, after that, were keept together for 8-10 seconds to let the NAA solution to go into the tissue (Figure 1/a, b, c).

a) b) c)

Figure 1. **Preparation of the vegetative cuttings**

Vegetative cuttings were planted for rooting at the period March 20-25.
After twenty days there were observed the formation of roots nodules and the callus ring at the end of vegetative cuttings, and forty days later (around 60 days after sowing) there were counted rooting cuttings, and were evaluated the rooting percentage for each variant.
The influence of NAA concentration on the rooting of vegetative cuttings of thuya "Emeraud" were confirmed by means of the difference of rooting percentage of different variants showed below in tables, graphs, and statistical tests (Anova test) (Papakroni, H., 2001).

RESULTS AND DISCUSSIONS

Vegetative cuttings were sowed in March 20-25 in the abovementioned distances, treated with different NAA concentrations. After sixty days were counted rooted cuttings of each variant, every year, and, at the end of the third year, was evaluated the three years mean.
Results showed that variant 1 (control – 0 ppm NAA – untreated cuttings) had the lowest rooting percentage, where from 300 cuttings (for three years of study) were rooted sixty or 20% of them. Rooting percentage of variants (different concentrations of NAA) V_2 to V_7 showed that NAA do affect it.
The mean rooting percentage of variants varies from 18% (V_7) to 45.67% (V_4). The increase of NAA concentration from 1000 ppm (V_2) to 4000 ppm (V_5) is accompained with the increase of rooting percentage from 23% (variant V_2 = 1000 ppm NAA) to 45.67% (variant V_5 = 4000 ppm NAA). For variants 5 and 6 (5000 ppm NAA and 6000 ppm NAA), the rooting percentage was lower than V_4, 34.67% (V_6) and 18% (V_7), respectively, which means that the increase of NAA concentration over 4000 ppm is not effective, even

though, the rooting percentage decreases, confirming that very high NAA concentrations act as rooting inhibitors (Rama, P., 2010) (Table 1 and Graph 1).

Table 1. **Rooted cuttings according to variants and years**

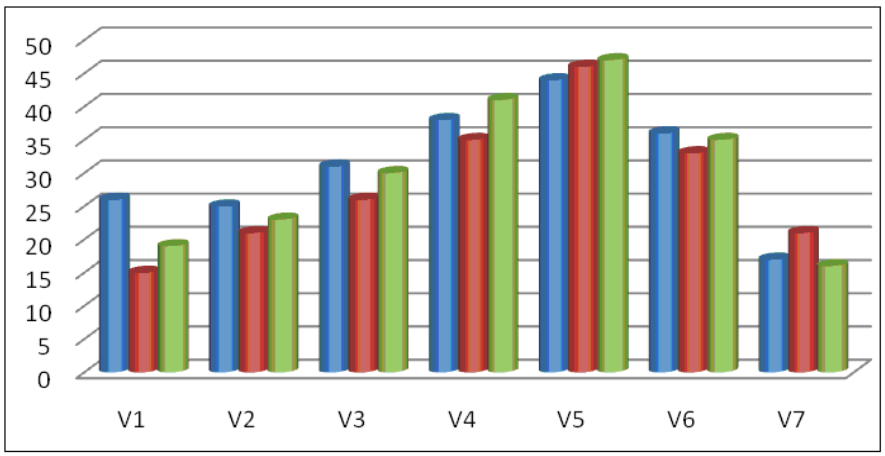
Vitet	**Variantet**						
	V_1	**V_2**	**V_3**	**V_4**	**V_5**	**V_6**	**V_7**
2008	26	25	31	38	44	36	17
2009	15	21	26	35	46	33	21
2010	19	23	30	41	47	35	16
Mean	20.00	23.00	29.00	38.00	45.67	34.67	18.00

The differences between variants, which were confirmed by statistical tests of variance, showed that NAA concentration do affect the rooting percentage of vegetative cuttings of *Thuya occidentalis* "Emeraud". The value of statistical variance index of variants (the NAA concentration) was F = 57.90605. This value is greater than the value of F-crit = 3.325835. At the same time, the value of propability P-value = 4.66E-07 (equivalent to 1/4 x 10^7) was smaller than confidence level $\alpha = 0.05$ (Table 2).

Table 2. **Anova: Two-Factor without Replication**

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows (Vitet)	10.11111	2	5.055	0.949896	0.419086	4.102821
Columns (Variantet)	1540.944	5	308.188	***57.90605***	***4.66E-07***	***3.325835***
Error	53.22222	10	5.322			
Total	1604.278	17				

Graph 1. **Rooted cuttings according to different variants and years**



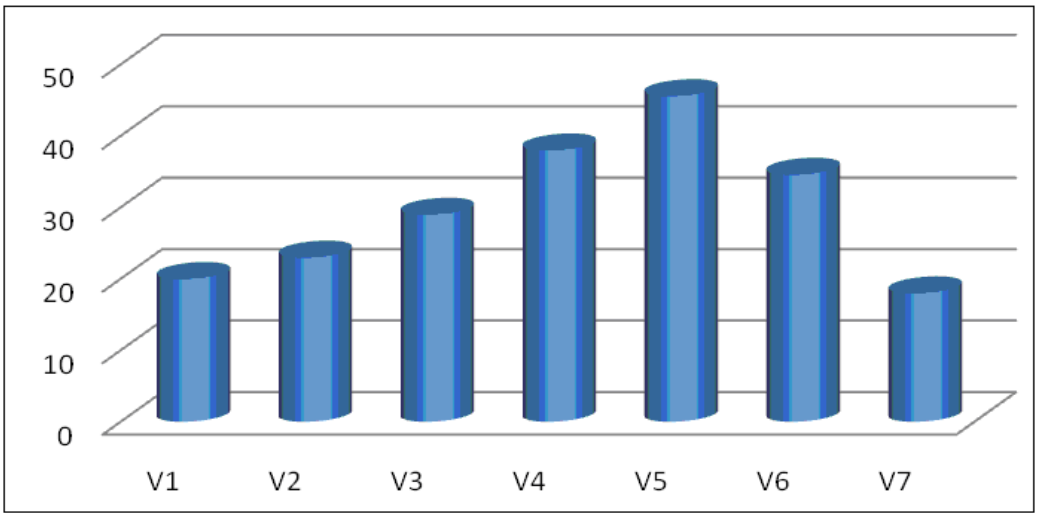
The graph shows that over three years of study, the highest rooting percentages were observed at V_5 (4000 ppm NAA). Over 4000 ppm NAA, variants 6 and 7, the rooting percentage was decreased. The observed results of three years rooting percentage means are presented below (Table 3 and Graph 2).

Table 3. **Three years rooting percentage means, according to variants**

Variants	Total number of		Rooting percentage (%)
	Planted cuttings	Rooted seedlings	
V_1 (control – 0 ppm NAA)	300	60	20
V_2 (1000 ppm NAA)	300	69	23
V_3 (2000 ppm NAA)	300	87	29
V_4 (3000 ppm NAA)	300	114	38
V_5 (4000 ppm NAA)	**300**	**137**	**45.67**
V_6 (5000 ppm NAA)	300	104	34.67
V_7 (6000 ppm NAA)	300	77	18

The comparison of observed results of different variants to the control (V_1) and to each other show that NAA concentrations do affect the rooting percentage of vegetative cuttings of *Thuya occidentalis* "Emeraud". The highest rooting percentage all over three years was oserved for V_5 (4000 ppm NAA), and the increase of NAA concentration over 4000 ppm NAA (V_6 - 5000 ppm NAA and V_7 - 6000 ppm NAA) is accompained with the decrease of rooting percentage. Form the comparison of rooting percentage of three years means there were observed that the rooting percentage of V_5 was 25.67% higher than V_1 (control), 11% higher than V_6 and 27.67% higher than V_7 (6000 ppm NAA).

Graph 2. **The comparison of three years rooting percentage means, according to variants**



The graph 2 shows that the highest three years rooting percentage mean was observed to V_5 (45.67%) and the increase of NAA concentration was accompained with the decrease of rooting percentage of vegetative cuttings.

The treatment of one year vegetative cuttings of *Thuya occidentalis* "Emeraud" with different NAA concentrations showed different effect on rooting percentage. The increase of NAA concentration from 1000 ppm to 4000 ppm was accompained with the increase of rooting percentage and the highest number of produced seedlings, and the increase of NAA concentration over 4000 ppm was accompained with the decrease of rooting percentage and the number of produced seedlings.

For the decorative plant *Thuya occidentalis* "Emeraud", the optimal NAA solution concentration is 4000 ppm. Higher NAA solution concentrations do not affect positively on the rooting percentage of vegetative cuttings.

CONCLUSIONS

The utilization of naphthaleneacetic acid (NAA) do affect on the rooting ability and the rooting percentage of one year vegetative cuttings of decorative plant *Thuya occidentalis* "Emeraud".
The level of NAA solution concentrations do affect on the rooting percentage of vegetative cuttings and the differences between variants (different NAA solution concentrations) were statistically confirmed by Anova test.
The optimal NAA solution concentration for the treatment of one year vegetative cuttings of *Thuya occidentalis* "Emeraud" is 4000 ppm (V_5).
Higher NAA solution concentrations do not affect positively on the rooting percentage of vegetative cuttings.

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Paper 064

"IN VITRO" MEDIUM TERM CONSERVATION OF SOME SPONTANEOUS FRUIT TREES

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ABSTRACT

The objective of our investigation is to evaluate a medium-term "in vitro" conservation protocol of some woody tree species (*Prunus avium* L., *Prunus mahaleb* L., *Zizyphus jujuba* Mill.). Wild relatives of cultivated fruit trees represent a source of genetic variability and can be very important in breeding programs and cultivation. For this reason, it would be of interest to use a method available for "in vitro" medium-term germplasm conservation, which involves strategies to slow plant growth through chemical and environmental manipulation of "in vitro" conditions. Effect of reduced sucrose and MS salts concentrations and combination of low temperature and light regime were examined using "in vitro" grown plant cultures. Maintenance in these conditions reduced microcuttings growth. To test the regeneration of the conserved cultures, they were transferred onto fresh culture medium. The examined species differed significantly in their survival. However they were similar in terms of proliferation ability, when they were transferred onto fresh medium. The effect of low temperature (4^oC) combined with reduced light regime is the most effective method of medium term preservation for all the species. *Zizyphus jujuba* species resulted with highest survival rate in both used preservation methods. The optimal time of conservation without subculture on 4^o C was 14 months for *Z. jujube* and about 6 months for *P. mahaleb*, and *P. avium*. Whereas reducing sucrose and MS salt (1/2MS) concentrations resulted optimal for 5 months for *Z. jujuba*, 4 months for *P. mahaleb*, and 3 months for *P. avium*.

Keywords: "In vitro" conservation, low temperature, reduced light regime, sucrose, survival, regeneration.

Introduction

Maintenance and preservation of diversity in crop plants is not only important to breeders for crop improvement programs, but also to human being for fulfilling their nutritional developments. The plant resources are threatened to extinct as a result of deforestation, developmental activities, introduction of new varieties etc. (Rao 2004). The technique of "in vitro" culture could be used for the multiplication and storage of disease-free plant germplasm (Neuman et al. 2009). This technique is an effective method for "ex situ" conservation of plant genetic diversity, allowing rapid multiplication from very little plant material and with little impact on wild populations. There are two types of "in vitro" preservation methods used in tissue culture: (i) growth retardation (slow growth or minimal growth) method and (ii) cryopreservation or ultra low temperature preservation. The first method is used for the preservation of genetic resources for medium terms (from several months to a few years), the latter method is for the preserving for long time (for several decades or longer) (Day et al. 2007). These alternate preservation techniques are less costly and safe to conserve the plant germplasm.

For safe preservation, the "in vitro" slow growth storage method was developed and is considered an alternative solution for medium term storage of fruit trees germplasm (Neveen et al. 2008). The aim of medium term storage is to increase the interval period between subcultures by reducing growth. This might be achieved by the use of modified environmental conditions, modified culture medium, growth retardants,

osmotic regulators and/or reduction of oxygen concentration (Kameswara 2004). Slow growth storage via "in vitro" cultures has been reported in many species (Maqsood et al. 2010).

The present study involved investigations of slow growth conditions for the storage of *Prunus. mahaleb* L., *Prunus avium* L. and *Zizyphus jujube* shoots cultivated "in vitro". Reduced concentrations of sucrose in medium containing half-strength MS nutrient salts and combination of low temperature and light regime have been examined.

Material and methods

Plant material: Cultures of *Prunus mahaleb* L., *Prunus avium* L. and *Zizyphus jujube* Mill. were established from apical and lateral buds removed from adult field-grown trees. Most often shoot tips and meristems are the explants of choice due to their genetic stability. Plant material used to introduce these fruit tree cultivars is obtained by collecting the active explants between January and March, when buds were starting to swell from shoots in dormancy.

Sterilization and bud isolation: Active shoots were cut in two- or three-node sections. The stem sections were washed carefully with water and were shaken for 5 min. in ethanol 70 %, followed by 20 min treatment with $HgCl_2$ 0.01% and two drops of Tween 20. Finally, stem sections were rinsed three times with sterile distilled water. The buds were dissected up to 3 mm by removing the outer scales and showed no sign of contamination after over one year of continued culture.

***Tissue culture*:** The isolated shoot tips were cultured onto glass tubes containing MS salts and vitamins (Murashige & Skoog 1962), combined with 0.3 mg l^{-1} BAP; 0.1 mg l^{-1} IBA; 0.3 mg l^{-1} GA_3 and supplemented with 3% sucrose and solidified with 0.55% agar. The pH of the media was adjusted 5.7 – 5.8 before autoclaving. The incubation conditions were at 25° ± 2° C in a 16 h light/24 h regime with cool, white fluorescent light of 1500 lux. Plant-derived shoots were subcultured monthly into fresh medium in order to obtain a great number of plantlets.

In vitro storage: In order to evaluate the effect of low temperature and light regime, the proliferated shoots were incubated at 4^oC in dark conditions. The medium under these conditions was the same with the multiplication medium. The cultures were stored in these conditions for different periods (3, 6, 10, 14 months).

The effect of reduced sucrose concentrations and MS salts strength was also evaluated. The cultures were transferred onto ½ MS medium without sucrose and supplemented with the same rate of plant regulators and agar as in the multiplication medium. The incubation conditions were the same as in the multiplication stage. The cultures were stored in these conditions for 3, 4 and 5 months.

Survival of the cultures was assessed on the basis of criteria as suggested by Reed (1992) as dead and brown shoots were considered as unsurvived while those with vigorous growth and having healthy leaves were considered survived.

Statistical analysis: Data collections in experiment were evaluated by computer using the statistical evaluation program JMP 7.0.

Results

The response of "in vitro" shoots stored for different periods under different storage conditions was assessed on the basis of survival and regeneration rates. Two methods of medium term conservation were examined. In the first method, the explants were stored at 4^oC in darkness for different periods (3, 6, 10, 14 months). In the second method, the explants of the three species under investigation were stored in a ½ MS salts medium without sucrose, under normal incubating conditions for 3, 4 and 5 months. The survival percentage was evaluated calculating the number of shoots survived by the number of shoots transferred under these conditions. The obtained data are presented on Tab. 1 and illustrated by Fig. 1a and 1b.

Tab. 1. Survival percentage for the three species under investigation during storage in two different methods

4^oC in darkness	**Survival percentage for different periods (%)**			
Species	**3 months**	**6 months**	**10 months**	**14 months**
Zizyphus jujube	100 ± 0,0000	100 ± 0,0000	80 ± 1,0677	72.5 ± 1,5166

	St. dev. 0,00000	St. dev. 0,00000	St. dev. 2,38747	St. dev. 3,39116
Prunus mahaleb L.	90 ± 2,3694 St. dev. 5,29811	75.2 ± 1,2284 St. dev. 2,74682	32 ± 1,4505 St. dev. 3,24345	0 ± 0,00000 St. dev. 0,00000
Prunus avium L.	92 ± 0,9905 St. dev. 2,21472	69.4 ± 1,1670 St. dev. 2,60960	27 ± 0,5413 St. dev. 1,21037	0 ± 0,00000 St. dev. 0,00000
½ MS salts without sucrose	**3 months**	**4 months**	**5 months**	
Zizyphus jujube	100 ± 0,0000 St. dev. 0,00000	94.2 ± 0,6671 St. dev. 1,49164	82.3 ± 1,3454 St. dev. 3,00832	
Prunus mahaleb L.	92.5 ± 1,3838 St. dev. 3,09435	74.7 ± 0,5891 St. dev. 1,31719	30 ± 0,6928 St. dev. 1,54919	
Prunus avium L.	77.8 ± 0,77460 St. dev. 1,73205	28.8 ± 0,72938 St. dev. 1,63095	0 ± 0,0000 St. dev. 0,00000	

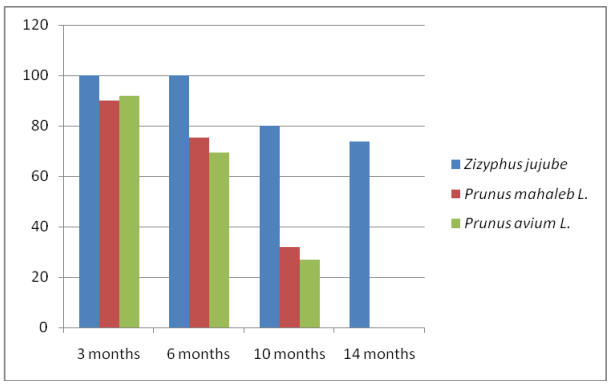


Figure 1a. Survival percentage of the explants stored on 4°C in darkness

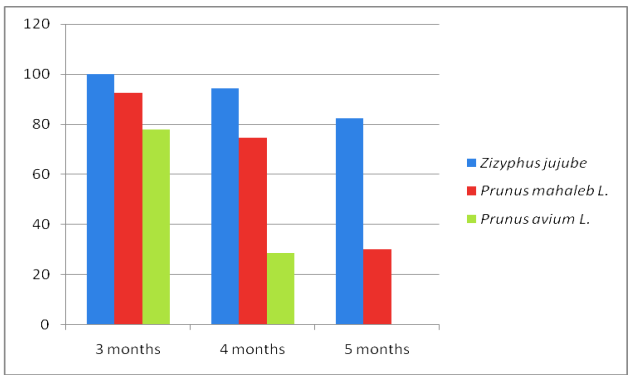


Figure 1b. Survival percentage of the explants stored on ½ MS salts medium without sucrose

nc shoots produced by the stored plants on two different storage methods. The obtained data are presented on Tab. 2 and illustrated by Fig. 2a and Fig. 2b.

Tab. 2. Regeneration percentage for the three species under investigation after transferring the shoots onto fresh medium

4°C in darkness	**Regeneration percentage for different periods (%)**			
Species	**3 months**	**6 months**	**10 months**	**14 months**
Zizyphus jujube	100 ± 0,0000 St. dev. 0,00000	98 ± 0,7071 St. dev. 1,58114	75.5 ± 0,6834 St. dev. 1,52807	70 ± 1,4770 St. dev. 2,95409
Prunus mahaleb L.	88 ± 1,1649 St. dev. 2,60480	61.3 ± 1,2309 St. dev. 2,75227	18 ± 0,7122 St. dev. 1,42449	0 ± 0,0000 St. dev. 0,00000
Prunus avium L.	89 ± 1,7404 St. dev. 3,89166	55.2 ± 1,6016 St. dev. 3,58120	17.7 ± 1,0136 St. dev. 2,02711	0 ± 0,0000 St. dev. 0,00000
½ MS salts without sucrose	**3 months**	**4 months**	**5 months**	
Zizyphus jujube	96 ± 0,9365 St. dev. 2,09404	90.2 ± 1,1967 St. dev. 2,67582	77.1 ± 1,0419 St. dev. 2,32981	
Prunus mahaleb L.	84.6 ± 1,0040 St. dev. 2,24499	62 ± 1,3657 St. dev. 3,05369	17.5 ± 0,6238 St. dev. 1,24766	
Prunus avium L.	70.1 ± 1,1726	15.5 ± 1,1453	0 ± 0,0000	

	St. dev. 2,62202	St. dev. 2,29056	St. dev. 0,00000	

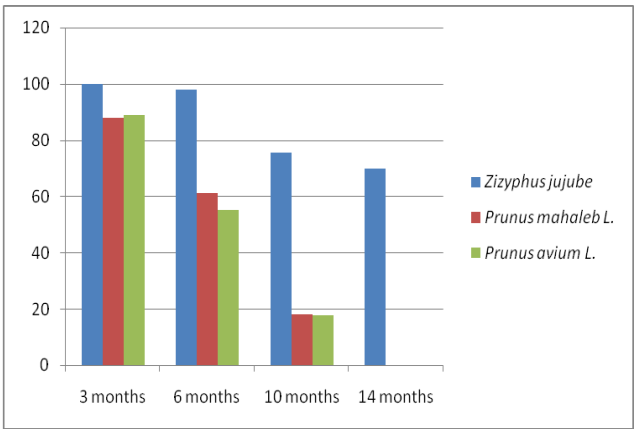


Fig. 2a. Regeneration percentage of the explants (stored at 4°C and in darkness) after transferring onto fresh medium

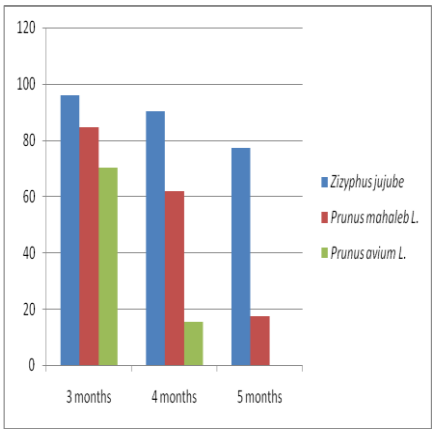
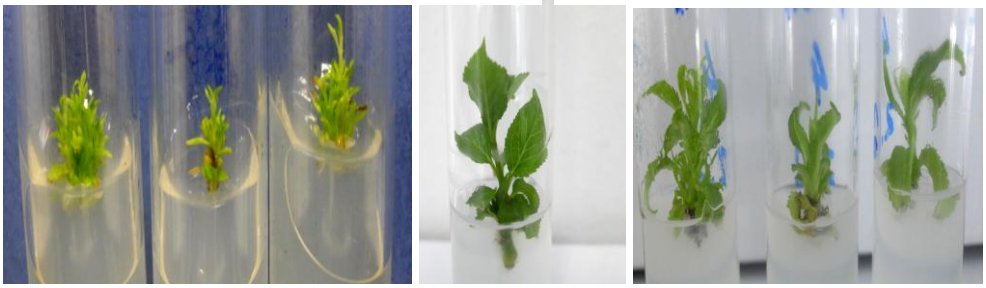


Fig. 2b. Regeneration percentage of the explants (stored ½ MS salts medium without sucrose)



(a) - *Zizyphus jujube;* (b) – *Prunus mahaleb* and (c) – *Prunus avium*

The three species differed significantly for the survival and regeneration (Fig. 3). The maximum survival and regeneration percentage was observed on *Z. jujube* for both conservation methods tested. The lowest survival and regeneration percentage was observed in shoots of *P. avium*. The maximum of these parameters was found when the cultures were stored for 3 months on both storage methods tested.

Maintenance on 4°C in darkness is the most effective method because the shoots were stored successfully for longer periods than in the other storage method. *Z. jujube* can be stored under such conditions for up to 14 months in a high survival and regeneration percentage (respectively 72.5 % and 70%) whereas *P. mahaleb* and *P. avium* can be stored successfully for 6 months (survival respectively 75.2%, 69.4% and regeneration respectively 61.3%, 55.2%) but, by increasing the storage period, the percentage of survival and regeneration decreases greatly for both species.

The lowest response of the cultures was observed when shoots were stored on ½ MS salts medium without sucrose. Storage in such conditions resulted more effective for *Z. jujube*, because the shoots showed satisfactory survival and regeneration percentage for about 5 months (respectively 82.3% and 77.1%). Storage of *P. mahaleb* shoots under such conditions resulted effective only for about 4 months (survival 74.7 % and regeneration 62%), while storage of *P. avium* was less effective, because only for 3 months were observed satisfactory percentages of survival and regeneration (respectively 77.8% and 70.1%). Longer periods of maintenance in these conditions resulted ineffective.

Discussions

Wild relatives of cultivated fruit trees represent a source of genetic variability and can be very important in breeding programs and cultivation. For this reason, it would be of interest to use a method available for "in vitro" medium-term germplasm conservation, which involves strategies to slow plant growth through chemical and environmental manipulation of "in vitro" conditions.

Low temperatures slow down plant growth. Under this principle, the genetic material can be stored at temperatures often less on the freezing point of water. Temperature and duration of cold storage depends on species and type of plant material. Method of low temperature is very effective for storage of potato, sugar beet, apple, strawberry and many forage plants (Alejo, 1992).

It should be noted that of all methods used for conservation by the method of minimal growth, storage at low temperature is better because this technique is cheaper. In our case, the storage at 4^{o}C in darkness of plantlets of *Z. jujube*, *Prunus avium* and *P. mahaleb* also proved the most effective.

Also the growth can be inhibited by reducing the amount of inorganic salts and sugar in the nutrient medium. According some works (George, 1996), the culture of stem pieces of coffee can be stored during 2 years at 26° C in the photoperiod 16/24 hours (7500 lux) in a nutrient medium MS 1/2 without sugar; significant reduction of growth of carnation plantlets resulted from a decrease of MS salts levels by 25-50% of normal medium.

This method is a valid alternative to facilitate the preservation of genetic plant materials. However, the data of our experiments on fruit trees species present this alternative less effective.

Conclusions

This study showed that: The shoots of different fruit trees can be stored successfully for different periods in the tested storage conditions.The conservation at 4^{o}C in darkness for the three examined species is resulted the most effective storage method.The plantlets of the species *Zizyphus jujube* showed best results of survival and regeneration percentage in both storage methods tested.

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Paper 070

IMPACT OF CLIMATE CHANGES ON AGRICULTURE IN ALBANIA AND RELATED ADAPTATIONS STRATEGIES

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ABSTRACT

One of the biggest concerns for the nowadays society are climate changes as consequences of global warming, which predicted effects would be harmful to the environment and in particular for agriculture. Climate changes as consequences of modifications in the distribution of the amount of precipitations, temperature and sea level rise will occur in extreme forms. Their expected effects will have a strong impact on human health, on water quality, biodiversity, agricultural production and on the environment generally. Global warming is due to the atmospheric greenhouse effect as natural phenomenon that makes the earth an inhabitable planet, but the anthropogenic factor has accelerated the process of release of "greenhouse gases" causing an increase in average temperature of the land surface. Analyzing the sources of the release of these gases, agriculture contributes about 34% of them (IPCC, 2007), but little attention has been paid to agricultural activities and land use in relation to the cycles of greenhouse gases. Earth possesses a great ability in capturing the carbon and other gases responsible for the greenhouse effect, but these potentials are not taken into account until now. The dependence of the Albanian economy from agriculture has fallen from 36% to 20.7% of GDP between 1990 and 2007, but 58.3% of the population are still making a living working on climate-sensitive sectors like agriculture, forestry and fisheries (Ministry of Agriculture, 2008). Taking into account the possible changes of temperature, precipitation and frequency of extreme weather events and their impact, the most tangible agricultural areas in Albania will deteriorate and will put a pressure on agricultural production and food supplying of the population in general. (Environmental Ministry,2009).

Key words: climate change, agriculture, greenhouse gas, greenhouse effect.

INTRODUCTION

The climate of our planet is dynamic and continues to be modified since the Earth was formed. Periodic changes in temperature and precipitations are the natural consequences of this change. Increasing concentration of greenhouse gases in the atmosphere is causing a corresponding increase in the average global temperature of the land surface. The average land surface temperature, in the last century, has increased from 0.74 ± 0.18 ° C (IPCC, 2007). It has increased by 0.6 ° C in the last three 10-years (Hansen et. al 2006). Europe is expected to have a growth by 2.3 - 6^0C in the future 100 years (IPCC, 2007). Melting ices, due to increased temperatures has led to an increasing of sea level by 10-20 cm in the last 100 years. Future scenarios predict an

increase from 19 to 90 cm up to year 2100 (Baettig, M.et al., 2007). Even in Albania climate change scenario predicts a temperature increase of 0.8 – 1.0 ^{0}C in 2025, 1.2-1,8^{0}C in 2050 and 2.1-3.6 ^{0}C in 2100 and a reduction of the amount of rainfall with -3.8 to - 2.4%, -6.1 to -3.8% and -12.5 to - 6.0% for the same periods of time, as well as an increasing sea level respectively with 20-24cm and 48-61 cm for the years 2050 and 2100. The decrease of the level of rainfall was assessed by 9-23% by 2025 (Bruci, E. 2008). Carbon dioxide is the main responsible of the greenhouse effect and global warming and in contrast to other gases that compete in the phenomenon, but rapidly degraded, CO_2 remains in the air for hundreds of years. Its concentration reached today is 385 ppm to 280 ppm in pre-industrial period (UNEP, 2007). Research concludes that if we permit to the CO_2 concentration to reach the concentration of 450-600 ppm, we will have big reduction of rainfall and great droughts (Stern Review 2006). In the last 200 years the use of fossil fuels, like coal and oil and deforestation have caused a continuous increase in the atmosphere of greenhouse gases (water vapor, carbon dioxide CO_2, nitrogen oxides N_2O, methane CH_4 and ozone O_3) (International Energy Agency,1999). These gases catch the part of the heat that the planet's surface, warmed by the sun, reflects towards the outside - causing over warming of the land (known as the greenhouse effect). Macroscopic effect of this warming are: increasing of global air and sea temperature, increasing in average sea level, decreasing of ice and snow surfaces etc. Nitrogen oxides are added to carbon dioxide. Nitrogen oxides are used in intensive agriculture as fertilizers and methane is produced by human activity in animal husbandry. Climate changes have already produced their effects, which may appear in the future years on human health, on food safety, on socio-economic development and water resources. Even Albania will be affected by these climate changes, but the greatest impact of these changes will be in the agricultural sector. The climate in the complex of ecological conditions, conditions in considerable scale the production of agricultural plants, but due to the spatial variability of climate and soil, many areas of Albania are not suitable for agricultural production, therefore they will be the most vulnerable to the climate change areas (Climate Portal World Bank, 2009).

MATERIAL AND METHOD

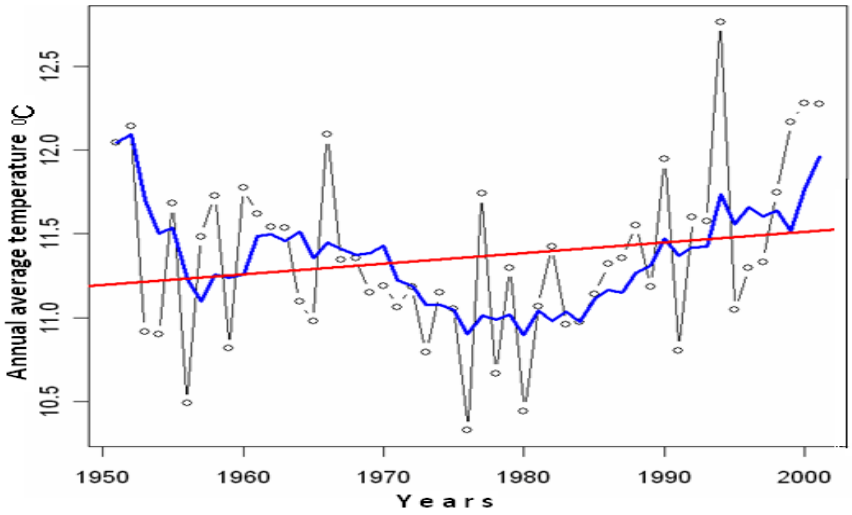
The study are used a range of statistical data registered for agricultural production in Albania by the Ministry of Agriculture, Food and Consumer Protection, 2007, the Ministry of Environment, Forestry and Water Management, 2007, the Intergovernmental Panel on Climate Change (IPCC) (2007), Climate Portal World Bank, 2009, and other studies conducted by different institutions and authors in relation to climate change, the level of greenhouse gas releases, the processing of future scenarios for climate change, sharing of agro-ecological zones etc. On the basis of these data are also analyzed the indicators of vulnerability for the agricultural sector and the impact that climate change will have on agricultural production. The definition of the Albanian spaces and of the plants effected by climate changes is carried out through the evaluation of impacts of possible future climate scenarios. For this there are defined two methodologies: 1) spatial analysis that examines the consequences of climate change (temperature increase, reduction of rainfall, etc.) in terms of localization of agricultural areas and examinations of the effects in areas where practically the agriculture is applied and 2)analysis of the plant production, which is a method developed to determine the vulnerability of different species and that climate change presents an evaluation method most commonly (Hudson, G., and Birnie, RV, 2000). Spatial analysis is determined by assessing the risk of agricultural activities subject to various scenarios of climatic variations. The first step consists in determining of one condition or set of conditions that strongly condition the agricultural plant. These conditions may refer to bio-physical aspects (duration of frost free period, duration of the dry season, degree days, potential evapo-transpiration etc.) or

socio-economical ones. For each of the selected conditions there are determined the indicators that allow to calculate the level of risk in areas with agricultural activity (e.g., bioclimatic indicators, indicators of risk of frost, a synthetic indicator of "land capability", etc.). The sensitivity of the agricultural areas and the risk of dropping out of these areas by climate change can be assessed by repeating the analysis for different climate scenarios. Analysis of plant productivity is carried out through the implementation of statistical procedures or simulation techniques. Simulation models are developed by integrating a set of mathematical equations based on empirical or analytical knowledge specific physiological processes (photosynthesis, respiration, transpiration, etc.) and their interaction with the environment (climate and soil). Simulation models are used more in comparison with statistical methods even for environmental conditions different from the current ones. This type of assessment of the climate change on agriculture permits to consider the technological responses, as well as the physiological adjustments towards climate changes. The elaboration of models for determining the effects of climate change requires the performance of a quantitative analysis for a number of environmental, economic and social issues. Stern Report (2006) uses integrative evaluation models. It provides a useful tool for simulating the process of climate change of human origin, from the production and the economic effects of changes in particular to the economic effects measured in monetary terms. In practice, it is analyzed the production growth with and without the effects of climate changes. The application of these assessments requires a series of simplifications; however, these models are today the best instrument available for assessing the costs and various global climate risks, especially in agriculture.

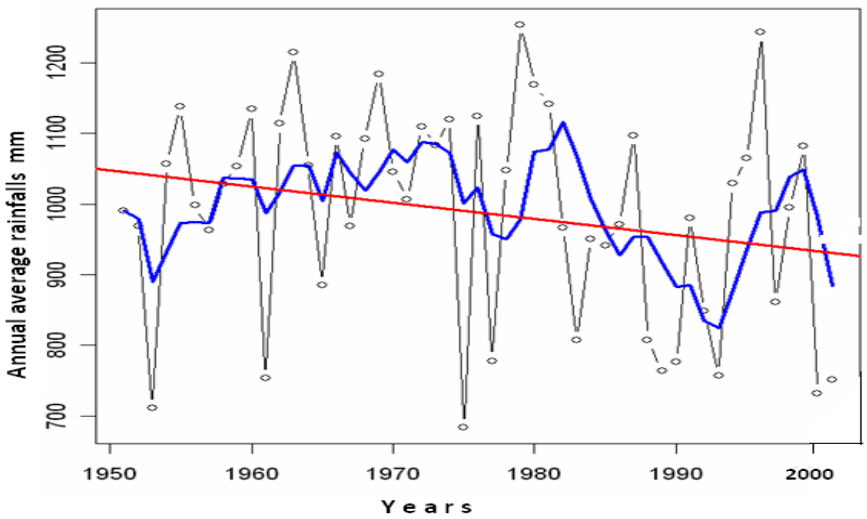
RESULTS AND DISCUSSIONS

Climate is the fruit of a very complex physical system and in time it has a sinusoidal behavior, so climate has always changed. Diversity of the current climate is related to human action. Climate changes in a natural way is defined as climatic variation, and when there are interventions as those observed in recent years, we can consider climate changes that cause various effects, not always negative. Knowing climate and its changes should constitute a source, so we should be able to understand what is happening in order to exploit maximum environmental resources that constitute the climate and climate change. Climate change affect agriculture in different ways, they define the variations of temperature, precipitation and water resources. The territory of our country in terms of climatic conditions presents a variety of areas with different climatic characteristics and with defining influences on the cultivation of agricultural plants. The Albanian climate in general is characterized by mild winters with abundant precipitation and hot summer and dry. It is characterized by abundant precipitation of rain moving from a minimum value included between 649 mm to 1060 mm per year in low and hilly areas and a maximum value between 2295 and 3117 mm per year, mostly in mountainous areas as well as a relatively hot summer and dry. Most rainfall occurs during the cold months of autumn and winter by about 70% of them, while the summer months are generally very dry. The average annual temperature for Albania is between 13.9 and 17.1^{0}C in the hilly areas and along the seaside, while it is from 7.5 of 10.7 ^{0}C along the hilly areas and mountains in the interior of the country - analyzed these data for the period 1951 - 2001. Analyzing the climate trends based on historical data, there are defined the potential impacts of current and future climate change, which will also serve to define measures of adjustments in each agro-ecological zone (Shundi, A. 2003). It is noticed that the overall trends show that the temperature has risen by an average of about 0.3^{0}C throughout Albania, while precipitation decreased by 114 mm during this period (World Bank, 2009). In a global level, during the last 100 years from 1906 to 2005, the temperature is increased by 0.74^{0}C (0.56 ^{0}C and 0.92 ^{0}C) (IPCC, 2007).

Picture 1 – National trend of average annual temperature during 1951 – 2001



Picture 2 – National trend of annual average rainfall 1951 – 2001



Source: www.climatewiz.org

Even though predictions are more or less different, overall trends in most climate models and scenarios of greenhouse gas emissions show that the country will become hotter and more dry (First National Communication of Albania 2002). Historical records show that Albania will be exposed to an increase of 2^0C annual average temperature for winter and summer, a decrease of 8% in average rainfall, a decline of 28% of the annual presence of water for irrigation (the Bank

Climate Portal World, 2009). First National Communication 2002, provides projections for the potential climate impacts: - Average annual temperature in the country will grow between 0.8 - 1.0^0C by 2025 and 2.1 - 3.6^0C by the year 2100; - average annual rainfall in the country is expected to fall to -2.4 ÷ -3.8% until 2025 and -3.8 ÷ - 6.1% by 2050. The decline in rainfall will be higher in summer and lower during the winter. Rainfall in the summer will fall to -5.6 - -8.0% until 2025 and -9.1 ÷

- 20.0% by 2050, while precipitation in winter will be relatively stable, with a rainfall that is reduced to 0 ÷ -1.6% to year 2025 and 0 ÷ -1.8% by 2050 and an increase in sea level. Sea level is expected to grow 20-24 cm by 2050 and 48-61 cm by the year 2100. Predictions developed in World BankPortal Climate of the (2009), help with the comparison of results for a number of climate parameters. These models show that Albania will be exposed to an average increase in temperature of

2° C in summer and in winter, for the period 2030 – 2049, compared to the years 1980 to 1999.

Table 1: Forecasts of the general model of circulation of IPCC (2009), for Albania in the years 2030 – 2049

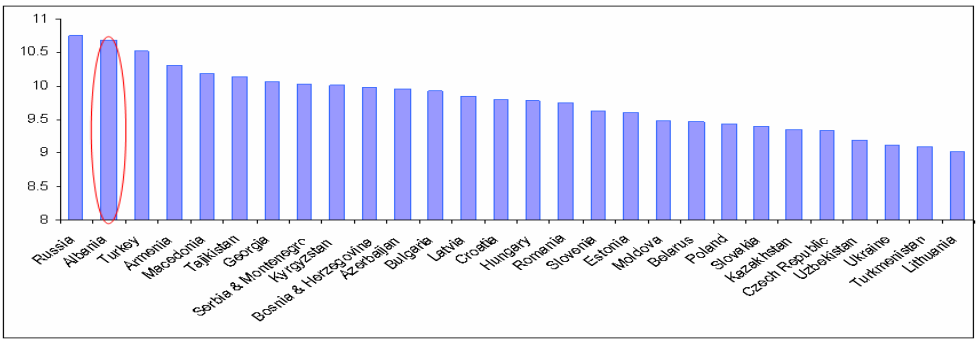
compared to the situation in the years 1980 – 1999

Climate Parameter	IPCC GCM	
	Difference (2030 – 2049 towards 1980 - 1999)	Models which foresee the same difference
Temperature (annual)	2°C	-
Average annual precipitations (mm):	-8%	18 to 20
Winter precipitations (December, January, February)	-10%	16 to 20
Spring precipitations (march, april, may)	-6%	13 to20
Summer precipitations (June, July, August):	-9%	15 to 20
Autumn precipitations (September, October, Nobember)	-8%	16 to 20
Maximum 5 days precipitations Total (mm):	-4%	6 to 8
Intensity of daily precipitations	2%	6 to 8
Rainfall:	-28%	12 to 12
Consequent Dry Days:	5 days	8 to 8
Freezing days:	-6 days	7 to 8
Index of Prolungation of Hot Wave:	20 days	8 to 8

Source: Climate Portal of the World Bank, 2009

The study undertaken by (Baettig et al, 2007) regarding the risk of extreme events in the future, predicts that Albania will be severely touched by this events, compared to other Europena and Central Asia countries (ECA).

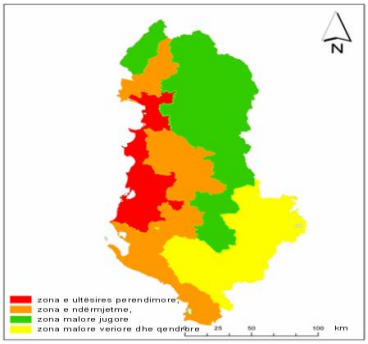
Picture 3 – Index of extreme events of climate changes, ECA region



Source: Baettig, M. et. Al. 2007. An index of climate change: Where could it be more evident the climate change in 21st century, Geophys. Res. Lett., 34, L01705

One of the most affected sectors from the climate changes will be the agricultural one. It results from the study that the agriculture and other rural regions will be affected more than the average of the ECA countries (Baettig et al, 2007). In order to afford these risks in the agricultural sector, it needs to be prepared the due adaptation strategies. These strategies must be prepared according to the agro-ecological regions of the country and at the same time in accordance with the different agricultural systems applied already in these regions. Actually the territory of our country is divided in four agro-ecological regions: western lowlands region, the intermediate region, mountainous southern region and northern mountainous central region. The agro-ecological division was made based on pedological-climatic characteristics, socio-economic, their market and infrastructure development. In the basis of its ecological characteristics, each area will be affected in different ways by future climate changes affecting agricultural sector, in particular plant production level.

Figure 4- Agroecological regions of Albania



Source: Shundi, A. 2003. Country Profiles Pasture Resources / Forage - Albania, FAO

On the basis of the predictions already made on the future scenarios of climate changes, there will be a considerable impact on the plant production level, deterioration of products quality, increasing of illnesses and detrimental factors incidence, decreasing of water disponibility, increasing of the erosion scale of the land, deterioration of livestock production conditions and forage supply and consequently, it will be negatively affected the economical growth of the respective agroecological regions.

Agriculture is one of the economical sectors with major water consumption; it is irrigated around 50 % of agricultural land and it is consumed in agriculture nearly 62% of the total quantity of disponible water (World Bank Climate Portal,2009). In order to preserve the existing water level, it will be needed more water, but in the conditions of a decreasing precipitation level til -2,4% to – 3% in the year 2025 according to the forcasts, there will be explored other strategies for increasing water use efficiency in agriculture.

Another problem which agriculture has to afford due to the future climate changes is the land erosion. Land erosion is a serious problem we are encounting in wide regions of our country, chiefly caused from the bad management of the land. It is evaluated that over 61 % of land surface in Albania is exposed to the grave and very grave erosion; while around 30% of the agriculture land has an annual loss between 20 – 70 mt/ha (Sutton, W. et al. 2008).

Climate changes might bring to a number of agronomical problems, including changes in the land drainage, land salting, damage of land structure, changes in the phenology of the principal plants and exposure to detrimentals and new illnesses.

Temperature increasing will affect cereals phenology, speeding up their harvest time to15-20 days. Lack or abbreviation of freezing period will bring to the decreasing of cereal production, which need cold (springing) and to difficulties in plant fraternity.

Temperature increasing will speed up the development cycles of the Autumn cereals, which might be encountered during not suitable periods.

Temperature increasing will bring to changes in the biology of detrimental development and to illnesses which increase the risk of the agricultural plant production.

Temperature changes will favourize the growing up of species of native grasses, increasing too much their aeral distribution. The changes in temperature and precipitations will affect not only the conditions of agricultural production, but even the livestock production, regarding animal health, animal feeding, husbandry and generally all the infrastructure connected to this sector. Climate changes will negatively affect on forage production, which will bring to changeble feed prices and lack of potable water. Due to this situation, there might be expected changes in the production level, passing in this way from the intensive systems to less intensive systems of livestock production, bringing to an increasing risk for losses especially for small producers, which constitute the majority of the rural population in Albania (Iglesias, A. et al., 2007).

CONCLUSIONS

Observing these problematic related to the climate changes and their impact in agriculture, it will grow up the necessity for elaborating not only policies of "softening"effects such as reductions of gas releases which cause greenhouse effect, but it will be strategically imperative to intervene with adaptation measures towards the climate changes, in order to limit the potential damages of these changes consequences. The adaptation measures should obstacle the effects of climate changes, aiming at a reduction of the risks deriving from the negative impacts (now and in the future), even under the economical point of view. Many impacts of climate change can be faced through adaptations, in particular impacts in a short period (Autonomous adaptations) through changes of cultivars (resistant to heat stress, cycle length); date of planting (acceleration); intake of new herbs (less water demand); the simultaneous use of cultivars or crops with different characteristics (reduction of risk in production output) and adaptation in long run terms (Planned adaptations) through changes in land use (optimization or stabilization of the production); development of new cultivars (adapted to the new rapid climatic conditions); changes in farming systems (to reduce vulnerability) (Giannakopoulos et al, 2005).Current acknowledgments allow adaptation to selected preventive actions, which have limited cost and do not threat social and economical systems. Risks in the agricultural sector are considerable in the context of projections of climate change, therefore

need to develop effective adaptation alternatives for many agricultural and livestock systems in the four agro-ecological zones of Albania. Adaptation alternatives should be developed not only nationally, but also at the level of agro-ecological zones, so that regional and local communities should have the option to be adaptive to climate change with which they will face. There are many new ready scientific concepts to be implemented, which could immediately improve the flexibility of agricultural systems in Albania, but the lack of financial resources at the farm level is a significant obstacle to their acquisition.

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Paper 74

THE IMPACT OF GLOBAL WARMING IN SOUTHERN ALBANIAN GRASSLAND ECOSYSTEMS

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ABSTRACT

The controversial data comes from different long-term experiments carried out throughout the world on global warming effects. Several data from the alpine meadows of North America suggest that the wildflowers will be affected by the warming climate, whereas the ecosystems of the higher altitudes in Western Europe expressed higher resistance of ecosystems to global warming. On the other hand, the Mediterranean grassland ecosystem also reflects intensive transformation under rapid climate change. Our data collected during years 2004-2010 in grassland ecosystems of Saranda, Gjirokastra, Vlora, Tepelena and Permeti, show an increase in changes of ecosystem structure and function. So, a decrease of cover vegetation and loss of active soil layer and expansion of thorny species toward the alpine grassland ecosystems were observed in this area. Several rare species, like *C. boryi*, *A. corcyrensis*, *C. microcalyx* subsp. *minor*, *C. decalvans* subsp. *leontopodium*, *C. banaticum* and several *Orchid* species are moving upward and adapted to the new ecological conditions. These data and the frequent hybrids between different species, observed in Southern Albania, are good indicators that show us the impact of global warming on grassland ecosystems.

Keywords: Grassland, cover vegetation, soil active layer, thorny species, hybrids

INTRODUCTION

The role of climate in distribution and adaptation of species is one of the most important and more studied ecological factors. Since the 1990s which mark the warmest decade known so far from the beginning of climate measurements (Gian-Reto *et al.*, 2005; Michelsen *et al.*, 2011), the studies are focused on the impact of climate change in species distribution and their biological cycle. Plants and animals have different responses to the recent period of warmer climatic conditions by either adapting their life cycles or shifting their ranges to suitable habitats (Beniston, 2003; Walther, 2004; Parmesan, 2006). In this way, investigation of plants and animals behavior, parallel with climate change have begun firstly in Alpine areas of northern European countries (Dullinger *et al.*, 2004; Thullier *et al.*, 2005; Gian-Reto *et al.*, 2005, Pauli *et al.*, 2007; Trivedi *et al.*, 2008; Schmitt, 2009)
According to EEA (2009) climate changes in Europe threatens to continue altering the alpine hydrological system drastically during changes in precipitation, snow-cover patterns and glacier storage. The changes in biological and hydrological system clearly have changed spring and summer phenology of leaf unfolding and flowering records advancing, across Europe (Menzel *et al.*, 2006).

Studies in the alpine pastures of different countries in North Europe and Mediterranean region show substantial enrichment of the vascular plant species pool and increase of invaders one, over the past last decades (Malo, 2010).

Altitudinal shifting of species represent most functional groups; herbs, woody species, pteridophytes and graminaceae (Kullman, 2010) which have influenced on native's species, biodiversity function and fragmentation (Haig *et al.*, 2000; Garden *et al.*, 2007; Kammer *et al.*, 2007). Although climate warming is expected to influence the distribution ranges of plant species along latitudinal and altitudinal gradients

(Hughes, 2000; Walther 2004), few studies exist in western Balkans related to this and no one for Albania. The following paper represents the first case studies from the south of the country.

MATERIALS AND METHODS

Studies of the impact of climate warming in Southern Albania ecosystem grasslands were done by intensive, multidirectional field trip, carried out during the years 2004-2010. Study of vegetation, plant communities and distribution of the rare and endangered species was based on transects method using randomly sampling plots (Reiss *et al.*, 2000).
During the field trip changes were estimated in grassland populations, snow melt and flora of rock faces from the bottom of valley to the summits of Mts range. Sampling plots were taken randomly within each vegetation type, walking from 800 m a.s.l up to 2480 m altitude. During each sampling plot, several relieve based on species composition were taken, including additional data, such as altitude, slope exposition, type of bedrock. The status of rare and endangered plant species was evaluated in accordance with the methodology of W. Sutherland (2006) and the Red List of Globally Threatened Species of IUCN (Walter & Gillet, 1998).
Our data collected in the field and morpho/phenological changes of presented plants were compared with that of Antonio Baldacci, collected more than 100-years before (Baldacci, 1966; 1998; 1999) and other data collected by F. Markgraf in 1926-1928 and data collected by P. Gölz, H.R. Reinhard in the years 1980-1982, (Gölz & Reinhard, 1984). Determination of species was based on books of *Flora Europaea* (Tutin *et al.*, 1964-1980) and books of Greece Flora (Strid & Kit Tan, 1985; Kit Tan & Iatrou, 2001):

Digital photos were also taken in the field in order to estimate the dynamics of cover vegetation over the years in Nëmërçka Mt. Analysis of the cover vegetation dynamics was performed using digital photographs and surface of sampling plots were calculated by Heron's formula.

RESULTS AND DISCUSSION

Study area

The study was conducted in mesophilous and xeromesophilous grasslands of the South Albania that covers limestone substrates from 800 m up to 2480 m a.s.l. The area is part of 34TCK3 and 34SDK2, UTM squares and includes the following mountain ranges: (i) Murgana-Mali i Gjerë-Mali i Çikës; (ii) Bureto-Mali i Çajupit and (iii) Mali i Nëmërçkës-Mali i Dhëmbelit. The first Mts. range was faced directly on the Ionian Sea, whereas the others are in the inner part of the country and are penetrated by two deep valleys: Vjosa Valley which is the longest and Drino Valley. The area is fragmentized by a net of tributaries, forming on it steep screes, deep gorges and canyons. The highest peaks of Mountains are: Papingi peak, 2485 m; peak of Këndërvica, 2122 m; peak of Çika, 2045, peak of Murgana 1806 m and peak of Lalucit in Çajupi Mt, 2155 m. Due to its position, the area is characterized by a typical Mediterranean climate and only in the alpine parts of Mt Nëmërçka, it was replaced by Continental climate. In general, the climate features of territory are soft and wet winters, and dry and hot summers. The annual average of temperatures (years 1951-1996) in subalpine grasslands varies from 14 ^{0}C in lower altitudes up to 7.8 ^{0}C above 1100 m. The annual average of temperatures in alpine grasslands is 6 ^{0}C. According to Draçi (1996) and SOGREAH (2008), the average of annual precipitation varies from 1560 up to 2200 mm, with distribution 40% in winter time, 35% in autumn and 18-20% in spring time. The period between mid-June up to mid-September is the driest period of the year. During those months the rate of precipitation is only 5-6% of the total precipitation.

Shifting of Species and their Adaptation

Near endemic or endemic species are good indicators that expose the present situation and evaluation of their growing habitat. In the case of Albania, the absence of data on species monitoring is a negative factor to judge for their future. These gaps were covered by using the data collected by A. Baldacci or others and data of literature of the neighboring areas in Greece.

Baldacci was the first botanist who during his field works in 1892 and 1894 yrs has collected and published several papers on floristic composition of South Albania and Northwest Greece. This data are the key stones for our following consideration on the role of climate changes in flora and vegetation of South Albania.

According to A. Baldacci (1896; 1899) the subalpine and alpine species of *Cerastium grandiflorum, C. decalvans, C. banaticum* subsp. *speciosum, Malcolmia bicolor Ptilotrichum baldacci* and *Sesleria tenerrima* are observed in altitudes 1600-1800 m a.s.l. particularly in northern slopes of Nemërçka Mt. The northern slopes of Nemërçka Mt are under the influence of Mediterranean climate, penetrated by Vjosa Valley and the upper part of mountain by continental climate. In our field works, during 2005-2010 yrs, we have observed altitudinal shifting of several species, which was followed by differentiations in morphological characters that indicate adoption of them to the cool climate. The good examples are changes observed in shifting upwards of *Cerastium* species. In the altitudes 1400-1900 m was observed *Cerastium decalvans* subsp. *leontopodium* f. *eglandulosum* (*C. grandiflorum*) with *C. banaticum* subsp. *speciosum* var. *speciosum* and in the higher altitudes, 2000-2470 m of the mountain was found *Cerastium decalvans* subsp. *leontopodium* var. *leontopodium* f. *stojanovii* and *Cerastium banaticum* subsp. *speciosum* var. *alpinum*. Differentiation of species was followed by morphological changes within the same taxa. So, *Cerastium decalvans* subsp. *leontopodium* var. *leontopodium* which is growing in the summit of Nemërçka Mt (fig. 1A) are morphologically different from that of lower altitudes whereas population of *Centaurea epirota* in Murgana Mt (northern slopes) are covered by densely and long trichomes compared with that of western slopes of Çika, Nëmërçka, Çajup and Wide Mts (fig. 1B). *Centaurea epirota* was recorded firstly by A. Baldacci in Kudhesi Mt and from F. Markgraf (1931) in Tomorri Mt. Latitudinal shifting of species towards the continental parts of the country was observed and to the following subendemic taxa: *C. boryi, A. corcyrensis, C. microcalyx* subsp. *minor* etc.
Baldacci (1896) was the first, who distinguish the high shifting potential of *Silene ungeri* that "…from Corfu invade l'Epiro" in the southern areas of Albania and northeast Greece. Previously this species was recorded only in coastal parts of Saranda and Himara grasslands. During our study the species conspicuously was observed on both sides of Drino Valley, climbing up to 1000 m a.s.l in Pogoni and above Erindi Villages.

Figure 1. A-Morphological changes observed in *Cerastium decalvans* and B- *Centaurea epirota*

The altitudinal shifting of species towards the continental parts of the south, were clearly argued by "sensitive" species of *Ophrys* and *Orchis* genus (Tab. 2). The following species: *Ophrys ferrum-equinum, Ophris apifera Ophrys lutea, Ophrys mammosa, Ophrys sphegodes* subsp. *epirotica, Ophrys umbilicata, Ophrys helenea, Orchis italica, Orchis morio* subsp. *morio* and *Orchis pauciflora* x *Orchis quadripunctata*

are recorded in lower altitudes, 30-800 m of Ionian or Adriatic coast (Goelz & Reinhard, 1984). Our investigations have resulted in a significant shifting of them in both latitudinal, toward inner parts of the country and altitudinal towards higher parts of mountain slopes. The presence of species was observed in the continental parts of Çajupi, Nemërçka Mts and Erseka or Korcha areas in altitude from 1000 up to 1400 m a.s.l (see table 2).

Table 1. Altitudinal and latitudinal shifting of some species in grasslands ecosystems in Southern Albania

	Name of species	**The locality and altitude reported by Gölz & Reinhard (1982)**	**The locality and altitude reported by Shuka & Malo (2007-2010)**
1	*Cerastium decalvans* subsp. *leontopodium* f. *eglandulosum*	Above Biovizhda, up to 1800 m	Nemërçka and Çajupi Mts up to 2300 m
2	*Cerastium decalvans* subsp. *leontopodium* var. *leontopodium* f. *stojanovii*	Above Biovizhda, up to 1800 m	Nemërçka Mt., up to 2470 m
3	*C. banaticum* subsp. *speciosum* var. *speciosum*	Above Biovizhda, up to 1800 m	Nemërçka Mt., up to 2200 m
4	*Cerastium banaticum* subsp. *speciosum* var. *alpinum*	Above Biovizhda, up to 1800 m	Nemërçka Mt., up to 2400 m
5	*Solenanthus albanicus*	Dhembeli and Nëmërçka Mts., <1600 m	Nemërçka and Çajupi Mts up to 2300 m
6	*Ptilotrichum Baldacci (P. cyclocarpum subsp. pindicum)*	Nëmërçka Mt	Nemërçka and Çajupi Mts up to 2300 m
7	*Silene ungeri*	In coastal parts of south Albania, <400 m	Drino and Zagoria Valley , up to 1000 m
8	*Centaurea epirota*	Tomorri and Kudhësi Mts. , up to 1700 m	Nemërçka, Çajupi and Murgana Mts., up to 2250 m
9	*Crocus boryi*	Coastal areas of Ionian sea, <400 m	Drino Valley, <800 m
10	*Alkanna corcyrensis*	Coastal areas of Ionian sea, <700 m	Kardhiqi Valley, 350 m
11	*C. microcalyx* subsp. *minor*	Coastal areas of Ionian sea in Greece	Kardhiqi Valley, <800
12	*Sesleria tenerrima*	Above Biovizhda, up to 1800 m	Çika, Dhembeli and Nemërçka Mts., up to 2400 m

Changes in Cover Vegetation and Ecosystem Services in Grasslands of South Albanian

The five-year observations on duration of the snow covers in the alpine grassland ecosystems, indicate that year by year, this layer is smaller and its duration shorter. During observations, the mountains have lost the snow cover at the beginning of May, with an exception in 2009, when the snow cover disappeared on 25th of May. The mountain peaks at the end of May have had only few patches of snow, particularly in deep ravines. Our results are confirmed by the data of Draçi (1996) and SOGREAH (2008). In spite of the longer growing period which provides higher photosynthetic active radiation, due to early losses of the snow cover, the plant communities in alpine grasslands are under the stress of the ground water absence. The dried summer, shallow soil layer have shortened the vegetative cycle of the plants too. The analyses of digital photographs results with a decrease of cover vegetation with 5 % of the alpine grasslands in Nemërçka Mt (fig. 2) during 2004 and 2010. On the other hand, early and overgrazing of the alpine pastures, have increased the presence

of thorny and pioneer species like *Centaurea* sp. *Cirsium* sps. or so called "resistant" species like *Sesleria tenerrima* etc.

Higher presence of invasive and pioneer species has changed the structure of population and the ecosystems services of the alpine grasslands, towards deterioration of pastures, mostly observed in Wide and Nemërçka Mts.

Table 2. Altitudinal and latitudinal shifting of some orchids species in Southern Albania

	Name of species	**The locality and altitude of species reported by Gölz & Reinhard (1982)**	**The locality and altitude of species reported by Shuka & Malo (2007-2010)**
1	*Ophrys ferrum-equinum*	Vl, Sr, Fr, Gj, 50-900 m	Çajupi Mt & Pogoni village, up to 1100 m
2	*Ophrys lutea*	Sr, Tp., up to 350 m	Llogora Pass and Kolonja village, up to 1100 m
3	*Ophrys helenea*	Sr, Vl., up to 350 m	Above Erindi village, up to 900 m
4	*Ophrys sphegodes* Mill. subsp. *epirotica*	Tp, Sr., up to 350 m	Murgana Mt and Sheleguri NP., up to 1200 m
5	*Ophris apifera*	< 900 m	from 200 up to 1400 m
6	*Ophrys umbilicata*	Vl, Sr, Dr, Gj, Fr, Tp., up to 380 m	Kolonja & Ducati village, up to 600 m
7	*Orchis italica*	< 400 m	< 1000 m, Çajupi Mt
8	*Orchis morio* L. subsp. *morio*	< 1000 m in western part of the country	up to 1300 m, and in the inner part of the country
9	*Orchis pauciflora* x *Orchis quadripunctata* Llogora Pass (1000 m)		Murgana Mt and above Pogoni village (up to 1150 m)
Abbreviations: Vl = Vlorë; Sr = Sarandë; Fr = Fier; Gj = Gjirokaster; Tp = Tepelenë; Dr = Durres			

Figure 2. Changes of cover vegetation observed in 2004 and 2010 years in Nemërçka Mt.

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Paper 076

Study of climatic temperature indicators in the region of Korca, Albania

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1.ABSTRACT

Korca Region located in south east Albania. The climate of the area determined by the value of the indicator and temperature climate. This study provides the option of setting the temperature trend in a period of over 30 years. The survey results are based on data metrological stations in the area of Korca. Also the results are issued based on statistical methods, based on height above sea level. Indicators are used values of correlations. Graphic method gives the possibility of logical analysis. Data processing shows that the region of Korca is heterogeneous in terms of climatic temperature indicators. The study is necessary for evaluation of further climate. His results can be used by farmers and specialists in the field of environment.
Key words:region, climatic temperature indicator, statistical method

2.INTRODUCTION

Eco climatic sources are decisive on cultivation plants, because they implicate plant development, and in consequence their production. These sources are related to the eco climate of cultivated zone. The climate contents of an eco zone reacts to an interconnected way and influence each other revealing compensation effects. The most important eco climatic indicators are: precipitation, the temperature, air relative humidity, the wind and the other atmospheric phenomena. Different case studies of bio climate factors on time and space give sufficient information for fruit agro ecosystem cultivation (Maracchi, G. 1983; Mankolli, H. et.al.2002). Plant species have definite ecologic distinction. These are related to the origin and biology. Ecology and climate determine the relationship between ecology and cultivated zones. This is verified by the presence of wild species in those climate zones. Eco climatic factors which influence growth yield and plant life cycles are:The sun light of an eco zone is a qualitative and quantitative factor. Light intensity during a day with solar time has a good influence on photosynthesis process. The quality of photosynthesis product is

depended to the intensity scale. The rhythm of this process for apples varies on whole day.The temperature has a priority influence on plants life cycle, but the influence of temperature on production and reproduction period is decisive. It is known that temperatures < 7°C influence on flowering apples process, the sum temperatures < 7°C on over than 1070 hours indicate on flourishing and foliate differentiation report.The presence of low temperatures under tree resistance caused frost phenomena on it. The frozen is physic and physiologic process and it could damage drying of plant parts and on extreme cases could cause drying up plants. High temperatures have a negative impact on physiologic and biologic process. A season with very highest temperatures during the vegetation influence, at first, on the reduction till blocking of plant photosynthesis rhythms, grows change-breath, increase water transpiration and, at last, plant can be wrinkled and drying up. The tolerance by temperatures different in confront of various plants.Precipitations are the main source of water reserves on Earth. These reserves vary due to precipitation dissemination, which is given on temperature inverse: large amounts on winter, low temperature and small amounts on summer.The plant has fixed reactions to precipitations. When the precipitations are in smaller amounts it presents air and soil drought. Hence, the apple would reduce metabolic activity, increase transpiration and it would appear plasmolysis and deplasmolysis. When the precipitations are present, fruit-tree reaction is positive, the metabolic process is realized normally and realized production is maximal. In a situation with abundant precipitations and on soils with swoon drainage, fruit-trees are incurred by physiologic disorder till asphyxia. In absence of water the fruit-trees react with tardiness, while with remaining water reacts more rapidly. The fruit-trees have a tolerance by presence or not presence of water on soil, but this tolerance is smaller than the presence of remaining water..Air humidity is an element of an eco zone climate. It shows that air is reach with water vapors or not. The source of water vapors in atmosphere is result of evaporation process and plant transpiration. The evaporation is a physic process for a plant, while the transpiration is a physic and physiologic process for this one. The evaporation process and transpiration process are in content of plant evapotranspiration, which is part of water cycle in atmosphere.Air relative humidity determines opening and closing of stomas plants. The leaf surface with many stomas requires to refresh in conditions of a low air relative humidity, but it could be achieved in closing process, with influence on physiologic and metabolic process.

3. METODOLOGY & DATA BASE

The bio climate study on Korça - eco zone and the bioclimatic indexes give a view about the conception and using values of bio climate classification indexes. (Hydrology of Albania 1984;EMBERGER 1969). The interpretations are result of combination of three bioclimatic models: Emberger Method.The Emberger Classification is known and applied, because it gives a detailed using about studied micro zone.

Emberger clasification is based on pluviometric indexes and gives a detailed classification.

The pluviometric index **Q** is result:

$$Q = \frac{2000\ P}{(M - m)(M + m)} \qquad (1)$$

where:

P=precipitations sum;
M= average temperatures on the hottest month of year °K;
m= average temperatures on the coldest month of year °K.

The index raport insolation is :

$$R = \frac{n}{N} \qquad (2)$$

R= index raport insolation
n= hour/year/ insolation/fact
N= hour/year/ insolation/posible

DATA

Data base for this study are the average hours of sunlightper month, the average precipitation (in mm) per month, the maximal temperature air per month, the minimal air temperature per month and the average air humidity in same stations, Korca –Ecozone, from 1970 to 2000, with sources Hydrometeorology Institute of Albania.The data base are on table no. 1,2,3,4.

Table 1. *The data average the hours with sun on months on same stations , Korca –Ecozone, for 30 years, from 1970 to 2000*

Stations	**Korçe**	**Sheqeras**	**Voskopoje**
Months	**1**	**2**	**3**
1	143.2	120.6	130.7
2	131.3	113.1	110.6
3	198.6	186.7	187.2
4	219.4	233.4	219.5
5	262.8	252.4	275.4
6	224.3	169.2	248.6
7	284.9	281.9	313.8
8	261	261.2	292.7
9	225.3	230.4	232
10	195.5	205.9	197.7
11	114.5	102.2	117.4
12	68.5	63.8	88
Total hours	**2329.3**	**2220.8**	**2413.6**
The days no san	**33**	**43**	**36**

Sources: Hydrometeorology Institute, Albania

Table 2. *The data average precipitation mm on months for same stations , Korca- Ecozone, for 30 years, from 1970 to 2000*

Stations	**B**	**D**	**G**	**Gj**	**Ko**	**N**	**L**	**Sh**	**Sht**	**V**	**Vo**	**Z**
Months	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	16.6	45.5	17.4	44.6	41	53.6	23	17.3	79.9	44	45.7	35.5
2	50.4	97.7	66.8	94.7	83.4	87.5	90.5	74.3	154	66.2	112	84.7
3	36.7	18	29.3	32.4	23	58.2	39,7	20,6	64	32	41.7	22.1
4	21	4.4	30.5	40.3	38.3	42.7	28.5	24.6	64.9	63.2	41.2	29.3
5	59.9	50.1	72.8	45.3	50.9	56.6	66.2	54.7	100	79	87.8	69.2
6	70.9	70.6	62.3	60.3	65.3	156	64.8	72.5	86.9	73.9	69.4	100
7	87.3	70.8	37.5	66.6	48.1	38.3	21.7	17.5	89.8	74.4	44	54.1

8	18.2	28.6	26.8	30.8	15.3	23	20.7	5	33.7	36.2	22	11.2
9	52.6	60	43.6	67.2	93.4	78.7	43	59	71.4	62.5	48.3	69.8
10	82.4	71.5	79.4	106	67.1	77.7	94.1	44.9	129	75.9	79.4	93.3
11	52.4	63.9	62.5	117	61	104	86.6	60.5	140	115	86.6	77.7
12	66.3	58.3	36.7	111	64.8	70.6	62.9	54.7	117	128	57.8	39.7
Total precipitation mm/year	**614**	**679**	**565**	**817**	**651**	**847**	**641**	**505**	**1129**	**850**	**736**	**687**

Sources: Hydrometeorology Institute, Albania

4.RESULTS & DISCUSSION

Based on real indices of climate conditions for long period from 1970 to 2000, the maximal average temperature, the minimal average temperature and the precipitations on micro zones areas have been studied, with Q values resulting in a wide range of limits. The minimal value of Q results on Sheqeras micro zone with 54,1 and maximal value results on Shtylla micro zone with 124,9.

To conclude Sheqeras micro zone is Semiarid, while Shtylla micro zone is humid. This difference is result of precipitations amount that vary from 505,6 mm on Sheqeras zone and 1129,3 mm on Shtylla zone with the following temperatures: for Sheqeras zone is 26,3^{o}C and for Shtylla zone is 21,3^{o}C. Korça zone is considerated as a sub humid zone, with precipitations during autumns, winter and spring season and with a dry climate during the summer season.

On plain micro zones, Q values are oscillated from 54,1 to 74,3 which corresponds to altitude of 1000 m over the sea level.

The micro zones with altitude more than 1000 m have Q values from 76,4 to 124,9.

The minimal temperature is permanent and varies from altitude under 1000 m, approximately at 4 to 6 ^{o}C.

Table . 3, **Q Values on Emberger Clasification**

Nr.	Microzone	**Mmax**	**m min**	**Pm/vj**	**Q**
1	Bilisht	25.5	-5.2	614.4	**70.6**
2	Dvoran	26.7	-5.5	679	**74.3**
3	Gurshqipe	25.5	-5.2	565.5	**59.3**
4	Gjonbabas	23.6	-5.9	817.7	**98.3**
5	Korça	25.5	-6.3	651.6	**72.5**
6	Korita	24.2	-4.4	847.1	**104.6**
7	Liqenasi	25.3	-4.3	647.7	**76.4**
8	Sheqeras	26.3	-6.7	505.6	**54.1**
9	Shtyllë	21.3	-11.2	1129.3	**124.9**
10	Vithkuq	23.6	-6.8	850.9	**99.4**
11	Voskopojë	23.2	-10.7	735.9	**77.7**
12	Zvirinë	25	-6.5	687	**77.2**

The Source: Data basing Analyzing Emberger, from 1970 to 2000

Q Index Emberger Index

The micro zones are situated on three bioclimatic variants based on Q index values.

- Micro zone with coefficient Q<60 which takes part at Sheqeras and Gurshqipe.
- Micro zone with coefficient 60<Q<90 which takes part at Dvorani, Zvirina, Bilishti, Liqenas (Korçë).
- Micro zone with coefficient 90<Q<150 which takes part at Shtylla, Korita, Gjonbabasi, Vithkuqi, Voskopoja.

The average insolation index values on three micro zones with different altitude over the sea level are as follow:

- Total insolation for Sheqeras (Zvirinë) micro zone, with altitude 815 m/d results as: 2220,8 hour/annual, and the number of days without sun is 43;
- Total insolation for Korça (Dvoran) micro zone, with altitude 894 m/d results as:2329,3 hour/annual,andf the number of days without sun is 33;
- Total insolation for Voskopoja micro zone, with altitude 1320 m/d results as: 2413,6 hour/annual, numbers day without sun is 33;
- Maximal month insolation in July results as: for Sheqeras micro zone with 281,9 hours, for Korça micro zone with 224,3 hours and for Voskopoja micro zone with 313,8 hours.
- Minimal month insolation on December results as: for Sheqeras micro zone with 63,8 hours, for Korça micro zone with 68,5 hours and for Voskopoja micro zone with 88 hours.

CONCLUSIONS

Based on result of method Emberger classification Q index ,for period 30 years, from 1970 to 2000 Korça - eco zone is classified on three cathegory bio climates:

- ✓ Micro zone with semiarid bio climate with coefficient Q<60 and annual precipitations 400-600 mm per year, in which take parts: Sheqeras and Gurshqipe.
- ✓ Micro zone with sub humid bio climate with coefficient 60<Q<90 and annual precipitations 600-700 mm per year, in which take parts: Dvorani, Zvirina, Bilishti, Liqenas (Korçë);
- ✓ Micro zone with humid bio climate with coefficient 90<Q<150 and annual precipitations over than 700 mm per year, in which take parts: Shtylla, Korita, Gjonbabasi, Vithkuqi, Voskopoja.
- ✓ Minimal month insolation on December results as: for Sheqeras micro zone with 63,8 hours, for Korça micro zone with 68,5 hours and for Voskopoja micro zone with 88 hours.
- ✓ Average humidity micro zones from 450-700 mm precipitations/year where takes part: Zvirina, Sheqeras, Liqenas, Bilisht, Gurshqipe, Dvoran and Korça micro zone;
- ✓ High humidity micro zones with index 700-1100 mm precipitations/year where takes part: Voskopoja, Vithkuqi, Korita, Gjonbabasi;
- ✓ A very high humidity micro zones with index >1100 mm precipitations/year where takes part Shtylla micro zone;
- ✓ Micro zones which have minimal month precipitations amount values under than twice of average month temperatures, from May to September where takes part: Sheqeras, Gurshqipe, Liqenas, Bilisht, Korça and Dvoran

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Paper 081

THE CHARACTERIZATION OF MOSSES AS BIOINDICATORS AND BIOACCUMULATORS IN AIR POLLUTION MONITORING

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Abstract

In this work the accumulation of heavy metals in different moss species collected in the same sampling sites is studied. Samples of terrestrial mosses *Hypnum cupressiforme, Homalothecium, Neckera crispa* and *Pseudoscleropodium purum* were collected from different sampling sites in rural area of the southern part of Albania. The moss samples were collected during the period September-October 2010 according to the guidelines of the UNECE ICP Vegetation. The concentrations of heavy metals (Cd, Pb, Cu, Zn, Fe and Mn) were determined using AAS and CV - AAS technique. The quantity of accumulated heavy metals differs in various moss species from the same sampling sites. In order to evaluate the better heavy metal bioaccumulator moss species the interspecies correlation between the moss samples is performed. Based on the concentration of heavy metals in the analyzed samples the characterization of bioaccumulation behavior was performed.

Keywords: bioindicator, moss, air pollution, heavy metal,

Introduction

Monitoring of air pollution using bioindicators is emerging as a potentially effective and more economical alternative performing by direct ambient air measurements. This is especially relevant for monitoring large areas. In the late 1960s the Swedish scientists Ake Rühling and Germund Tyler used mosses for monitoring the presence of heavy metals in the environment (Rühling and Tyler, 1968, 1970). They found that in particular *Hylocomium splendens* and *Pleurozium schreberi* are excellent 'catch organisms' for wet and dry depositions of heavy metals; in other words, certain mosses can be used as indicators of heavy –metal pollution.

Mosses are lower plants without true roots, shoots or vascular system. All nutrients and moisture are mainly absorbed directly from the atmosphere across the mosses cell wall. In consequence they reserve little or no possibility of avoiding the uptake and retention of the supplied contaminants. This fact together with the tolerance of these plants in heavy polluted environments make them very useful indicators for biological monitoring of regional atmospheric depositions and heavy metal contamination of their environment

The capability of the different species to accumulate heavy metals depends on the kind of these species and the place of their habitat. For this reason some different species of mosses population are usually collected from ecosystems where the major source of the metals in question is the atmospheric depositions, either in the form of precipitations or dust-falls. Analytical data concerning heavy metal concentrations in mosses growing in high polluted areas should be compared with the corresponding data from mosses growing in relatively unpolluted areas. The regional and even local differences in deposition levels are clearly reflected because of their additive effect in the body of the indicators.

There are numerous sources of heavy metal pollution of the atmosphere. Natural sources are terrestrial dust and salt spray from the seas. Anthropogenic sources of heavy metals emission are the great variety of technical and industrial processe. On the other hand, automobile exhausts, fossil fuel in domestic heating and refuse combustion are the major emission sources in many inhabited areas of the world.

In this work, the results of a great survey for mosses as biological monitoring indicators are presented. The sampling area was Southern Albania and the sampling points were either urban and industrial areas. The heavy metals that were selected for the analysis and determination were Pb, Cd, Zn, Cu, Fe and Mn. The most suitable method for the analysis, that was applied, was acid digestion of the plant matrix and atomic absorption spectrometrical determination of the metals in the final solution.

Materials and methods

Mosses were collected from 9 sites in South Albania during the period of September-October, 2011.

The sampling was carried out in accordance with the strategy of the European moss survey programme (Ruhling and Steinnes, 1998). The moss was collected in open areas and forest gaps, avoiding areas close to trees, and always from the ground. The sampling sites were located at least 300 m from main roads, 100 m from local roads, and 200 m from villages. 5-10 subsamples from each site ($50x50m^2$) were taken on a random basis and finally mixed to make up a total sample. Collected material was stored in paper bags. Some of these species were *Hypnum cupressiforme, Homalothecium, Neckera crispa* and *Pseudoscleropodium purum.*

In the laboratory foreign materials adhering to the surface of the samples such as tree bark, lichens, soil dust and detritus were removed carefully. For the analysis, only the green and greenish brown parts of the moss plants were used, as they generally are intended to represent a period of about 3-5 years. Their metal content is generally considered to reflect the atmospheric deposition during that period (Ruhling and Steinnes, 1998). The unwashed samples were dried at 40^0C and homogenized in an agate mill.

An accurately weighted portion of each sample (about 0,5g DW) was placed in an open Teflon vessel. 15 ml of concentrated HNO_3 9:1 (Merc, pro analysi) was added to each vessel and the mixture was left at room temperature all night. The closed teflon vessels were heated for 3h at 150-200^0C and then the temperature was raised to 250^0C for 1h. Finally the vessels were cooled, carefully opened, and digests quantitatively transferred to calibrated flasks and were diluted with bi-distilled water to make 25 ml. These solutions were analysed for heavy metal concentrations.

The contents of Zn, Fe, Mn were determined by flame absorption spectrophotometry (Varian, Spectra AA10 Plus). The contents of Cu, Cd, Pb were determined in an atomic absorption spectrophotometer with a graphite furnace (Analytic jena, AA400). AES method with flame was used for Na and Ca determination (Varian, Spectra AA10Plus).

Results

Concentrations of elements in *Hypnum cupressiforme(H), Pseudoscleropodium purum(P), Neckera crispa(N) and Homalothecium(Ho),* from the sampled stations are shown in Table 1.

Table 1

Concentrations of different elements (µg/g; *ng/g) in the four mosses growing at the same sampling stations

		Sarande	Memaliaj	Luzat	Peshtan	Teriahat	Kakavi	Permet	Dracove	Kelcyre
Zn	H	48,48	25,49	18,56	42,22	12,87	12,60	35,31	33,34	25,06
	P	38,30	33,82	12,73	29,24	25,17	37,93	42,21	-	29,28
	N								25,07	-
	Ho									20,92
Fe	H	352,63	596,80	515,57	397,28	421,30	406,90	1107,47	738,78	495,60
	P	348,22	426,68	492,10	284,83	314,70	235,64	443,26	-	228,18
	N								786,45	-
	Ho									639,30
Mn	H	14,97	50,98	39,87	23,38	47,53	73,71	32,59	65,39	30,84
	P	15,71	54,64	27,43	42,41	27,11	58,35	54,55	-	34,75
	N								92,58	-
	Ho									46,36
Cu*	H	1535,84	2535,93	1708,97	4138,98	2334,66	1869,11	2988,94	1713,38	1738,43
	P	2074,87	2661,46	1654,24	1926,74	1795,17	1877,05	2883,57	-	1419,59
	N								1973,74	-

Ho									2203,17
Cd* H P N Ho	51,11 23,31	28,95 19,77	36,23 32,33	40,06 22,10	41,85 31,28	40,66 56,88	343,51 56,97	56,24 - 47,46	51,47 59,81 - 64,32
Pb* H P N Ho	463,39 385,84	329,29 314,59	415,07 335,59	425,29 323,74	468,75 386,90	345,22 245,05	930,83 251,98	384,27 - 440,35	336,68 239,99 - 428,09
K H P N Ho	3011,22 2907,46	2775,03 2863,17	1756,31 1633,04	2960,61 3883,21	2209,31 3169,09	1641,83 3960,02	2581,98 2985,38	3205,98 - 946,07	2050,40 3067,36 - 1366,88
Na H P N Ho	93,93 184,36	69,08 176,2	35,37 47,05	106,40 155,40	79,86 186,69	70,31 162,73	183,20 208,69	74,62 - 53,19	89,54 131,99 - 86,77

Discussion

Sometimes we are often forced to use different moss species because of the absence of species with a sufficiently distribution. The most widely spread are *Hypnum cupressiforme* and *Pseudoscleropodium purum*. The different bioconcentration capacities of mosses for different elements were into consideration for a detailed evaluation of the concentrations of each element.

It is obvious from these measurements that different moss species collected in a given biotope exhibit differences in the accumulation properties of the elements. The evaluation criterea of moss bioaccumulation was done based on the results given by different authors (Carballeira et al., 2008; Wolterbeek et al., 1995; Brown and Sidhu, 1992; Rasmussen, 1978). The difference in bioaccumulation must be due to different morphology of mosses, as it was verified that there are no differences in cationic exchange capacity or cell wall composition. The variation in the concentrations of heavy metals in the moss species of the same place may also be due to the differing degrees of tolerance to heavy metals and the element specific uptake capacity. On other hand, the variation in the accumulation pattern of the heavy metals among the different species might be also due to the differences in binding affinity of the metals to the moss species.

Conclusions

From this present study, it can be said that the different mosses studied were precise and useful bioindicators of heavy metals.

Comparing the four collected moss species it is proved that the specie of *Hypnum cupressiforme* has the maximum accumulation capacity. In this case the leaf surface is rough, wich must have helped this species to trap more dust particles and hence accumulated more amounts of metals than in others. Besides this, *Hypnum cupressiforme* is much branched with many julaceous branches, close leaf growth and a more compact shape. These characteristics must have increased the surface to volume ratio, which resulted in more surface exposure to air.

Most of the investigated sites resulted with low concentration of K, Na and heavy metals, wich show a slight level of contamination. Higher concentrations of Cu, Pb, Cd and Fe were found at Permet urban area. The higher concentration of Zn was found in the area of Saranda. It might be due to the emission from the brick-kiln near this area (combustion of coal).

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Paper 090

AIR POLLUTION SURVEY OF TIRANA , ALBANIA USING THE MOSS BAG BIOMONITORING TECHNIQUE

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Abstract: The aim of this survey is the monitoring of air pollution of Tirana area, Albania by means of mosses. For the first time the atmospheric deposition of trace elements, by means of the biomonitoring technique associated with analytical techniques, were applied to study multielement atmospheric deposition in our country. Terrestrial mosses have several advantages as biomonitors: they lack a root system; variability of morphology through the growing season is small; they lack epidermis and cuticula; have a high surface to volume ratio; a high cation exchange capacity. Moss samples were collected in rural areas isolated from urban and industrial centers. Two different types of mosses, *Hypnum cupressiforme* and *Pseudoscleropodium purum*, were collected in two different places, respectively at Llogara (N40 01 50.3 E20 16 07.7) and Libohova (N40 01 50.3 E20 16 07.7) during September-October 2010. They were used as active samples and the study was carried out at seven monitoring sites located in Tirana. Two different moss samples were exposed at each site for a period of five months. Heavy metals, such as Cu, Pb, Zn, Ni, Co, Cr, Mn, Fe, As and Cd were determined by flame AAS method and/or electrothermal system. CVAAS method was used for mercury determination. Using the data, statistical methods and a less polluted moss sample were used for background evaluation. Quality controll for the process of extraction and determination of elements was carried out by analysis of CRM. PCA and CLUSTER Analysis was used to identify the most polluted areas and to define different pollution sources.

Key words: air pollution survey, moss, passive sample, bioindicator, heavy metals, AAS method, PCA, CLUSTER Analysis

Introduction

The urban atmosphere is subjected to large inputs of anthropogenic contaminants produced by both stationary sources (power plants, industries and residential heating) and mobile sources related to traffic. Trace elements are widely dispersed in the environment and their interactions with different natural components result in toxic effects on the biosphere. The transport and mobilization of trace elements have already attracted much attention. Most of trace elements in terrestrial ecosystems originate from atmospheric wet and dry deposition. From a biogeochemical perspective, the characterization of atmospheric deposition is relevant in order to identify the variability and sources of the atmospheric pollutants (M. Anicic et al., 2008).

Studies on atmospheric contamination have frequently been limited by the high cost of classical analytical methods and difficulties in carrying out extensive monitoring in time and space. Therefore, there has been increasing interest in the use of indirect monitoring methods, such as the use of organisms that act as bioaccumulators. Many studies have demonstrated the ability of moss to absorb and accumulate atmospheric pollutants in tissue. Root and cuticule absence makes them find their nutritive elements in wet and dry atmospheric deposition (Rühling and Tyler, 1968).

In urban areas, where mosses are often scarce or even absent the ‘‘moss bags technique’’ (active biomonitoring) has been initiated and developed with the aim of spatial and/or temporal assessment of contaminant deposition in highly polluted areas (A. Basile et al., 2007). The *Pseudoscleropodium purum* is one of the moss species recommended for active biomonitoring purposes (Miris Castello, 2007).

For the first time the atmospheric deposition of trace elements, by means of the biomonitoring technique associated with analytical techniques, were applied to study multielement atmospheric deposition in our country. The aim of this study was the monitoring of air pollution of Tirana, Albania by means of the moss bag technique, identifying the most polluted areas and defining different pollution sources.

Materials and Methods

Sampling procedure and sampling sites

Pseudoscleropodium purum moss sample was collected from a pristine wetland area, in Libohova, isolated from urban and industrial centers, during September-October 2010.

Monitoring sites

The survey was carried out at seven monitoring stations: Shkolla e bashkuar (St.1), Qender (St.2), 21 Dhjetori (St.3), Kombinat (St.4), Laprake (St.5), Stacioni i Teleferikut (St.6), Stacioni i Trenit (St.7).

Mosses treatment

The moss bag samples were exposed for a period of five months at each monitoring station. Some unexposed moss sample were preserved as well, to be used further as background concentration level of the elements. After exposure moss bag samples together with unexposed sample were carefully cleaned from all dead material and attached litter and just the green and green-brown shoots were included. The unwashed samples were dried to constant weight at 40ºC and then homogenized to a fine powder.

Samples digestion

Nearly 0.5 g aliquots of each sample were placed in a Teflon digestion vessels and 10 ml HNO_3 (9:1) were added. They were first left for 48h at room temperature, after that heated at 150-200^{0}C for 3h and then at 250^{0}C for 1h. After the vessels were cooled the digested materials were transfered quantitatively to 25 ml calibrated flasks and diluted to the mark with bidistilled water.

Heavy metals determination

The concentrations of Zn, Fe, Mn were determined by flame atomic absorption spectrometry (FAAS) (Varian, Spectra AA 10 Plus), the concentrations of K, Na were determined by flame atomic emission spectrometry (FAES) (Varian, Spectra AA 10 Plus) and the concentrations of Cu, Cd, Pb were determined by graphite furnace atomic absorption spectrometry (GFAAS) (Analytik jena, AA 400).

Results and Discussions

The intervals of the concentrations of elements obtained in this study, together with the intervals reported from some other Balkan countries and Norway (Spiric et al., 2009) which are also obtained by the analysis of moss samples are presented in Tab. 1. In all cases our intervals fall within the reported values from the other countries**.**

Tab. 1. Intervals of the results obtained in this study and other countries, ppm

	Albania (Tirana)	Norway	Serbia	Romania	Kroatia	Macedonia
Zn	62.53-93.33	7.9-173	14-415	39-2950	12-283	14-203
Fe	39.79-138.83	77-1370	720-9230	815-21340	320-12140	424–17380
Mn	11.54-27.41	22-750	30-2340	27-1470	20-1421	37–1475
Cu	2.57-7.18	2.1-9.2	6.31-3140	2.21-2420	3.7-22.7	3–83
Cd	0.14-0.49	0.025-0.171	< 0.4-6.5	-	0.07-1.9	0.016–2.95
Pb	0.026-0.752	0.64-6.12	-	6.45-31.5	0.06-82.4	1.5–37.2
K	5367-7562	-	2710-11750	4770-19980	2565-23720	2861–18190
Na	365-659	-	178-2440	192-4330	67-2332	118–8673

It was seen from the analytical results that the urban air pollution is more reflected from the elements Cd and Pb, therefore, in Fig. 1 are shown the concentration intervals of Pb and Cd according to the monitoring stations. It is noticed that the concentration of element Pb varies evidently through the stations and has the maximum value (752.43 ppb) at the station ‘’Qender’’. While the concentration of the element Cd doesn’t vary significantly through the stations, except in the station ‘’Kombinat’’ where it reaches its maximum value (491.29 ppb).

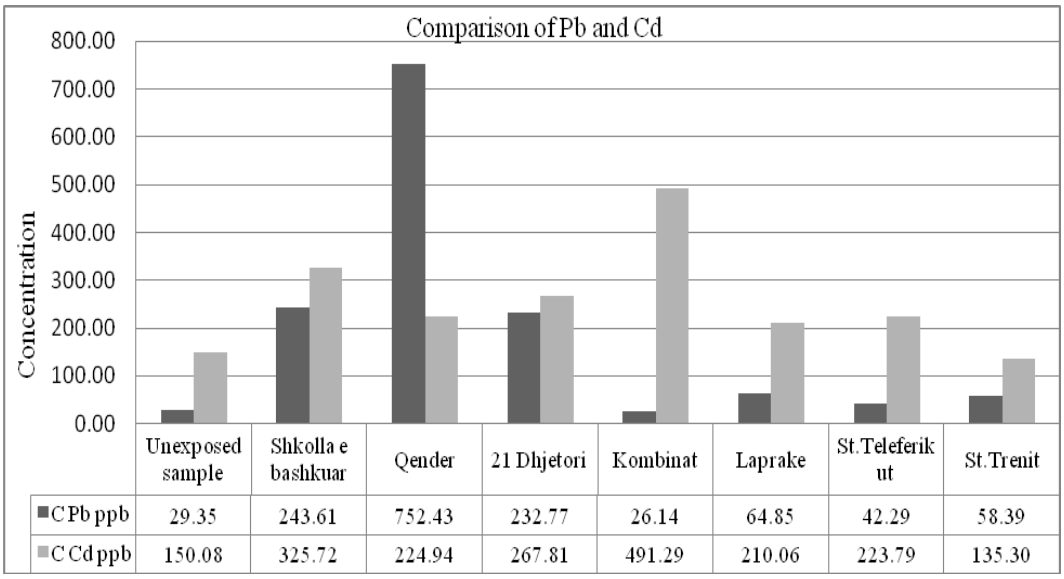

Fig. 1. Comparison of concentrations of Pb and Cd

In Fig. 2. is shown the dendrogram according to the monitoring stations. It is evident that the sations where the mosses were exposed are divided into two main groups; in one group are the stations 1 and 4 with a nearly 92% correlation and the station 2 with a correlation of nearly 73% with these stations; in the other group are the stations 3, 6 and 7 with a correlation of nearly 80% and the station 5 which have a correlation of nearly 72% with these stations.

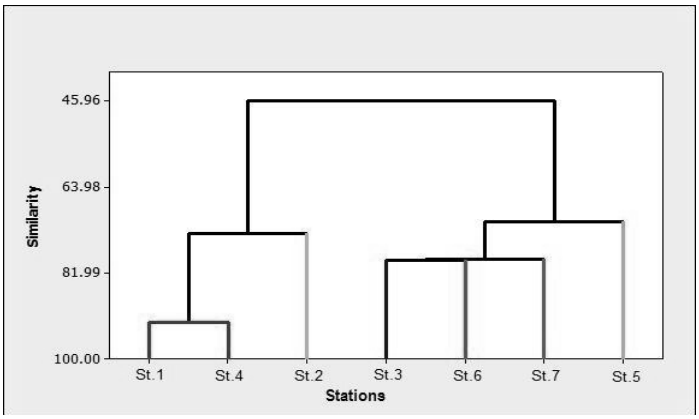

Fig. 2. Dendrogram according to the monitoring stations

Principal Component Factor Analysis was used to identify and characterize different pollution sources. Factor analysis is a multivariate technique for reducing matrices of data to their lowest dimensionality by the use of orthogonal factor space and transformations that yield predictions and/or recognizable factor. The results of factor analysis are given in Tab. 2. and illustrated in Fig. 2. and Fig. 3.

Principal Component Factor Analysis of the Correlation Matrix

Variance 4.3263 2.8285 0.4429 0.1931 0.1264 7.9172
% Var 0.541 0.354 0.055 0.024 0.016 0.990

Rotated Factor Loadings and Communalities
Varimax Rotation

Tab. 2. Factor analysis of the data on moss bag samples.

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Communality
Zn	**0.630**	-0.117	**-0.723**	0.191	-0.016	0.970
Fe	**0.852**	0.084	-0.379	0.095	-0.335	0.998
Mn	**0.955**	-0.104	-0.201	0.165	0.049	0.993
Cu	-0.142	**-0.950**	-0.174	0.211	0.012	0.997
Cd	-0.202	**0.522**	**0.744**	-0.330	0.047	0.979
Pb	**0.937**	0.190	-0.164	-0.215	-0.112	1.000
K	0.141	**0.458**	0.398	**-0.779**	0.018	0.996
Na	**0.902**	0.161	0.005	-0.319	0.209	0.985

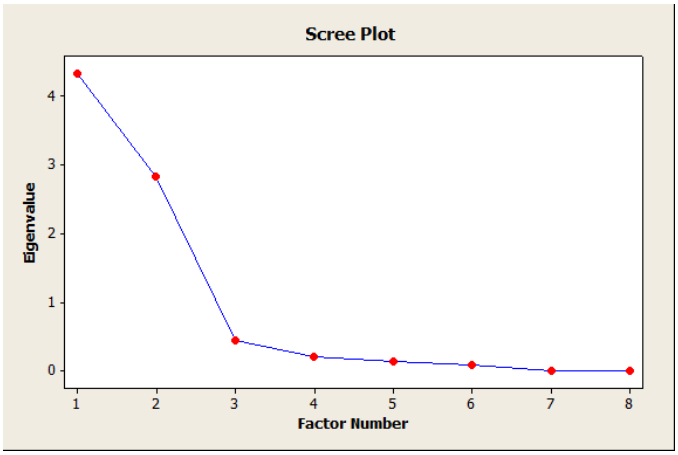

Fig. 2. Factor analysis Scree Plot.

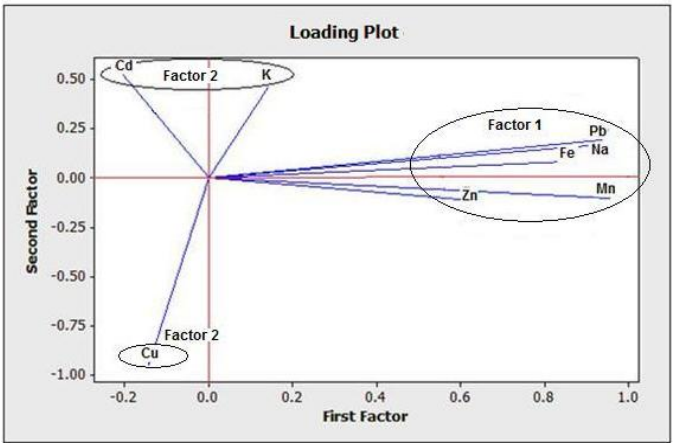

Fig. 3. Factor analysis Loading Plot

As shown in Tab. 2. there are five identified factors, but in Scree Plot (Fig. 2.) only three are shown as more important and in Loading Plot (Fig. 3.) only the first two are shown as the most significant. These factors are interpreted as follows:

Factor 1 is particularly related with elements Zn, Fe, Mn, Pb and Na which is more probably related to the contamination of moss samples with soil particles. In Factor 2 there are moderately high loadings for Cd and K, and there is a considerable replacement process for Cu. The elements Zn and Cd have a replacement process at Factor 3. This may be explained from the fact that, with the input of the element Cd in the areas that are polluted from this element (eg. Kombinat) it is noticed an increase of Cd and a decrease of Zn. Thus, the increase of the concentration of Cd causes decrease in the concentration of Zn at Factor 3. The element K is known as an exchangeable element in mosses as shown at Factor 4. Factor 5 is not significant.

Conclusions

The urban air pollution is more reflected from the elements Pb and Cd (Tab. 1.). The concentration values of Pb have variation through the stations and the maximum value is reached at the station ‘’Qender’’. The most probable emission source related to the elevated concentration of Pb element in that station is from the fuel consumed by the vehicles, as this station was located in an area with heavy traffic. Cd, on the contrary, have concentration values that do not have significant variation throughout the stations, except in ‘’Kombinat’’ where it has a noticeably higher value. There are two main emission sources to be considered in this case. One because of some various plants situated in that area which consume high ash content fuel substances for combustion during their work process, and the second because of the massive burning of waste in the vicinity of that area.

However, the air pollution levels from these elements that we have studied in Tirana, Albania fall within the reported intervals from the other countries, which are also obtained from the analysis of moss samples.

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Paper 095

DETERMINATION OF GROSS ALPHA BETA RADIOACTIVITY IN AIR SAMPLES OF TIRANA

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Abstract
The activity concentration of radionuclides in the air is a critical factor in assessing the air quality and the potential impact of possible pollutants. Air is in fact one of the main pathways for human exposure to pollutants. European directives require substantial efforts and resources to comply with the requirements and ensure a good air quality.
In this study we present the results of activity measurements for some air filters collected in the city of Tirana. The air filters used are glass fiber P10. Air is collected with a low volume air sampler pump for a period of one week. Air filters are measured for gross alpha and gross beta radioactivity by a Ultra Low Level Alpha Beta gas proportional counter (MPC 9604, Protean Instrument Corporation) with Vista 2000 software. Each particulate filter is analyzed for gross alpha and gross beta radioactivity after waiting about four days for naturally-occurring daughter products of radon and thorium to decay. Air sampler averaged a flow of approximately 50 l/min. During a week period the filter will collect particulate material from approximately 500 m^3 of air.
All measured gross alpha and beta activities were within the expected range of background levels.
It is important checking the trueness and precision of the analytical results produced by our laboratory. Hence, we have participated in a proficiency test organized by International Atomic Energy Agency (IAEA) for the determination of radionuclides in air filters. Results obtained in our laboratory were in good agreement with the reference values given by IAEA.

Key Word: air filters, gross alpha beta radioactivity.

Introduction

Radioactivity in the atmosphere originates from naturally radioactive materials, cosmogenic production, nuclear weapons testing and nuclear accidents. So, the source of the alpha/beta contamination in air can be natural or man-made Clesceri (1992).
The health effects of alpha particles depend heavily upon how exposure takes place. External exposure (external to the body) is of far less concern than internal exposure, because alpha particles lack the energy to penetrate the outer dead layer of skin. However, if alpha emitters have been inhaled, ingested (swallowed) or absorbed into the blood stream, sensitive living tissue can be exposed to alpha radiation Krieger (1980). The resulting biological damage increases the risk of cancer; in particular, alpha radiation is known to cause lung cancer in humans when alpha emitters are inhaled. The greatest exposure to alpha radiation for average citizens comes from the inhalation of radon and its decay products, several of which also emit potent alpha radiation.

Beta radiation can cause both acute and chronic health effects. The main chronic health effect from radiation is cancer. When taken internally beta emitters can cause tissue damage and increase the risk of cancer. The risk of cancer increases with increasing dose. Some beta-emitters, such as carbon-14, distribute widely throughout the body. Others accumulate in specific organs and cause chronic exposures. Iodine-131 concentrates heavily in the thyroid gland. It increases the risk of thyroid cancer and other disorders. Strontium-90 accumulates in bone and teeth Safety Series 115 (1996).

Air pollution monitoring became mandatory and is performed by dedicated institutions and agencies in many countries of the world.

The gross alpha and beta radioactivity analyses in air are performed on the samples collected weekly. It is simply a measurement of all alpha and beta activity present, regardless of specific radionuclide source EPA (1986).

The main purpose of this work is the rapid screening test to determine if air samples show alpha or beta contamination. The test does not pick up contamination by radioactive substances that are pure gamma emitters. It is not possible to determine the levels of radioactivity from specific isotopes with this test.

The Environmental Radioactivity Measurement Unit of Centre of Applied Nuclear Physics performs gross alpha/beta air analyses. Samples are collected from strategic locations in Tirana. Air is drawn through a filter for about one week using a special pump. The samples are sent to the laboratory. The gross alpha and gross beta radioactivity in the samples were determined by a gas-flow proportional counter Herranz (1999).

Gross alpha radiation concentration (gross alpha) and gross beta radiation concentration (gross beta) data indicate levels of airborne radioactivity. Based on gross alpha and gross beta concentrations, further analysis may be conducted to determine specific alpha- or gamma-emitting radionuclide. Ortega (1996)

Material and Methods

Samples are taken in the region of Tirana city. Air is collected with a low volume air sampler pump for a period of one week. The air filters used are glass fiber P10. Air filters are measured for gross alpha and gross beta radioactivity by a Ultra Low Level Alpha Beta gas proportional counter (MPC 9604, Protean Instrument Corporation) with Vista 2000 software. The filters are mounted directly on a planchet (no chemical processing) with the loaded face of the filter exposed. Each particulate filter is analyzed for gross alpha and gross beta radioactivity after waiting about four days for naturally-occurring daughter products of radon and thorium to decay. Air sampler averaged a flow of approximately 50 l/min. During a week period the filter will collect particulate material from approximately 500 m^3 of air. The obtained results are presented in Table 1.

It is rather important to assure that the conclusions of air monitoring studies are based on reliable and validated analytical results and to ensure the comparability of the results of different countries. Hence, we have participated in a proficiency test (PT) organized by International Atomic Energy Agency (IAEA) for the determination of radionuclides in air filters. This proficiency test was organized to evaluate the analytical performance of the participating laboratories.

Results of the proficiency test obtained in our laboratory are presented in Table 2.

The PT materials used in this exercise (twenty spiked air filters with known activities of gross α and gross β) were prepared by the Department of Energy's (DOE) Radiological and Environmental Sciences Laboratory (RESL) in the United States of America

All radionuclide standard solutions used in the preparation of the air filter samples for this PT study are traceable to the National Institute of Standards and Technology (NIST). The target values for each of the radionuclides contained in the air filters were calculated from the certified values obtained from the certificate. The combined uncertainties were calculated by propagating all random uncertainties incurred anywhere in the preparation process including uncertainties associated with weight and volumetric dilutions. The target values and associated uncertainties are listed in Table 3. It should be noted that the known values

are directly traceable to SI (Système International d'unités) through NIST by means of an unbroken chain of calculations and are not experimentally determined by analysis.

Results

Calculated activities depend on sample mass and are based on calibration of specific isotopic standards.
All sources of the measurement results uncertainty are estimated according to an internationally agreed method such as the IAEA-TECDOC-1401 (2004).

Tab.1. Activity concentration of gross alpha and gross beta in air filters from Tirana

Place of sampling	Gross Alpha Activity of air filter [Bq/filter]	Uncertainty (±1σ) [Bq/filter]	Gross Beta Activity of air filter [Bq/filter]	Uncertainty (±1σ) [Bq/filter]
QFBZ	0.78	0.023	2.3	0.09
21 Dhjetori	0.81	0.027	3.1	0.11
Stacioni Trenit	0.90	0.030	2.9	0.08
Hotel Tirana	0.89	0.029	3.5	0.12
Hotel Sheraton	0.95	0.030	3.8	0.12
Liqeni Artificial	0.88	0.032	2.7	0.11

Tab. 2. Results of our laboratory in the PT in spiked air filters

Nuclides	Activity of spiked air filter [Bq/filter]	Uncertainty (±1σ) [Bq/filter]	MDA [Bq/filter]
Gross alpha	0.19	0.01	0.06
Gross beta	0.33	0.009	0.04

Tab. 3. Target values and associated standard uncertainties (u) of the proficiency test sample on reference date of 1st of May 2008.

Nuclides	Target value [Bq/filter]	Uncertainty (±1σ) [Bq/filter]	Uncertainty (±1σ) [%]
Gross alpha	0.17	0.009	5.29
Gross beta	0.29	0.01	3.45

Discussion

All measured gross alpha and beta activities of air filters were within the expected range of background levels.
Results of the PT obtained in our laboratory were in good agreement with the reference values given by IAEA.
Data generated by the study are unique and cannot be easily obtained by using alternative techniques. A regional approach is needed in order to standardize and harmonize analytical procedures to study local and regional air pollution including transboundary events.

Conclusions

Since air pollution studies should be performed more systematically over the extended period of time, the collection and analysis of samples should be continued in order to generate meaningful and sufficiently large set of analytical data to apply advanced data interpretation methods. Moreover, implementation of the guidelines/recommendations to reduce air pollution requires extensive efforts and time before assessment of the effectiveness of the abatement strategies can be performed. A new aspect of the studie is related to the recent directives of the European Parliament which requires implementation of PM2.5 particle fraction monitoring. Future activities in this field will require better coordination and cooperation with other national and regional institutions mandatory involved in air pollution monitoring and air quality management. Further efforts should be made to study the impact on the human health and environment including study of transboundary movement of pollution.

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Paper 107

Kinetic and thermodynamic studies of the biosorption of Cu(II) by Agaricus campestris

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Abstract

Agaricus campestris was used as an adsorbent for the adsorption of Cu(II) ions in water. The adsorption process was carried out in a batch process and the effects of contact time, initial pH, initial Cu(II) ion concentration, adsorbent amount and temperature on the adsorption were investigated. Kinetic calculation results from the resent experiments showed that the amount of adsorbed Cu(II) increased with increasing Cu(II) concentration, pH, temperature, contact time and with decreasing adsorbent amount. Pseudo-second-order reaction model provided the best description of the data with a correlation coefficient 0.99-1 for different initial metal concentrations and temperatures were studied. The equilibrium data were well fitted to the Langmuir isotherm. The maximum adsorption capacity for Cu (II) was 32.52 mg g^{-1} at 298 ^{o}K. Thermodynamic parameters such as ΔH^o, ΔS^o and ΔG^o were calculated. The adsorption process was found to be endothermic and spontaneous.
Keywords: Cu(II) ions; *Agaricus campestris*; Adsorption kinetics; Isotherm

1. Introduction

Heavy metal pollution is an environmental problem of worldwide concern with effluents from various industrial processes representing one of the most important sources of pollution[1]. Rapid industrialization has seriously contributed to the release of toxic heavy metals to water streams. Elevated environmental levels of Cu(II) come from a variety of sources. Mining, metal cleaning, plating baths, pulp, paper and paper board mils, refineries, fertlizer industry, etc. are the potential sources of Cu(II) in industrial effluents[2].

Copper, a widely used metal in industry, is an essential trace element for human health and play an important role in carbohydrate and lipid metabolism and in the maintenance of heart and blood vessel activity. The adult human body contains 100- 150 mg of Cu(II), but excess amounts in the body can be toxic[3]. In aqueous environments, the speciation of the metal is dependent both on ligant concentration and pH. While the cupric ion (Cu(II)) is the metallic form most toxic to flora and fauna, it is also a nutrient necessary for algal growth[1].

If allowed to enter the environment excessive amounts of Cu(II) can cause serious potential health issues such as nausea, headache dizziness, respiratory difficulty, hemolytic anemia, massive gastrointestinal bleeding, liver and kidney failure, and death[4-9]. The World Health Organization(WHO) recommended a maximum acceptable concentration of Cu(II) in drinking water of 1,5 mg L^{-1}[5].

In recent year, increasing concern about the effect of toxic metals in the environment has resulted in more strict environmental regulations for industrial applications that discharge metalbearing effluents[10]. Removal of metal ions from wastewater in an effective manner has become an important issue[2]. Efficient methods for the removal of metals has resulted in the development of new separation technologies. Precipitation, adsorption, ion exchange, flocculation, absorption, electrochemical processes and/membrane processes such as electrodialysis, nanofiltration and reverse osmosis are commonly applied for the treatment of industrial effluents[2,5,7,9,11-18]. However, these techniques have several disadvantages such as high chemical cost,

low removal efficiency, low selectivity, high-energy requirements, and generation of secondary toxic slurries. Among these various treatment techniques, activated carbon adsorption is one of the most commonly used due to its high efficiency and easy operation. However, it is expensive and may also require complexing agents to improve its ability to remove inorganic matter[11]. Thus, there is a need to develop a cost effective and an efficient technique for metal removal from wastewaters. That is biosorption. Biosorption is considered as an alternative process for the removal of heavy metals, metalloid species, compounds from aqueous solution by biological materials. Compared with conventional methods for the removal of toxic metals from wastewater, the biosorption process offers potential advantages such as low operating cost, minimization of the volume of chemical and/or biological sludge to be disposed of, and high efficiency in detoxifying very dilute effluents[12,18-22]. Large number of studies were reported in literature on biosorption of [4,8,10,16,19,20,22-27] heavy metals onto different microbial and plant biomass.

Agaricus campestris was chosen for adsorption study of Cu (II) in this study because it is one of the most common edible mushrooms in Erzurum and its biomass is cheap and easily available. In most areas, it is a fall mushroom and, as its commen and Latin names suggest, it comes up in meadows, fields, and grassy areas, after rains. It is recognized by its habitat, its pink gills which become chocolate Brown as the mushroom matures, its quickly collapsing white ring, the fact that it does not discolor yellow when bruised. In none of the literature studies, isotherms and the kinetics of adsorption of Cu(II) ions onto *Agaricus campestris* was investigated as a function of operating parameters. Zeta potential measurements have been used experimentally to predict optimum pH levels on *Agaricus campestris*. Adsorption equilibrium, kinetic works and thermodynamic parameters were carried out to evaluate the removal capacity of *Agaricus campestris* as a function of pH, adsorbent concentration, initial metal ions concentration and contact time.

2. Material and Methods

2.1. Collection and Preparation of Biomass Samples

In this study, *Agaricus campestris* was used as a biosorbent for the biosorption of Cu(II) ions, because it is one of the most commen edible mushrooms in Erzurum and its biomass is cheap and easily available. Samples of biomass were collected from dense forests covering area of Erzurum Atatürk University Campus, Turkey, in April and May of 2007. All samples were washed in distilled water and then dried in the open air. The dried biomass were cut into small pieces, ground in a motor to a very fine powder and sieved to select particles of less than 0,5 mm for use as a biosorbent in batch studies. The Brunauer- Emmelt, Teller(BET) surface area was measured from N_2 adsorption isotherms with a sorptiometer and the surface area of the biosorbent was determined to be 0,967 m^2/g (BET-N_2)

2.2. Zeta potential measurements

In order to study the possible biosorption mechanism, the zeta potential of the *Agaricus campestris* was measured before and after the metal ions adsorption using the microelectrophoretic apparatus Zeta Meter(Zeta Meter System 3.0+ 542 USA)

2.3. Synthetic wastewater preparation

Synthetic wastewater solutions were prepared by dissolving analytical grade $CuS0_4$. $5H_20$ in distilled water to obtain 1000 mg L^{-1} of Cu(II) solution. The solution was diluted to the required concentration for experiments. The pH of the solution was measured and observed as 5 ±0,5 and no chemicals were added to change pH.

2.4. Batch biosorption experiments

The factors that affect the biosorption rate and uptake capacity of the biosorbent were examined in a batch system. Batch biosorption tests were conducted by mixing known weight of *Agaricus campestris* and 100 ml of solution of known Cu(II) ion concentrations used were in the range 50–250 mgL^{-1}. The mixture was shaken in a mechanical shaker(Thermolyne ROSI 1000) samples were taken at known time intervals. Preliminary experiments showed that biosorption is fast and the removal rate is negligible after 60 min. Therefore, contact time of 60 min were used for batch tests. The sample was filtered to remove any fine particles(Whatman, 110 mm Ø and 11 µm pore size) and analyzed for the Cu(II) ion. The Cu(II) concentration in the supernatant solution was determined using flame atomic absorbtion spectrophotometry(Shimadzu AA-670) at 324,8 mm. Series of experiments were conducted to determine the

effect of adsorbent dose, initial metal ion concentration, contact time and initial pH on biosorption. Effect of initial solution pH on biosorption was determined by mixing 0,15 g of biosorbent with 50 mL of solution containing metal concentration of 100 mg L^{-1} at various pH values ranging from 2 to 5. Solution pH was adjusted with 0,5 M, HCI and NaOH solutions. The mixture was shaken for 1 hr and the solution was filtered and analysed. All the experiments were conducted at 25 ^{o}C. Adsorption experiments were carried out in duplicate.

The metal concentration in the liquid phase was determined at beginning(Co) and equilibration(Ce) in mgL^{-1}. The following equation was used to compute biosorbent uptake capacity at equilibrium q_e (mgg^{-1}):

$$q_e = (Co - Ce) * \frac{V}{M}$$

M is the dry mass of biomass in grams and V is the volume of solution in litres.

Percent removal of Cu(II)(%) = $\frac{Co - Ce}{Co} * 100$

2.5. Equilibrium isotherms and kinetics of adsorption

The Langmuir isotherm was used to describe observed sorption phenomena and suggests that uptake occurs on a homogeneous surface by monolayer sorption without interaction between adsorbed molecules. In addition, the model assumes uniform energies of adsorption onto the surface and no transmigration of the adsorbate. The lineer form of the equation can be written as

$$\frac{Ce}{q_e} = \frac{1}{b.q_{\max}} + \frac{Ce}{q_{\max}} \quad (1)$$

where Ce is the equilibrium concentration of Cu(II), q_e is the amount of adsorption at equilibrium, $q_{\max}$ is the maximum monolayer capacity, and b is an equilibrium constant of Langmuir. The shape of the Langmuir isotherm can be used to predict whether a sorption system is favorable or unfavorable in a batch adsorption process. The essential features of the isotherm can be expressed in terms of a dimensionless constant separation factor(R_L) that can be defined by the following relationship[8].

$$R_L = \frac{1}{(1 + b.Co)} \quad (2)$$

where Co is the initial concentration($mg.L^{-1}$) and b is the Langmuir equilibrium constant($L.mg^{-1}$). It is reported that, when $0 < R_L < 1$, the sorption system is a favorable isotherm. It can be explained apparently that when $b > 0,$ sorption system is favorable[9].

The Freundlich isotherm is a nonlinear sorption model. This model proposes a monolayer sorption with a heterogeneous energetic distribution of active sites, accompanied by interactions between adsorbed molecules. The linear form of the equation can be written as

$$\ln q_e = \log K_F + \frac{1}{n} \log Ce \quad (3)$$

where, K_F ($mg.g^{-1}$) is the adsorption capacity and n is related to the adsorption intensity of the adsorbent.

where, K_F and $\frac{1}{n}$ can be determined from the linear plot of log (q_e) versus log (C_e).

2.6. Adsorption kinetic model

The pseudo-second-order kinetic model was used to describe the experimental data of heavy metals adsorption on biomass.

The pseudo-second order kinetic model as developed by Ho and McKay[28] has the following form;

$$\frac{dq}{dt} = k_2(q_e - q_t)^2 \quad (4)$$

where k_2 (g. mg^{-1}min^{-1}) is the equilibrium rate constant of pseudo-second order biosorption(g. mg^{-1}min^{-1}). Eq. (5) can be rearranged and linearized to obtain:

$$\frac{t}{q_t} = \frac{1}{k_2(q_e)^2} + \frac{t}{q_e} \quad (5)$$

The plot t/q_t versus t should give a straight line if second-order kinetics are applicable and q_e and k_2 can be determined from the slope and intercept of the plot, respectively.

The initial adsorption rate, $h\ \left(mg.g^{-1}.\min^{-1}\right)$ as $t \to 0$ can be defined as

$$h = k_2 q_e^{\ 2} \quad (6)$$

2.7. Adsorption thermodynamics

The thermodynamic parameters of the adsorption process were determined using the following equations:

$$K_C = C_a / C_e, \quad (7)$$

$$\Delta G^o = -RTInK_C, \quad (8)$$

$$InK_C = \Delta S^o / R - \Delta H^o / RT, \quad (9)$$

where K_C is the distribution coefficient for the adsorption. $\Delta H^o, \Delta S^o$ and ΔG^o are the changes in enthalpy, entropy, and Gibb's free energy, R is the gas constant(8.314 J mol^{-1}K^{-1}), T is absolute temperature, C_a (mg.L^{-3}) is the amount of Cu(II) adsorbed per unit mass of the adsorbent and C_e (mg.L^{-3}) is the equilibrium adsorbate concentration in the aqueous phase. The values of ΔH^o and ΔS^o were determined from the slopes and intercepts of the plots of InK_c versus $1/T$ [8].

2.8. Activation parameters

From the pseudo-second-order rate constant k_2, the activation energy E_a for the adsorption of Cu(II) on *Agaricus campestris* was determined using the Arrhenius equation:

$$Ink_2 = InA_o - E_a / RT, \quad (10)$$

where E_a is the activation energy kJ.mol^{-1}, R is the gas constant and A_o is the Arrhenius constant. By plotting Ink_2 versus $1/T$ and from the slope and the intercept, values of E_a and A_o can be obtained. The magnitude of activation energy may give an idea about the type of adsorption. Two main types of adsorption may occur, physical and chemical. In physical adsorption, the equilibrium is usually rapidly attained and easily reversible, because the energy requirements are small. The activation energy for physical adsorption is usually not more than 4.2 kJ/mol, since the forces involved in physical adsorption are weak. Chemical adsorption is specific and involves forces much stronger than in physical adsorption.

3. Results and discussion

3.1. Effect of biosorbent dose

Biosorbent dose is a significant factor to be considered for effective metal removal as it determines sorbent-sorbate equilibrium of the system[9]. Effects of biosorbent dose on percentage of Cu(II) ion removal and the amount of Cu(II) adsorbent(q_e) at equilibrium conditions are shown in Fig.1. It was observed that the amount of copper adsorbed varied with varying *Agaricus campestris* biomass concentration. The amount of copper adsorbed was decreased with an increase in adsorbent dosage from 0.025-0.2 g. The percentage copper removal was increased from 12.3-83 % for an increase in biomass concentration from 0.025-0.2 g. Dose of biomass added into the solution determine the number of binding sites available for adsorption. The number of adsorption sites or surface area increases with the weight of adsorbent and hence results in a higher percent of metal removal at a high dose. However, as shown in Fig.1, The amount of metal ions adsorbed per unit weight of adsorbent(q_e) decreases with the adsorbent dose. This is due to the fact that at higher adsorbent dose in the solution ion concentration drops to a lower value and the system reaches equilibrium at lower values of ' q_e ' indicating the adsorption sites remain unsaturated.

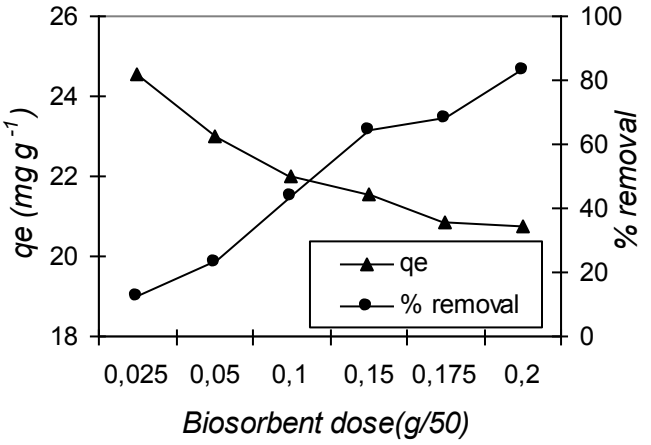

Figure 1: Effect of biosorbent dose on percent Cu (II) ion removals and biosorbed Cu (II) ion concentrations with the amount of the biosorbent(*qe*)(initial Cu (II) concentration = 100 mg L^{-1}, pH = 5, T = 25 ^{o}C, stirring speed = 150 rpm)

3.2. Effect of initial metal ion concentration

The effects of initial metal concentration on the biosorption capacity and percentage of Cu(II) ion removal at equilibrium conditions are shown in Fig.2. Biosorption experiments were carried out at different initial Cu(II) concentrations ranging from 50 to 250 mgL^{-1}. Ion removal percentage increases from 41.74 % to 76 %, when the initial ion concentration decreases from 250 to 50 mg L^{-1}. At low ion concentrations, the ratio of surface active sites to the total metal ions in the solution is high and hence metal ions may interact with the adsorbent and be removed from the solution. Also, at high concentration levels of metal ions more Cu(II) ions are left unadsorbed in solution due to the saturation of binding sites on the biomass surface. However, amount of metal adsorbed per unit weight of adsorbent, q_e, is higher at high concentrations as shown in Fig.2 and with increase in initial concentration the amount of Cu(II) adsorbed increases from 12.6 to 27.8 mgg^{-1}.

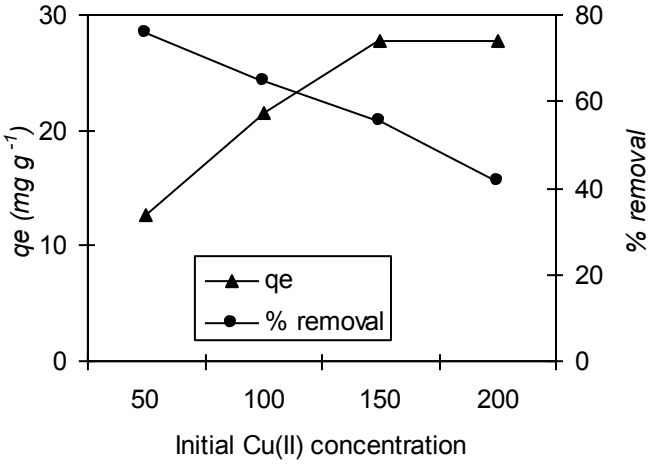

Figure 2: Effect of initial Cu (II) ion concentration removals and biosorbed Cu (II) concentrations with the amount of the biosorbent(*qe*)(pH = 5, biosorbent dose = 0,15 g /50 mL, T = 25 ^{o}C, stirring speed = 150 rpm)

3.3. The effect of pH

pH is one of the most important environmental factor influencing not only site dissociation, but also the solution chemistry of the heavy metals; hydrolysis, complexation by organic and/ or inorganic ligands. Redox reactions, precipitation are strongly influenced by pH and, on the other site, strongly influence the speciation and the adsorption availability of the heavy metals. It was found from speciation diagram for the Cu(II)-H_20 system that almost all copper ions were present in the ionic form of Cu(II)at pH<6.0[29]. Thus, the variation in Cu(II) removal from pH 2 to 5 could not be explained by the change in Cu(II) speciation in the solution. Accordingly, Cu(II) adsorption was principally dependend on the type and ion state of the functional groups(ligands) in biomass. Fig.3 shows the effect of pH on the adsorption of Cu(II) onto *Agaricus campestris* at 25 ^{o}C, 100 mg L^{-1} of initial Cu(II) ion concentration and 0.15 g of adsorbent dosage with 50 mL Cu(II) solution. The pH values ranging from 2.0 to 5.0 were studied in the experimental run. Cu(II) removal sharply increased from 17 % at pH 2.0 to 64.6 % at pH 5.0(see Fig. 3). It can also be seen from Fig.3 that the adsorption capacity of Cu(II) onto *Agaricus campestris* increases significantly with increasing pH. From the Figure, it may be observed that amount of Cu(II) adsorbed increases with increase in pH and reaches maximum 5.67- 21.53 mgg^{-1}. The increase in adsorption levels with an increase in pH can be explained by the surface charge of the adsorbent and the H^{+} ions present in the solution

At low pH values, the surface of adsorbent would also be surrounded by hydronium ions, which decrease the Cu(II) interaction with binding sites of *Agaricus campestris* by greater repulsive forces and therefore lower adsorption. In contrast, as the pH was increased, the competing effect of hydrogen ions decreased and more ligands were available for Cu(II). Therefore, at high pH values, the overally surface on the *Agaricus campestris* became more negative and adsorption increased. The study at pH higher than 5 were not conducted, because insoluble copper hydroxides get precipitated and restricted the true biosorption studies[15,30-33]. Similarly, other researces reported that pH 5.0 was the optimum pH value for removal of Cu(II) ions from the aquation solutions[15].

Zeta potential is one of the most useful parameters to characterize the surface charge of biomaterials. There is a close relationship between the zeta potential and the adsorption capacity of biomaterials. Zeta potential values were determined at various pH for deionized water and Cu(II) solution, while zeta potentials of Agaricus campesris biomass's particles at pH 3,4 and 5 are -20.6, -24,6 and -25 mV for Cu(II) solution, zeta potential at pH 3,4 and 5 are -1.8, -3.0 and -6.85 mV, respectively. As discussed above, at low pH values, such as pH 3, due to high(H^{+}) ion concentrations in solution, the surfaces of *Agaricus campestris* were neutralized yielding slightly negative zeta potentials(-1.8 mV), and thus prohibiting binding of positively charged Cu^{+2} ions onto the surfaces of *Agaricus campestris*. The extent of biosorption was rather low at low

pH values. However, the equilibrium solid phase Cu(II) ion concentration and Cu(II) removal increased with increasing pH, because of increasingly negative charges or highly negative zeta potentials (-6.85 mV) on the surfaces of the *Agaricus campestris*. Almost no biosorption onto *Agaricus campestris* was observed at pH 2 because of neutral or positively charged *Agaricus campes*tris surfaces at low pH(high H^+ ions) values(Zeta potential was not observed at pH 2). Zeta potential at pH 3 was observed as -1.8 mV. Increased pH values resulted in increasingly negative charges on *Agaricus campestris* surfaces yielding higher extent of Cu(II) ion biosorption at pH values around 5 with zeta potential of – 25 mV and therefore the biosorption of positively charged Cu^{2+} and $Cu(0H)^+$ species were more favourable. The dominant species between pH 2 and 5 in the Cu(II) solution were Cu^{2+}, $Cu0H^+$ and $Cu(0H)_2$ as suggested by Asmal et al[34-36]. Zeta potential values of *Agaricus campestris* particles at pH(3-5) in the distilled water were bigger than Cu(II) solution concentration. The dominant species in the Cu(II) solution were electrostaticaly effected by adsorbed particles and then adsorbated on the surface of *Agaricus campestris* particles. Adsorption of Cu(II) on the *Agaricus campestris* biomass caused a decrease of zeta potential values of the *Agaricus campestris* biomass. The decrease in the zeta potential values of *Agaricus campestris* biomass was a sign of biosorption of Cu(II) from aqueous solutions[2, 21, 34-36].

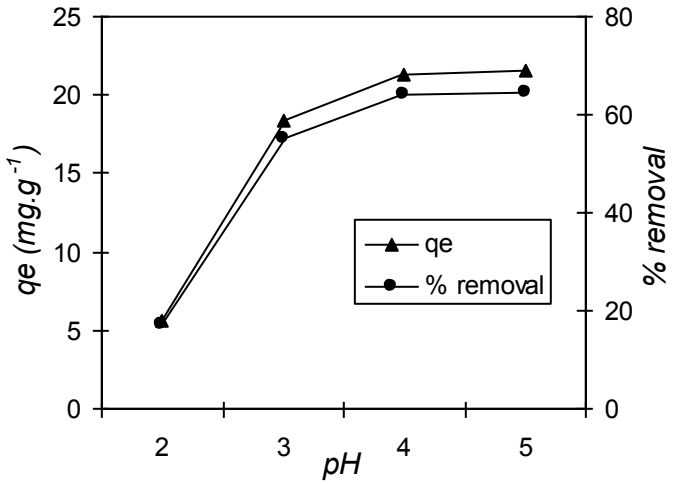

Figure 3: Effect of pH on percent Cu(II) ion removals and biosorbed Cu (II) ion concentrations with the amount of the biosorbent(*qe*)(initial Cu(II) concentration=100 mg L^{-1}, biosorbent dose = 0,15 g/ 50 mL, stirring speed = 150 rpm, T = 25 ^oC).

3.4. Effect of temperature

The effect of temperature on the biosorption capacity and percentage of Cu(II) ion removal at equilibrium conditions is shown in Fig. 4. From the Figure, It can be observed that when the temperature of the solution is changed from 303 to 328 K, the amount of Cu(II) ions adsorbed onto *Agaricus campestris* biomass increases from 22.3 to 24.6 mgg^{-1} for an initial concentration of 100 mgL^{-1}, which indicates that Cu(II) removal by adsorption an *Agaricus campestris* favours at high temperature. Anirudhan and Radhakrishman(2008) reported that this case may be a result of increase in the mobility of Cu(II) ions with temperature[8]. Igbal and Edyvean(2004)[37] also reported that increase in metal uptake at increased temperature is due to either higher affinity of sites for metal or an increase in binding sites on relevant biomass. Meena et al., (2005)[38] reported that the increase in adsorption with temperature may be attributed to either an increase in the number of active surface sites available for adsorption on the adsorbent or the decrease in the thickness of the boundary layer surrounding the adsorbent with temperature, so that the mass transfer resistance of adsorbate in the boundary layer decreases. It can be also observed from Fig. 4 that the percentage Cu(II) removal is increased from 67 to 74 % for an increase in temperature from 298 to 328 K.

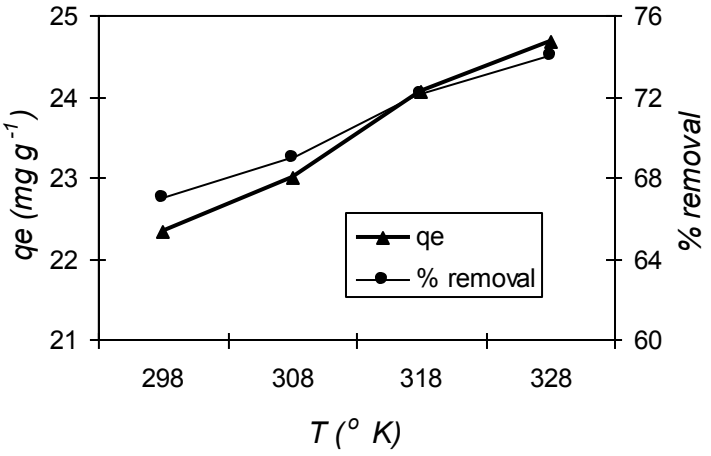

Figure 4: Effect of temperature on percent Cu(II) ion removals and biosorbed Cu (II) ion concentrations with the amount of the biosorbent(*qe*)(initial Cu(II) concentration=100 mg L^{-1}, biosorbent dose = 0,15 g/ 50 mL, stirring speed = 150 rpm, T = 25 ^{o}C).

3.5. Adsorption isotherm models

The equilibrium data were analysed using two isotherm equations namely, Langmuir and Freundlich isotherm models and the evaluated constants are given Table 1. Fig. 5 shows the sorption isotherms of Cu(II) ions on the fungi.

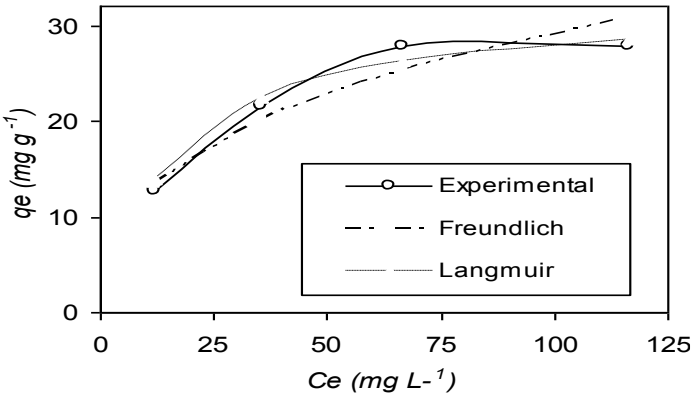

Figure 5: Equilibrium curves for Cu(II) on to *Agaricus campestris*(pH= 5, initial Cu(II) concentration = 100 mg L^{-1}, adsorbent concentration = 0,15 g / 50 mL, stirring speed = 150 rpm)

The best fit equilibrium model was determined based on the linear regression correlation coefficient R^2. The isotherm constants and correlation coefficient(R^2) are summarized in Table 1.

Table 1. Langmuir and Freundlich Isotherm Constants

Langmuir		
q_{max} (mgg^{-1})	b(Lmg^{-1})	R^2
32.52	0.0623	0.99
Freundlich		

K_F (mgg^{-1})	n	R^2
5.4	2.73	0.93

As shown in Table 1 and Fig. 5, it was observed that the Langmuir was better fits the experimental equilibrium adsorption data than the Freundlich isotherm equation for Cu(II) adsorption according to the values of R^2. In Langmuir isotherm, the highest value of R^2 was 0.99 for Cu(II)(see Table 1). It was also seen from Table 1 that the Langmuir maximum adsorption capacity q_{max} (mgg^{-1}) is 32.52 and the equilibrium constant b(Lmg^{-1}) is 0.0623. The Freundlich constant K_F is 5.4 mgg^{-1}. Furthermore, the value of 'n' at equilibrium is 2.73. The correlation coefficient of Freundlich isotherm(R^2) was 0.93. A comparison of the maximum capacity, q_{max}, of the *Agaricus campestris* biomass with that some other adsorbent reported in the literature is given in Table 2.

Table 2. Comparison of the adsorption capacities(Langmuir q_{max}) for Cu(II) ions of various adsorbents.

Adsorbent	q_{max} **/mg g^{-1})**	**Reference**
Typha latifolia L.	6.230	39
Pleurotus pulmonarius	6.20	40
Pseudomonas putida	15.80	15
Ascophyllum nodosum	29.251	26
Pithophora oedogonia	23.08	26
Ochrobactrum anthropi	32.6	41
Rhizopus oligosporus	79.37	15
Rhizopus arrhizus	48.54	15
Rose waste biomass	55.79	41
Agaricus campestris	32.52	This study

It can be seen in Table 2 that in general, *Agaricus campestris* tested in this study has good adsorption capacity when compared with other adsorbent except Rhizopus oligosporus, Rhizopus arrhizus and Rose waste biomass. The adsorption capacity differences of metal uptake are due to the properties of each adsorbent such as structure, functional groups and surface area.

The values of R_L for Cu(II) adsorption onto *Agaricus campestris* biomass were found tobe 0.24, 0.14, 0.01 and 0.07 at 25 ^oC. As can be observed, the value of R_L decreased with increasing initial Cu(II) concentration, indicating that the Cu(II) adsorption on *Agaricus campestris* is more favorable at 25 ^oC. In addtion, for $0<R_L<1$ the adsorption process is favorable.

3.6. Adsorption kinetics

Adsorption kinetics describes the solute uptake rate which intern controls the residence time and hence the size of the adsorption equipment. Fig. 6 shows the plot between amount adsorbed, q_e (mgg^{-1}) versus time, t(min) for different initial Cu(II) concentrations. From the Figure 6, it was observed that q_e value increased with increase in initial Cu(II) concentration. However, the adsorption rates within the first 5 min. was observed to be very high and thereafter; the reaction proceeds at a slower rate till equilibrium and finally a steady state was obtained after 30 min. The equilibrium time is independent of initial Cu(II) concentration. Initially, the adsorption sites are open and the metal ions interacts easily with the site and hence a higher rate of adsorption is observed in the first 5 min. Further, the driving force for adsorption- the concentration difference between the bulk solution and the solid liquid interface is higher initially and this results a higher adsorption rate. However, after the initial period slow adsorption may be due to slower diffusion of solute into the interior of the adsorbent.

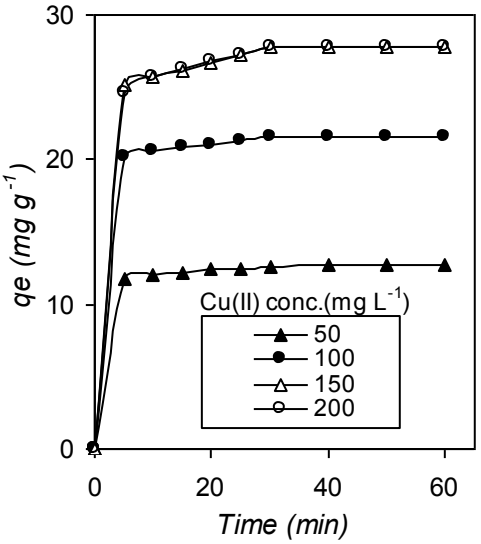

Figure 6: Plot of the adsorption of Cu(II) onto *Agaricus campestris* against contact time(adsorbent concentration=0.15 g/50mL; initial pH=5; T= 298 K

Kinetic analysed were made at different initiall Cu(II) concentrations and temperatures by using following pseudo-second-order equation. The linear plots of t/q_t versus t for different concentrations and temperatures are shown in Figs. 7(a) and (b). The results of the various kinetics parameters including k_2, q_e, h and R^2 are shown in Table 3. The values of R^2(0.99-1) are closer to unity for pseudo-second-order kinetic model for the different initial concentrations and temperatures studied, implying the suitability of this model for Cu(II) adsorption by *Agaricus campestris*. The initial sorption rate(h) increases from 1.61 to 2 mgg^{-1} $min.^{-1}$ with increase in concentration until 100 mgL^{-1} initial concentration. After 100 mgL^{-1} initial concentration, the initial sorption rate decreases from 2 to 1.062. However, at all initial concentration of Cu(II), initial sorption rate increases from 0.861 to 1.325 mgg^{-1} $min.^{-1}$ with increase in temperature. The values of k_2 decrease from 0.126 to 0.0375 gmg^{-1} min^{-1} as the initial Cu(II) concentrations increases from 50 to 200 mgL^{-1}.

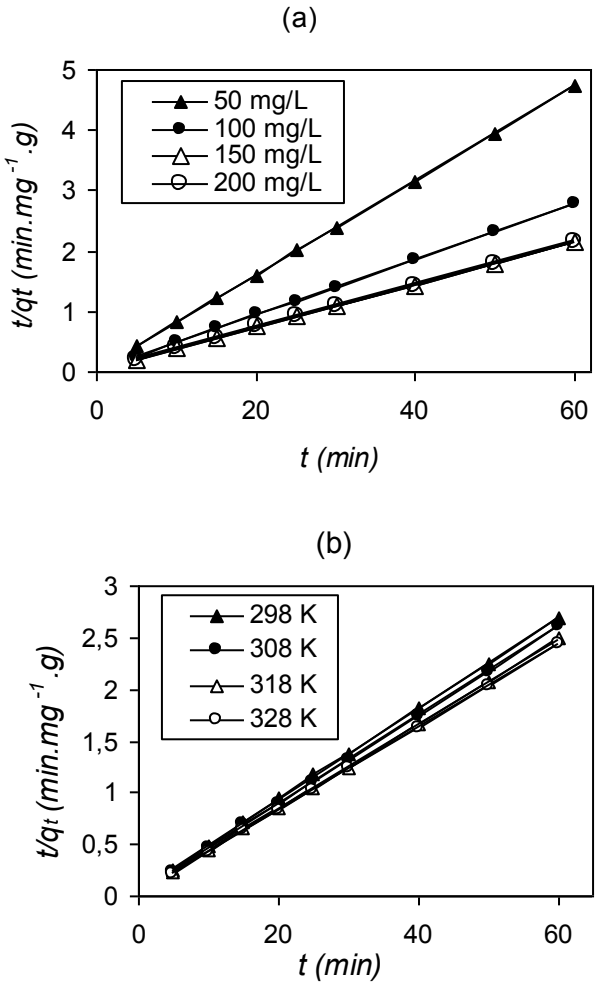

Figure 7: Pseudo-second-order kinetic plots for the adsorption of Cu(II) onto *Agaricus campestris* (a) at different initial concentrations: adsorbent concentration= 0.15 g/50 mL; Initial pH=5; T=298 K and (b) temperatures: adsorbent concentration= 0.15 g/50 mL; Initial pH=5; Initial Cu(II) concentration=100mgL^{-1}

The reason for the decrease in the rate constant with increasing Cu(II) concentrations may be the competition among Cu(II) ions for the same binding sites on *Agaricus campestris* biomass, while the values of k_2 increases from 0.0380 to 0.0529 gmg^{-1} min.$^{-1}$ as the temperature increases from 298 to 328 K indicating that the Cu(II) adsorption on *Agaricus campestris* is an endothermic. This is due to higher frequency of interactions(ie; high energy levels) among the Cu(II) ions and the adsorbent particles at high temperature. As seen in Table 3, the values of q_e increase both with increase in concentration and temperature.

Table 3. Pseudo-second-order kinetic parameters for the adsorption of Cu(II) onto *Agaricus campestris* at different initial concentrations(Co, mgL^{-1}) and temperatures(K).

Co /(mgL^{-1})	**k_2/(gmg^{-1}min^{-1})**	**h/(mgg^{-1}min^{-1})**	**$q_{e\ exp}$/(mgg^{-1})**	**$q_{e\ cal}$/(mgg^{-1})**	**R^2**
50	0.126	1.61	12.66	12.80	1
100	0.0923	2	21.53	21.74	1
150	0.0393	1.109	27.77	28.24	0.99
200	0.0375	1.062	27.82	28.32	0.99
		T (K)			
298	0,0380	0,861	22.33	22.67	0.99
308	0.0529	1.236	23	23.36	0.99
318	0.0526	1.285	24.06	24.44	0.99
328	0.0529	1.325	24.66	25	1

3.7. Thermodynamic parameters

The change in Gibbs free energy(ΔG^o) for adsorption of Cu(II) ions onto *Agaricus campestris* biomass were calculated from Eq.(8). ΔH^o and ΔS^o values were also determined from the slope and the intercept of the plot of In Kc versus 1/T(Fig. 8) and listed in Table 4.

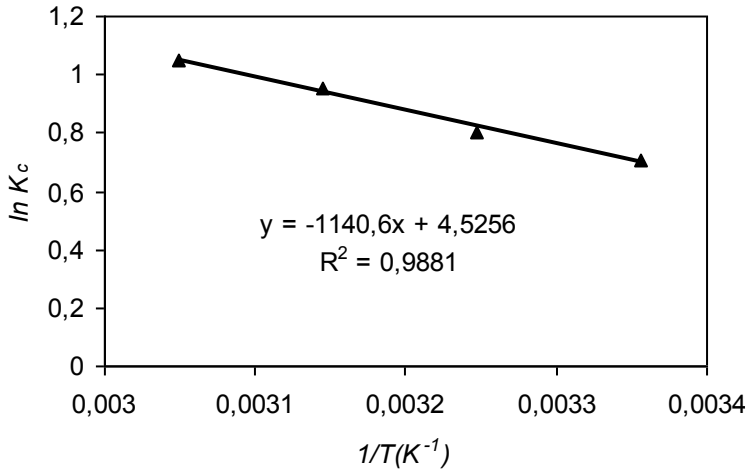

Figure 8: Plot of In K_c against 1/T for the adsorption of Cu(II) onto *Agaricus campestris*

The distribution coefficient(Kc) indicates the capability of *Agaricus campestris* biomass to retain the solute and also the extent of movement in a solution phase and hence it is a useful parameter for comparing the adsorption capacity of any metal ion under the same experimental conditions. Obtained thermodynamic parameters are given in Table 4. The values of ΔG^o were found to be(-1.75,-2.05, -2.52 and -2.85) kj mol^{-1} at all temperatures(T= 298, 308, 318 and 328 K). As shown in the Table 4, the negative values of ΔG^o imply the spantaneous nature of the adsorption process and a better adsorption is actually obtained at higher temperature(T=308 K). After this temperature, it was observed an slightly increase in ΔG^o. The ΔG^o value determines the rate of the reaction, rate increases as ΔG^o decreases, and hence the energy requirement is fulfilled, the reaction proceeds. Generally, the change in free energy for physisorption is between -20 and 0 kj mol^{-1}, but chemisorption is a range of -80 to -400 kj mol^{-1}[8]. The values of ΔG^o obtained in this study was in the range of (-1.75 - -2.85) kj mol^{-1} and so the adsorption was predominantly physical adsorption. The positive value of ΔH^o(9.48 kj mol^{-1}) confirms the endothermic process, meaning the reaction consume energy. The positive value of ΔS^o(37.63 j/mol K) suggests the increased randomness at the solid/solution interface during the adsorption of Cu(II) onto *Agaricus campestris*. In adsorption of Cu(II) the adsorbed solvent molecules, which are displaced by the adsorbate species, gain more translational entropy than is lost by the adsorbate ions, thus allowing for the prevalence of randomness in the system. Also, in the case of

physisorption which may also contribute to the total adsorption process can cause increase in entropy because of the water molecules released from the hydrated ions or water molecules present on the surface during the adsorption process.

Table 4. Thermodynamic parameters of *Agaricus campestris* biomass at initial Cu(II) concentration of 100 mgL^{-1}, pH 5.

T (K)	ΔG^o(kJ mol^{-1})	ΔH^o(kJ mol^{-1})	Kc	ΔS^o(J/mol K)
298	-1.75	9.48	2.03	37.63
308	-2.05		2.22	
318	-2.52		2.66	
328	-2.85		2.84	

3.8. Activation Parameters

Fig. 9 shows the corresponding linear plot of In k_2 aganist 1/ T with a correlation coefficient of 0.91. The value of activation energy for the adsorption of Cu(II) on *Agaricus campestris* at different temperature was calculated and its value was found tobe 0,11 kj/mol. The activation energy for physical adsorption is usually not more than 4.2 kJ/mol, since the forces involved in physical adsorption are weak. It appears from the value of activation energy that the sorption of Cu(II) on Agaricus compestris is physical adsorption process.

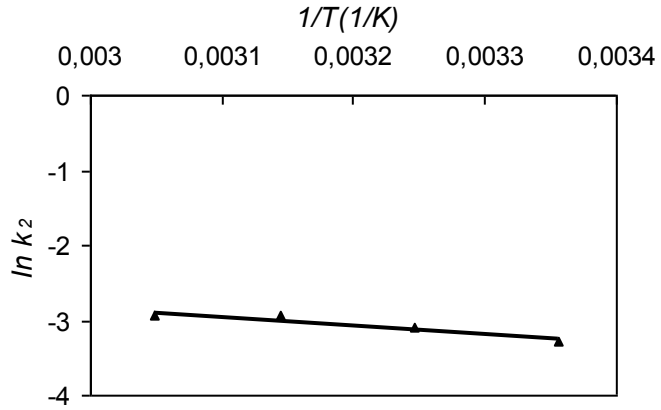

Figure 9: Plot of In k_2 aganist 1/ T for the adsorption of Cu(II) onto *Agaricus campestris*

4. Conclusion

In the present study, the thermodynamic and kinetic investigations of Cu(II) adsorption on A. campestris were studied. The optimum pH for maximum adsorption of Cu(II) was found to be at pH 5. The maximum adsorption capacity from the Langmuir isotherm was found to be 32.52 mgg^{-1} at 298 K^o. The adsorption kinetics were well described by the pseudo-second-order kinetic model equation and the rate constant increases with increase in Temperature indicating endothermic nature of adsorption. The value of adsorption energy, Ea, gives an idea of the nature of adsorption. The activation energy of the Cu(II) adsorption was calculated using Arrhenius equation. From the value of activation energy of the process and ΔG^o obtained in this study, it is suggested that the adsorption of Cu (II) by A. campestris is physical adsorption. Thermodynamic parameters indicated that adsorption of Cu(II) on *A. campestris* was endothermic and spantaneous. Positive value of entropy shows the spontaneity and feasibility of adsorption process.

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Paper 134

A MACROSCOPIC VIEW OF THE AGRO-ECOSYSTEMS` LEVEL OF SUSTAINABILITY IN ALBANIA

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Abstract
Agro-ecosystems are a combination of natural and human factors. Plant production increase requires both yield increase through intensification of cultivation technologies and extension of newly cultivated land. During the production process farmers invest different inputs in order to make plants yield more. This human interference in the human made ecosystems is accompanied with several negative consequences, such as water pollution, soil erosion, deposition of toxic residues in soil and water, etc. Different methodologies may be used to assess human impact on natural processes. It`s becoming clearer that this revision requires intensive research in the future. Achieving this objective requires a shift towards the use of more renewable resources. That`s why a revision of human made interference in the agro-ecosystems remains a long term challenge for the agricultural research.
Key words: Agro-ecosystems, technology of cultivation

Introduction
Since the beginning of the agro-ecosystems, humans have increased the cultivated land with the goal of providing more food for a continuously increasing population. Comparison of the net primary production provided by the natural ecosystems with the plant production obtained by farmers in agro-ecosystems shows that agro-ecosystems` yield exceed several fold the yield of plants in natural conditions. This increase is due to additional investments made by humans in the agro-ecosystems. For almost all the period of time since the beginning of conscious plant production, humans have seen mainly the positive side of their interference within nature`s processes. But during the last half century it became progressively clear that along with yield increase plant production inflicted damages in natural and human made ecosystems. That`s why the concept of sustainable plant production started to be elaborated by many authors who are in search of finding the right balance between nature and human activities Campbell, D.E. (2004); Haden, A.C, (2002); Lefroy, E & Rydberg,T.(2003).
In this context the study of agro-ecosystems in Albania is becoming of primary importance in order to reduce the stress on natural processes created by humans during the process of plant production for food, fodder, and other human needs.

Methods
Most of the data used in this study were found in the 2008 and 2009 Statistical Year Books prepared by Albania`s Ministry of Agriculture, Food, and Consumer Protection. Soil erosion was calculated based on average values of soil erosion in land areas with different slope gradients, presented in the erosion maps of Albania. These data made possible the identification and calculation of main energy flows that drive most of the plant production processes in the agro-ecosystem land area. These energy flows were organized in a visual form in order to exclude the energy flows overlapping and minor energy flows which might not play a significant role in the agro-ecosystems development.
All energy flows were converted in sej units by using for most of the cases the transformaties proposed by Brandt-Williams (2001). The emergy flows were organized in three groups: renewable (R), non-renewable (N) and feed-back (F) resources. Some emergy indices were calculated by using Brown & Ulgiati formula (1997) which are recommended to be used in sustainability evaluation procedures. Along with these indices an additional way was used in the form of inequality for the main emergy components to shed more light in the evaluation of agro-ecosystems sustainability.

Results and Discussion
Main energy flows that were identified in figure 1 were converted in sej/year and are presented in table 1. Evapo-transpiration (ET) has the largest value (2.53E+20 sej/year in 2008 and 2009) among the renewable

resources and it represents all the renewables (R) in order to avoid double counting. The largest component of nonrenewable resources is represented by soil erosion (9.96E+21sej/year in 2008 and 2009).

Table 1: Main emergy flows included in Albania`s agro-ecosystems for 2008 and 2009.

Inputs & Units		2008	2009
		sej/year	sej/year
RENEWABLES (*)			
1	Evapo-transpiration	**2.53E+20**	**2.53E+20**
NONRENEWABLES			
2	Soil erosion	**9.96E+21**	**9.96E+21**
FEEDBACK			
3	Fertilizers (gram)	4.47E+21	4.63E+21
4	Pesticides (gram)	5.81E+21	7.34E+21
5	Fuel	1.31E+20	1.30E+20
6	Electricity	3.38E+19	3.38E+19
Total FEEDBACK		**1.04E+22**	**1.21E+22**

(*) The largest component represents the renewable resources in order to avoid double counting of emergy flows.

Feedback from the economy totals at 1.04E+22 sej/year for 2008 and 1.21E+22 sej/year for 2009. These two numbers represent the sum of the main emergy components that make for the feedback: chemical fertilizers, pesticides, fuels, and electricity.

Calculation of sustainability indices is based on the values obtained for R, F, and N which are applied in the following formula:

Table 2: Emergy indices as a function of Renewables (R), Nonrenwables (N) and Feedback from the economy (F) used for agro-ecosystems` sustainability assessment.

	2008	2009		2008	2009
R	2.53E+20	2.53E+20	**EYR**	1.98	1.84
N	9.96E+21	9.96E+21	**ELR**	80.47	87.19
F	1.04E+22	1.21E+22	**ESI**	0.025	0.021
R/F	0.024	0.021			
N/F	0.958	0.823			

By analyzing the data presented in table 2 it becomes quite evident that Albania`s agro-ecosystems were by far not sustainable during 2008 and 2009. Given that the value of R is practically unchanged as it represents the natural resources at the disposal of plant production, high values of **F** and **N** contribute to the high level of agro-ecosystems unsustainability in a negative manner. Looking closer at these two variables reveals that **F** (feedback from the economy) is completely under humans` control as it is made of the inputs invested during plant production processes, whereas **N** (soil erosion) is partially dependent on human activities and partially on natural factors.

Switching from the high values of **F** and **N** presented in table 2 to more sustainable values of indices might require radical changes in the agricultural strategies of Albania in the long run. These changes would make necessary a significant reduction of fossil fuels, pesticides, and other chemicals by replacing them with renewable resources.

Given that the soil erosion (N) is partially a natural process implies that farmers may control it partially but significantly, through the improvement of land management practices both in slope and flat areas, as well as by planting wherever possible suitable plant species that minimize the erosion rate.

Conclusions

- Given the actual conditions of human interference in natural processes, agro-ecosystems in Albania are not sustainable for the time being.
- This lack of sustainability is mainly a consequence of non-balanced interference of farmers during the production process through the use of extensive chemicals.
- As a consequence of that, Albanian farmers should pay more attention during the investment of different inputs in the production processes.

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Paper 135

CORRELATION, PATH ANALYSES AND SELECTION CRITERIA FOR IMPROVED GRAIN YIELD IN DURUM WHEAT

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Abstract

Durum wheat is a very important crop in the Mediterranean region, and its uses are very variable. Selection efficiency could be increased if specific physiological and/or morphological attributes related to yield, could be identified and used as selection criteria. A deep understanding of the cause effect mechanisms involving putative traits versus grain yield, and the knowledge of the heritability of the trait and its genetic correlation with yield are essential. Biological yield and harvest index could be used as an indirect selection criterion for better grain yield. Significant genotypic differences ($P<0.01$) were observed for all the traits studied, indicating considerable amount of variation among genotypes for each character. Grain yield had strong positive correlations ($P<0.01$) with plant height, number of kernels spike^{-1}, grain yield plant^{-1}, biological yield and thousand-kernel weight. On the other hand, grain yield had strong negative correlation ($p< 0.01$) with days to heading, suggesting the usefulness of selecting early heading genotypes with long grain filling period in improving grain yield. The remaining traits recorded moderate to low phenotypic and genotypic estimates. The maximum positive direct effect on grain yield was exerted by biological yield (0.99) followed by days to maturity (0.89) and harvest index (0.73). While, maximum negative direct effects were exerted by days to heading (-0.81) and grain filling period (-0.68).
Key words: Genotypic correlations, indirect selection

Introduction

The main objective of wheat breeding is to increase the productivity. Breeding programmes are traditionally empirical, that is the selection is based on the yield per se. However, challenges of increasing productivity and quality will depend on the work of breeders to incorporate new technologies to complement traditional breeding programs.

The reasons mentioned above are basic, since the presence of phenotypical correlation between yield and a specific trait does not guarantee that selection for that trait will lead to greater improvement in grain yield than the selection for grain yield itself, because the relationship may be environment – specific (Ceccareli et al., 1991). Identifying and manipulating characters contributing to grain yield is important as it increases breeding efficiency. In light of this therefore, easily measurable characters with high heritability and having useful relationship with grain yield are of high importance to practice indirect selection for high yield (Falconer and Mackey, 1996). Correlation between various physiological and morphological traits results from complex interrelationships between grain yield and the traits and among the traits themselves. But it does not give an exact picture of the relative importance of direct and indirect effects of the various yield attributes (Bhatt, 1973).

Increasing the yielding ability of wheat crop, requires the study of direct and indirect effects of various characters on yield. It also provides the basis for success in the breeding programmes and thus the problem of yield increase can be tackled more effectively. Selections based on correlation without taking into account the interaction between the component characters may sometime prove misleading. Path coefficient analysis (a statistical technique) makes it possible to quantify the interrelationship of different components for their direct and indirect effects on grain yield through correlation. The results of different studies show high and positive correlation of 1000-kernel weight with grain yield and large and positive direct effect at one location. Thus, they suggested that selection in bread wheat may be based on 1000-kernel weight. In this study, an effort has been made to evaluate the association of seed yield with some characters for developing selection criteria.

Materials and Methods

The experimental material consisted of 20 genotypes, which were randomly taken from the germplasm collections, including one standard variety. These genotypes were planted during 2007-2008 period, in experimental field of Agricultural Research Institute of Lushnja (Albania)

The experiment was laid out in a randomized complete block design (RCBD) with four replications. Each plot consisted of 6 rows, 5 m long and 20 cm apart. The net area harvested for each plot was 5 m^2. The plots were fertilized with 80 kg P_2O_5 ha^{-1} at planting, and 120 kg N ha^{-1} during vegetation period (from tillering to booting). Creso was used as check variety.

Data on different agronomic traits were collected on plant. At maturity 10 guarded plants from each plot were randomly selected and data were recorded for Days to heading (DH), days to maturity (DM), Grain filling period (GFP), Plant height (PH), Number of spikelets in spike (NSS), Number of kernels per spike (NK), Grain yield per plant (GYP), Biological yield (BY), Thousand kernel weight (TKW), Harvest index (HI), Grain yield (GY),

Analysis of variance, using completely randomized block design, was computed for all the characters evaluated as per Gomez and Gomez (1984).

Genotypic and phenotypic correlation coefficients were determined according to Kwon and Torrie (1964)

The methodology proposed by Dewey & Lu (1959) was used to perform the path analysis for grain yield and its components keeping grain yield as resultant variable and its components as causal variables.

RESULTS AND DISCUSSIONS

The analysis of variance revealed that the mean squares for genotypes were significant for all the traits studied. This indicates the existence of a high degree of genetic variability in the material and this is an opportune situation for breeding programs

Phenotypic and genotypic correlation coefficients of grain yield with other characters are presented in Table 1.

TABLE 1. Genotypic (below diagonal) and phenotypic (above diagonal) correlations of durum wheat genotypes

Charact	DH	DM	GFP	PH	NSS	NK	BY	TKW	HI	GY
DH		0.532**	-0278**	-0.231	0.416*	0.071	-0.117	0.011	-0.312	-0.187
DM	0.794**		0.734**	-0.009	0.454*	0.234	0.056	0.079	-0.243	-0.056
GFP	-0.038	0.641*		0.214	0.108	0.167	0.098	0.236	-0.004	0.089
PH	-0.379*	0.032	0.871**		0.258	0.361*	0.542*	0.412*	-0.087	-0.034
NSS	0.417	0.798**	0.456*	0.236		0.719**	0.306	0.145	-0.236	0.132
NK	-0.016	0.275	0.512*	0.613*	0.515		0.331*	0.276	-0.062	0.376
BY	-0.542	0.107	0.798**	0.801**	0.511	0.777**		0.374*	-0.203	0.911**
TKW	-0.356	0.240	0.905**	0.572*	0.042	0.453	0.563*		0.289	0.423*
HI	-0.512	-0.578*	-0.207	-0.062	-0.396	0.031	-0.326	0.256		0.305*
GY	-0.834**	-0.264	0.637*	0.512*	0.099	0.704**	0.786**	0.844**	0.314	

Genotypic correlation coefficient values were greater for most of the characters than their corresponding phenotypic correlation coefficient values, indicating inherent association of the characters.

At phenotypic level, grain yield had significant positive associations with biological yield (0.911**), 1000-kernel weight (0.376*), number of kernels per spike (0.318*), harvest index (0.305*) and plant height (0.301*)
At genotypic level, grain yield had very strong positive correlation (P< 0.01) with number of kernels per spike (0.704**), biological yield (0.786**) and 1000- kernel weight (0.844**), implying that improving one or more of these characters could result in high grain yield. On the other hand, grain yield had strong negative correlation (P< 0.01) with days to heading (-0.834**), suggesting that selecting early heading genotypes with long grain filling period would give high grain yield especially under moisture stress area.

Relation of grain yield with other characters.

High and positive phenotypic direct effects on grain yield were exhibited by days to maturity (6.18), followed by biological yield (0.86) and harvest index (0.53). Phenotypic correlation coefficient between grain production and biological production and harvest index were almost equal to their respective phenotypic direct effect, showing that the coefficient of phenotypic correlation explained authenticity of relationship between them. While the maximum positive phenotypic direct effect of days to maturation on grain wheat production was balanced by phenotypic indirect effects through the day to heading and grain filling period and represent a weak negative phenotypic correlation with grain yield.
Maximum positive direct effect on grain yield was exerted by biological yield (0.99) followed by days to maturity (0.89) and harvest index (0.73). Days to maturity had weak negative genotypic correlation with grain yield though it had positive direct effect. The cause of negative genotypic correlation for days to maturity with grain yield is the negative indirect effects *via* days to heading and grain filling period. On the other hand, biological yield and harvest index had strong positive direct effect with grain yield.
Maximum negative direct effect was exerted, by days to heading (-0.81) and grain filling period (-0.68). Days to heading, in addition to the maximum negative direct effect on grain yield, it had significant negative genotypic correlation with grain yield. Grain filling period, number of kernels per spike and thousand kernel weight had positive genotypic correlation with grain yield though their corresponding direct effects were negative. The maximum negative direct effect of grain filling period was counter balanced by its positive indirect effects *via* days to maturity and biological yield and rendered the genotypic correlation coefficient positive and significant.

Conclusions

1. Improvement of durum wheat grain yield could be done through indirect selection to obtain way early heading genotypes which have also high biological yield and harvest index.

2. Positive correlation of grain yield with plant height, number of kernels spike^{-1}, grain yield plant^{-1}, biological yield and thousand-kernel weight make possible an efficient indirect selection.

TABLE 2. Estimates of phenotypic direct (bolded diagonal) and indirect (off-diagonal) effects of different characters on grain yield of durum wheat genotypes

Nr	Characters	DH	DM	GFP	BY	TKW	HI
1	DH	**-7.42**	4.63	2.76	-0.18	-0.013	-0.23
2	DM	-2.87	**6.18**	-5.58	0.27	0.009	-0.12
3	GFP	1.91	4.09	**-8.13**	0.16	0.008	0.05
4	BY	0.68	0.12	-0.34	**0.86**	0.004	-0.12
5	TKW	1.02	0.56	-1.27	0.35	**0.016**	0.13
6	HI	1.44	-1.88	0.11	-0.18	0.004	**0.53**

TABLE 3. Estimates of genotypic direct effects (bolded diagonal values) and indirect effect (off-diagonal values) of different characters on kernel yield per plot durum wheat genotypes

Nr	Characters	DH	DM	GFP	BY	TKW	HI

1	**DH**	**-0.81**	0.72	0.06	-0.38	0.007	-0.31
2	**DM**	-0.63	**0.89**	0.18	0.17	0.002	-0.29
3	**GFP**	0.04	0.44	**-0.68**	0.76	-0.031	0.13
4	**BY**	0.33	0.16	-0.57	**0.99**	-0.016	-0.21
5	**TKW**	0.26	0.24	-0.39	0.73	**0.038**	0.24
6	**HI**	0.35	-0.53	0.11	-0.42	0.019	**0.73**

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Paper 138

THE DETERMINATION METHOD OF CHLOROBENZENES (CBs) IN THE SOIL

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ABSTRACT

Chlorobenzenes (CBs) are a group of substituted benzene compounds with only chlorine and hydrogen atoms on the benzene ring. They are mainly used as solvents, pesticides, fire retardants, degreasers, heat transmitters, chemical intermediates and are released in the environment due to their extensive use.This study presents a developing method for determination of chlorobenzenes in the soil, including extraction techniques, concentration, clean up and injection in GC-ECD system which was equipped with a DB-5 capillary column and an AS 2000 autosampler. The detection limit of the method was calculated based on the chlorobenzene recoveries of the presented analytical method and on the detection limits in GC of each chlorobenzes.
The extraction with ASE technique presented the best results as the recoveries of MCB, 1,2,4-TCB and HCB from soil with were 100,5±2,5, 88,0±3,3 and 88,0±5,0 respectively. The detection limits of chlorobenzens in the GC-ECD varied from 0,38 pg/µl for HCB to 250,00 pg/µl for MCB. Also, the total recovery of chlorobenzenes was high for HCB (84,13 ± 4,30) and very low for MCB (9,80 ± 1,16). The values of method detection limits of chlorobenzenes in soil were from 0,14 µg/kg soil for HCB to 765,31 µg/kg soil for MCB, whereas other clorobenzenes had intermediate values. Therefore, by using this determination method, high chlorinated benzenes as HCB and PCB could be detected in very small amounts in soil samples.

Keywords: Chlorobenzenes, method, extraction, detection limit, soil.

1. INTRODUCTION

Chlorobenzenes (CBs) are organic compounds with only chlorine and hydrogen atoms on the benzene ring; the number of chlorine atoms can vary from one to six. They are chemically very unreactive and generally stable under environmental conditions. The difference between chlorobenzene structures is just the number of chlorine atoms they posses and their substitution place on the benzene ring. This substitution yields 12 compounds, including: monochlorobenzene (MCB), 3 isomeric forms of dichlorobenzene (DCB), 3 isomers of trichlorobenzene (TCB), 3 isomers of tetrachlorobenzene (TeCB), pentachlorobenzene (PCB) and hexachlorobenzene (HCB). MCB, 1,2-DCB, 1,3-DCB and 1,2,4-TCB are colourless liquids, while all other congeners are white crystalline solids at room temperature. The position of the chlorine atoms leads to different isomers with different properties. Chlorobenzenes are listed as toxic compounds and their toxicity increase generally with the increase of the number of chlorine atoms in the benzene ring. They are very irritating and react readily with tissues in liver and kidney (IPCS, 1991; WHO, 2004a). The potential health hazard of a xenobiotic compound is a function of its persistence in the environment as well as the toxicity of the chemical class. Hexachlorobenzene is classified as a probable human carcinogen by the US Environmental Protection Agency (ATSDR 1999, 2002). Due to their toxicity some chrorobenzenes are ranked in priority list of pollutants.Chlorobenzenes are mainly used as solvents, odorizers, herbicides, insecticides, fungicides, fire retardants, degreasers, heat transmitters and chemical intermediates for the production of several other compounds, such as dyes, and pharmaceutical products (IPCS, 1991; WHO, 2004).Chlorobenzenes are released in the environment due to their extensive use, the presence in industrial effluents and wastes or by the incineration of wastes which contain organochlorine compounds. They may also enter in the ecosystems due to the biodegradation of chlorinated compounds (IPCS, 1991).Due to the extensive use and long range transport, chlorobenzenes are detected in different environmental compartments.

Therefore, chlorobenzenes are detected in soil samples of different areas. In uncontaminated soils, chlorobenzene levels were less than 0.4 mg/kg for dichlorobenzene congers and less than 0.1 mg/kg for other chlorobenzenes (Wang et al. 1995). The total chlorobenzene concentrations in soil samples from a former pesticide factory in Germany ranged from 1.5 to 18400 mg/kg (Feidieker et al., 1994). The concentration of HCB in soil samples originated from Leipzig-Halle region were between 0.57 and 3.75 µg/kg dry weight (dw) (Manz et al., 2001). In Switzerland, agricultural soil had HCB level of only 0.15-5.0 µg/kg dw (Streit, 1994), while considerably higher values of approximately 40 µg/kg dw are encountered in Italy (Leoni and D'Arca, 1976). Nakata et al. (2005) have detected in soil samples a HCB concentration up to 3.2 ng/g dw. Meijer et al., (2003) have analysed the HCB contents in nearly 200 background surface soil samples and they found an average value of 680 pg g^{-1} dw, showing clearly the ubiquitous presence of HCB in the environment.The occurrence of chlorobenzenes is also observed in sediments due to their transport and the affinity to be absorbed into sediment materials. (Oliver and Nicol, 1982; Masunaga et al., 1991; Beurskens et al., 1993; Lee et al., 2005; Nakata et al., 2005). Thus, determination of chlorobenzenes in soil or sediments is of high importance.The objective of this study was to develop a method for determination of chlorobenzenes in the soil, including extraction techniques, concentration, clean up and injection in GC-ECD system equipped with a DB-5 capillary column and an AS 2000 autosampler. Furthermore, the calculation of the detection limit of the method was based on the chlorobenzene recoveries of the analytical method and on the detection limits in GC of each chlorobenzes.

2. MATERIALS AND METHODS

2.1. Chemicals and reagents

Uniformly ^{14}C-ring-labelled chlorobenzenes: hexachlorobenzene (HCB), pentachlorobenzene (PCB), 1,2,4-trichlorobenzene (TCB) and monochlorobenzene (MCB), purity >98 %, specific radioactivity of 5 mCi/mMol (or 185 MBq/mMol) were obtained from International Isotope (Munich, Germany). The non labelled chlorobenzenes – including hexachlorobenze (HCB), pentachlorobenzene (PCB), monochlorobenzene (MCB) and the isomers of tetrachlorobenzene (TeCB), trichlorobenzene (TCB), dichlorobenzene (DCB), purity >99.5% were purchased from Dr. Ehrenstorfer (Augsburg, Germany). The standard solutions were used for identification and quantitative analysis of chlorobenzens by GC-ECD. n-Hexane Picograde® was obtained from Promochem (Wesel, Germany). All other solvents (methanol, acetone and n-hexane) were of analytical grade and were purchased from Merck (Darmstadt, Germany). Sodium sulphate (Na_2SO_4) and sea sand were also obtained from Merck (Darmstadt, Germany). The scintillation cocktails (Ultima Gold XR; Ultima Flo) were purchased from Packard (Dreieich, Germany).

2.2. Standard solutions

The standard solutions for application were prepared from stock standards of labelled and non labelled chlorobenzene. Different preparation methods were used for the chlorobenzenes.The ^{14}C-monochlorobenzene standard solution was prepared according to Wang and Jones (1994): ^{14}C-monochlorobenzene was dissolved in hexane, and then mixed with non-labelled MCB in acetone. This mixture was diluted further with distilled water at a rate of 0.06:1:12 (hexane:acetone:water, v/v).The standard application solutions for the other chlorobenzenes including HCB, PCB and 1,2,4-TCB were prepared by mixing the labelled with unlabelled chlorobenzenes in the required rates and dissolved in n-hexane. The standard solutions of non labelled chlorobenzenes were prepared by dissolving also in n-hexane in the required concentrations. These standards were used for identification and quantitative analysis of chlorobenzens by GC-ECD.The prepared standard solutions were kept in refrigerator until application.

3. RESULTS AND DISCISSIONS

The obtained results of extraction recoveries for the extraction methods (ASE extraction, Soxhlet extraction and Column extraction) are presented in the table 1. Higher recoveries were observed for HCB in the three extraction methods, this could be due to the stability and low volatility of this compound. The lowest recoveries were attained for MCB and TCB. These compounds present higher volatility, therefore higher losses during the extraction procedure.

The ASE extraction method presents the lowest standard deviation (SD), as it is an automated technique when the extraction parameters are regularly the same from one to the other replicate.

Table 1. The extraction recoveries of ^{14}C-chlorobenzenes from soil for the tested extraction methods (n=3, ±SD).

Chlorobenzenes	Recovery (%) ± SD		
	ASE extraction	Soxhlet extraction	Column extraction
^{14}C-HCB	100,5±2,5	100,4±13,9	90,3±6,9
^{14}C-TCB	88,0±3,3	92,9±14,5	86,8±7,6
^{14}C-MCB	88,0±5,0	71,4±3,9	86,2±6

The accelerant solvent extraction (ASE) technique can be recommended for the extraction of chlorobenzenes from the soil samples, since the extraction efficiencies were satisfactory and furthermore the deviation standards were lower and consume less time and solvents than the other extraction techniques.
The qualification of the chlorobenzenes was attained by comparing their retention times with chlorobenzenes standards that were injected in GC-ECD under the mentioned conditions. The retention time of chlorobenzenes, varied from low to high chlorinated benzenes. DCBs and TCBs can be detected first and then TeCBs, PCB and HCB as high chlorinated benzenes which are characterized by volatilization in higher temperature.
The quantification was performed by using linear calibration curves (r^2=0,99) of the individual chlorobenzenes. In the Figure 1 are presented as example the calibration curves of HCB and 1,3,5-TCB. It should be mentioned that the samples were diluted in the cases of quantifications of HCB and the other chlorobenzenes when the concentrations were above linear range of calibration curves.
Chlorobenzenes recoveries and detection limits
The total recoveries of all chlorobenzenes were tested for the presented analytical method. Standard solutions of chlorobenzenes with known concentrations were applied to the soil sample and followed the same procedure as describe above including soil sample preparation, ASE extraction, liquid-liquid separation, filtration, concentration, clean up and injection in GC-ECD.
The parallel tests were conducted with labelled MCB and HCB to compare the obtained results in concentration calculation from GC analysis with the measuring of the radioactivity. The total recovery for each chlorobenzene (table 2) was calculated based on the initial applied concentration and the finned concentration from GC analysis. The obtained results were corrected according to the respective recovery of chlorobenzenes. The detection limits of chlorobenzens in the GC-ECD were also estimated (table 2). The prepared standard solutions of each chlorobenzene in different concentrations were injected in GC-ECD at least in four replicates. Linear regression between concentration and peak area of respective chlorobenzene was used for estimation. Furthermore, the detection limits of chlorobenzenes were calculated by using a software programme StatCal version 3.3.

Table 4. The total recoveries, detection limits in GC-ECD and Method detection limits of chlorobenzenes.

Nr.	Chlorobenzes	Recovery ± SD (in % of appl. amount)	GC-detection limit (pg/µl)	Method detection limit (µg/kg soil, d.w.)
1.	MCB	9,80 ± 1,16	250.00	765,31
2.	1,3-DCB	20,52 ± 2,41	4.97	7,26
3.	1,4-DCB	19,62 ± 2,91	7.79	11,91
4.	1,2-DCB	25,30 ± 2,75	3.64	4,32
5.	1,3,5-TCB	26,48 ± 1,39	1.91	2,16
6.	1,2,4-TCB	36,63 ± 2,01	1.54	1,26
7.	1,2,3-TCB	40,36 ± 3,61	2.19	1,63
8.	1,2,4,5- & 1,2,3,5-TeCB	59,46 ± 2,14	0.99	0,50
9.	1,2,3,4-TeCB	64,36 ± 1,68	0.75	0,35

10.	PCB	81,93 ± 3,70	0.64	0,23
11.	HCB	84,13 ± 4,30	0.38	0,14

The detection limit of the presented method was calculated based on the chlorobenzene recoveries of the presented analytical method and on the detection limits in GC of each chlorobenzes (table 2). The results show that method detection limits are decreasing from low to high chlorinated benzenes.

4. CONCLUSIONS

The accelerant solvent extraction (ASE) technique can be used for the extraction of chlorobenzenes from the soil samples, since the extraction efficiencies were satisfactory and furthermore the deviation standards were lower and consume less time and solvents than the other extraction techniques.The presented method can be used for the determination of chlorobenzenes in soil samples. Furthermore, high chlorinated benzenes as HCB and PCB could be detected by using this method in very small amounts in soil samples.

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Paper 142

Animal waste management and their impact on methane emissions

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ABSTRACT

The intensification of the livestock sector contributes to climate change, air pollution, soil and water degradation. Animal waste is important sources of methane, nitrous oxide and ammonia emissions.
The present study aims to estimate methane emission inventories from manure management for domestic livestock in Shkodra district, using Tier 1 methane emission factors of IPCC (2006) and national population of each species of domestic livestock.
The study describes the potential contribution of on-farm biogas production by anaerobic digestion in reducing GHG emissions from livestock operation, either via the production of renewable energy to substitute fossil fuel and or via the reduction in chemical fertilizer needs for livestock and cash crop productions.

Key words: livestock, animal waste, potential, biogas, GHG

INTRODUCTION

Livestock manure is primarily composed of organic matter and water. Anaerobic and facultative bacteria decompose the organic matter under anaerobic conditions. The end products of anaerobic decomposition are methane, carbon dioxide, and stabilized organic material. Several biological and chemical factors influence methane generation from manure. Methane is a potent greenhouse gas with 21 times the greenhouse warming, on a mass ratio basis U. S.EPA 2007.
The methane production potential of manure depends on the specific composition of the manure, which in turn depends on the composition and digestibility of the animal diet. The amount of methane produced during decomposition is also influenced by the climate and the manner in which the manure is managed. The manage end system determines key factors that affect methane production, including contact with oxygen, water content, pH, and nutrient availability. Climate factors include temperature and rainfall. Optimal conditions for methane production include an anaerobic, water-based environment, a high level of nutrients for bacterial growth, a neutral pH (close to 7.0), warm temperatures, and a moist climate.
The aim of this study is to highlight and estimate methane emission in atmosphere from the animal waste matter of livestock in Albanian farm conditions.

MATERIAL AND METHODS

The methane emission from animal waste matter of livestock in Albanian farm conditions was analyzed and estimate in Shkodra region.

A. According to formulas we identified as follow:
   Number of farms per commune
   Number of animals according to species/type
   Production level
   Manner or System of waste management

B. Manure generation was calculated for each livestock type using the following equations:

- Total raw manure (kg/day) = No. of animals (head) X Raw manure per animal per day (kg) (1)
- Manure total solids (kg/day) = Total raw manure (kg/day) X Per cent total solids (%) (2)
- Collectible manure total solids (kg/day) = Manure total solids (kg/day) X % collectible (3)

C. Methane emission was calculated using Tier 1 IPCC (2006) method and the formula as shown below:

$$\mathbf{CH_4 = EF_T \times N_T}$$

Where:
CH_4 Manure = CH_4 emissions from manure management, for a defined population,
EF(T) = emission factor for the defined livestock population, kg CH4 head-1 yr-1
N(T) = the number of head of livestock species/category T in the country
T = species/category of livestock

D. It was calculated the quantity of potential methane that could be produced in case when the waste in managed under a biogas production system.
Daily potential for biogas generation was calculated using the following equations:

1. *Potential Volume of Biogas (Litres/day) = Collectible manure total solids (kg/day) X typical volume of biogas produced per kg total solids (L/kg TS)*
2. *Potential Volume of Methane (L CH4/day) = Potential Volume of Biogas (L/day) X % Methane in Biogas*
3. *Weight of Methane produced per day (Kg CH4/day) = Potential Volume of Methane (L CH4/day) X Density of Methane (Kg/L)*
4. *t CO2 equivalent/year (tonnes) = t CH_4/year X $GWPCH_4$*
   where $GWPCH_4$ = Global Warming Potential for CH_4 (t CO_2/CH_4) = 21 (IPCC 2006).

RESULTS AND DISCUSSION

As result of analyzing the livestock development in Shkodra region was prepared the Table 1 which indicates the number of livestock per commune

Table 1 Number of livestock by category and by commune in Shkodra region

N	Commune	Dairy	Sheep	Goats	Poultry	Pig	Horse
1	Bushat	5600	3800	700	75500	7700	750
2	Bërdicë	2380	3200	240	21500	1600	300
3	Velipojë	2500	3700	1170	17200	2300	115
4	Dajç	3500	3100	300	20000	2700	150
5	Ana Malit	1580	800	650	18000	100	90
6	Postrribë	1480	3000	5800	15000	260	195
7	Guri Zi	2230	2300	2200	19800	2700	340
8	Hajmel	1500	460	140	26800	2270	55
9	Rrethina	2680	2600	350	116500	1300	210
10	Vau Dejes	2200	2100	1860	35700	3850	165
11	Shkodër(qytet)	630	200		20500	1250	30
12	Vig Mnelë	530	1100	1100	2400	1120	16
13	Pult	400	600	2000	1200	400	10
14	Shosh	290	400	1500	700	200	5
15	Shalë	410	850	1300	1500	315	10
16	Shllak	160	250	800	1800	245	5

17	Temal	300	250	1300	1300	300	
∑		**28370**	**28710**	**21410**	**384900**	**28610**	**2446**

Table 2 shows calculation data per each category and for the daily quantity of organic waste as well as the waste quantity which are calculated by using addition coefficient method. Small ruminants and horses are managed in extensive systems and most of the cases are grazing in pastures and for this reason their calculation is difficult and this is the reason why they are not present in the below table 2.

Table 2: Total quantity of waste that could be gathered in Shkodra region

Livestock Type	Head (no.)	Fresh Manure /head (kg/day)1	Total Solids (% of fresh manure)*	% Collectible	Total manure t/day	Total manure t TS/day
Dairy Cows	22580	35	13	80	632.24	81
Beef steer	5790	25	13	75	108.56	14.1
Fattering pigs 50 kg	26412	3.3	9	90	78.443	7.05
Breeding sow	2209	16	9	95	33.577	3.02
Poultry	384900	0.12	25	70	32.332	8.08
Sheep	28710	3.9	32	45	50.386	16.12
Horse	2446	39	15	60	57.236	8.6

*Data from New Zealand Ministry of Agriculture and Fisheries AgLink FPP603 (1985)

Methane emission quantity CH_4 is calculated according to the Tier 1 method. It is a simplified method that only requires livestock population data by animal species and climate region or temperature, in combination with IPCC default emission factors, to
estimate emissions. Average yearly air temperature for Shkodra region in our study is calculated 18 ^{o} Celsius. In table 3 shows the methane quantity values which are emissioned by each animal species and the total value.

Table 3 Methane emissions from livestock's manure management by species

Livestock Type	Head (no.)	Emission Faktors kgCH_4 head/yars	Baseline CH_4 Product t CH4 / vit	tCO2 eq	Contribution to the categori %
Dairy Cows	22580	**23**	519.34	10906.14	71.8
Beef steer	5790	**11**	63.69	1337.7	8.7
Fattering pigs 50 kg	26412	**4**	105.65	2118.4	14.6
Breeding sow	2209	**7**	15.46	323.4	2.3
Poultry	384900	**0.02**	7.7	161.7	1.1
Sheep	28710	**0.15**	4.3	90.4	0.6
Goats	21410	**0.17**	3.6	76.4	0.4
Horse	2446	**1.64**	4.01	84.02	0.5
TOTAL			**723.8**	**15098.3**	**100**

Total quantity of CH4 emissioned by livestock in Shkodra region is approximately 723 ton per year. Emission contributions show that cattle represent 80.5% of the total CH4 emissions, followed by pigs 16.9% ; horses (0.5%), sheeps (0.6%) and poultry (1.1%) goats 0.4 %. In conclusion, GHG emissions from farming sector are strictly conditioned by cattle population.

Reduce emissions of harmful gases in the atmosphere coming from economic development of livestock sector today constitute one of the important areas of research. According to many studies and authors one of the most efficient ways is the management of these wastes in an anaerobic process of bio-methane. During this process, decomposition of their organic matter leads to the formation of biogas wich contains CH_4.

Livestock Type	HEAD	Total Collectible manure TS (kg/d)	Typical Volume Biogas Produced (L/kg TS)	Potential Volume of Biogas (L/Day)	% Methane in Biogas	Potential Volume 0f CH4 (LCH4/day)	Density of CH4 (kg/L)	Kg CH4 /day	t CH4/yr	t CO2eq/ yr
Cattle	28370	95.1	190	18069	60	1084100	0.00067	726	264	5547
Pig	28621	10.07	310	31217	55	1716900	0.00067	1150	419	8793
Poultry	384900	8.08	375	3030	57	172700	0.00067	115.7	42.3	886.2
Sheep	28710	16.12	200	3224	56	180500	0.00067	121	44.17	927
Goats	21410	10.02	200	2004	52	104200	0.00067	69.8	25.5	535.5
Horses	2446	8.6	210	1806	60	108400	0.00067	72.6	26.5	556.5

Already formed, this gas can be used as renewable energy source.

In the following tables 4 and 5 we have calculated theoretical amount of potential that can be produced from these wastes and have calculated reducing. harmful gas emissions after the implementation of this biotechnology.(only for cattle).

Table 4 Biogas potential that could be produced in Shkodra region.

Table 5 Calculated Annual Baseline Emissions and Net Emission Reductions from Biogas1

	Head	Baseline Emission		Potential Leakage from Bigaz System		Potential net emission Reduction	
Livestock Type		**t CH4**	**t CO2 ekivalent**	**t CH4**	**t CO2 ekivalent**	**t CH4**	**t CO2 ekivalent**
Cattle	**28370**	**583**	**12243.8**	**264**	**5547**	**319**	**6696**

CONCLUSIONS

Development of livestock in our country was increased by 17% during the period 2009-2010. As result, this development has increased the amount of organic waste which on 95% of them are not managed. Our study analyzed Shkodra region:

- Total amount of CH_4 emissioned by livestock in Shkodra region is approximately 723 ton per year.
- Emission contributions show that cattle represent 80.5% of the total CH4 emissions, followed by pigs 16.9% ; horses (0.5%), sheep (0.6%), poultry (1.1%) and goats 0.4 %.
- Waste management as the main source in the process of bio-methane decreased significantly CH_4 emissions in the atmosphere.
- From the remains of cattle in this region can be produced 583 ton of CH4 per year as part of the biogas when it occupies 55%.
- Bio-methane from bovine waste reduces 50% of the CH_4 emission as well as the CO_2 equivalent.

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Paper 146

Correlation between Aluminum in Drinking Water and the Risk of Alzheimer's disease

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Abstract
Maintaining good drinking water quality is a critical consideration, since it is an important influence on own health and therefore quality of life.[1] One of the chemical element in our diet that can influence health is aluminum. It is certainly possible that Aluminum may be a key risk factor in Alzheimer's disease.[2] In Albania Aluminum is not classified as main cause of that disease. Thereupon is undertake this investigation in order to know about this phenomena as well as increase the realization that need in this direction
In the following material are presented the aluminum quantity in pretreated and treated water in the bovilla water treatment plant, which is the most important public establishment of the water supply in Tirana city. It's noticed an increase of the aluminum quantity in the drinking water, especially in hard rainy periods, so it's performed a four years monitoring of the aluminum presence in water, to have an idea and projects to optimize the treatment process in order to minimize the quantity of aluminum, and improve the quality of the drinking water.

Keywords: aluminum, Alzheimer's disease, neurotoxin, treatment plant.

Introduction

Aluminum is the most abundant metallic element of the Earth's crust, occurring in minerals, rocks, and clays. Naturally occurring aluminum as well as aluminum salts used as coagulants in water treatment are the most common sources of aluminum in drinking water.[7]Aluminum salts is used in treatment water as coagulant to reduce organic matter, colour, turbidity and microorganism levels. Such use may lead to increased concentration of aluminum in finished water [8,9]
Bovilla water treatment plant is the most important public establishment of the water supply in Tirana city, which use surface, water of bovilla lake. The treatment technologic process follow the diagram:
Oxidation → Coagulation – Sedimentation → Filtration → Disinfection
The water treated with chemicals as: Poly Aluminum Chlorine (Aln(OH)m (Cl) x SO4)v) 10%
(as coagulant – flocculent), Sodium Hypochlorite (NaOCl) 13-15% (as oxidant – disinfectant). Hydrochloric Acid 30-33% (as corrective pH). During the period of the appearance of the water taste is used, Powder Activated Carbon.

Health risks of aluminum

Drinking water is a relatively small source of exposure to aluminum compared to food, but it has been suggested that the chemical form of aluminum in drinking water could be more easily absorbed from the gastrointestinal tract than aluminum from food.[10,11]According to *Water Uk Technical Briefing Note* (November 2006) was suggested that a high concentration of aluminum in drinking water might be a factor in the development of other neurological diseases in the general population, particularly Alzheimer's disease.[5] This is a common form of senile and pre-senile dementia, for which there is presently no effective treatment. Aluminum was identified as being present in the characteristic lesions in the brains of Alzheimer's patients, along with other chemical elements. When the aluminum was paired with beta-amyloidal, a protein found in the brains of Alzheimer's patients, the combination killed off even more cells. [4]

Material and methods

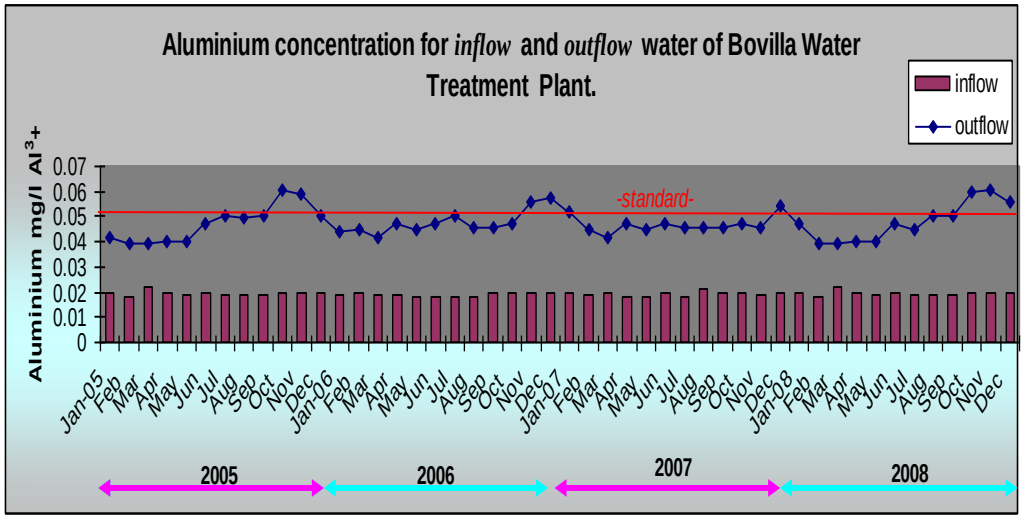
It is studied for three year the quantity of aluminum in water of inflow (lake water) and outflow of the plant, making everyday chemical analysis in laboratory of the Bovilla system.
The test method is based on Standard methods for the examination of water and wastewater (19th ed.): Rapid modified Eriochrome cyanyne R method for determination of aluminum in water.[6]
The laboratory test method measures both dissolved aluminium as well as the aluminium that is present in any soil particles present. Acid-soluble aluminium is what remains after adding acid to the water sample and filtering out the remaining particles, which can contain aluminium that is acid-insoluble. [3]

Results and Discussions
According to Albanian standard about Drinking Water Quality , based on European directives Nr 80/778 (August 1993) the allowed value of aluminum in drinking water are:

	Measure units	Standard	Max. allowed value
Aluminum	mg/l Al^{3+}	0.05	0.2

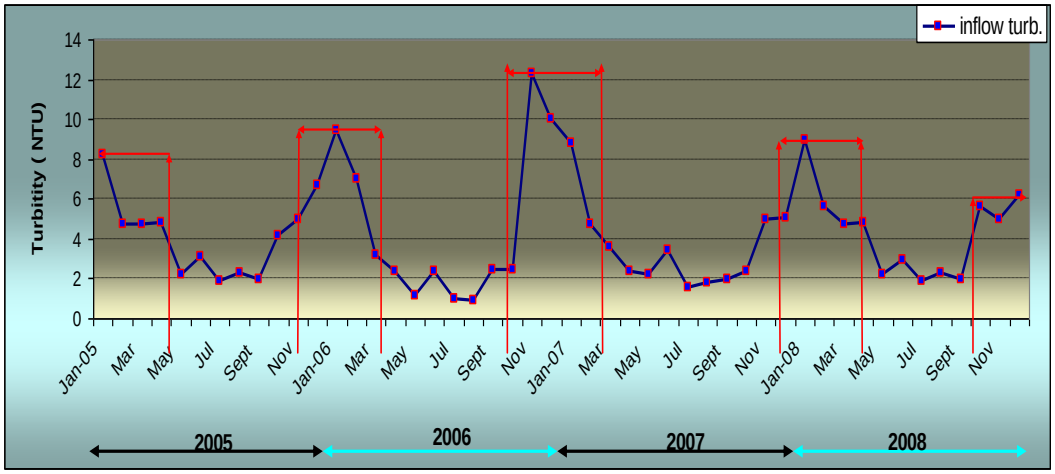
The aluminum variability of inflow and outflow water of bovilla water treatment plant, for the period 2005-2008 (the mean values) are given below:

The monthly mean values of aluminum (Al^{3+})



In the period October – March because of the intensification of rainfall, erosion and the decrease of the temperatures etc the concentration of aluminum in the outflow water endure visible deviations. In the chart nr .2 are figured the monthly mean values of turbulence for the same period, as we see, for high value of turbulence we have also high value of aluminum concentration in consequence of increase quantity of coagulant in treatment process.

The monthly mean values of turbulence for the period 2005 -2008.



Conclusions and recommendations

Lake Water Protection would be an beneficial process of managing activities in the watershed to minimize adverse effects on water quality. That will generate savings by avoiding costs of additional water treatment or supply development. It is much easier and less costly to protect water quality than it is to restore water quality.

Minimizing health risks requires that the Bovilla lake water be as clean as possible, so ;

It is recommended to be undertaken some activities for the reduction of erosion and contamination in the Bovilla reservoir, which can be focused in the implementation of the techniques and models for the control of land erosions (for example: the reforestation of the naked areas etc.) and to avoid the fecal contamination extending the sanitary area in all the basin of the reservoir.A lower level of the contamination of the Bovilla lake will decrease of the quantity of the chemicals that are used in the treatment water process having in this way a double profits: in quality (the decrease of aluminum quantity) , and also lower costs of the water production.Several approaches could be available for minimizing residual aluminum concentrations in treated water. This include use of optimum pH (7.5 – 7.8 pH) in the coagulation process, avoiding excessive aluminum dosage, good mixing at the point of application of the coagulant, optimum paddle speeds for flocculation and the efficient filtration of the aluminum floc . The optimum aluminum range lies between 20 and 300 μg/L.

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Paper 147

Preparation of Paratuberculosis Vaccine for Anatolian Wild Sheep: Preliminary Report

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Abstract
Four different vaccine (inactivated bacterin+aliminium hydroxide ($Al(OH)_3$), inactivated bacterin+mineral oil, live+mineral oil, gamma irridation+mineral oil) from *Mycobacterium avium subs. paratuberculosis* (MAP) strain isolated from Anatolian Wild Sheep (*Ovis gmelinii anatolica*), Etlik MVKAE from bovine strain (one) and subunit (one) vaccine were prepared. Commercial Gudair^{TM} vaccine were used as positive control. Each vaccine were subcutaneously administared to 15 Akkaraman lambs 2 months age old. Ten lambs were unvaccinated as negative control. Lambs to 5 in each vaccine groups were divided for seropotens. After vaccination at 40 days, lambs in groups of vaccine (lambs to 10, 7 groups, 70 lambs) and control (10 lambs) were orally challenged with MAP isolate into milk at $2x10^9$ cfu/ml. Taking into account seropotens groups, antibody titres were monitored by ELISA. According to the first five post-vaccination serologic measurements; Gudair vaccine provided faster antibody production but developed 4 vaccine formulation (inactivated bacterin+mineral oil, gamma irridation + mineral oil, live+mineral oil, live Etlik) were determined stimulated to humoral immunity as measured in the positive control at 5th measurements. In addition, INF-□, skin test by PPD johnin, lenfosit transformation test and clinical efficiences were observed. It has shown that data in laboratuar efficiency tests of vaccine prepared from Anatolian Wild Sheep isolate in domestic lambs could also be protective against paratuberculosis infection for Anatolian Wild Sheep.

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Introduction

Paratuberculosis is highly a contagious diseases caused by *Mycobacterium avium subspecies paratuberculosis (MAP)* in domestic (cattle, sheep, goats, horses) and wild animals (antelope, deer, sheep, goats, martens, foxes, weasels, etc) and induced by chronic diarrhea, weight loss and ending in death. In recent years, the zoonotic importance of paratuberculosis has created by reports in human Crohn's Diseae transmitted from animals. In some countries, this disease is "notifiable disease".

The objectives of this study were aimed to development of different vaccines [wild strain from isolated sheep, 4 vaccine (3 inactive and 1 live), Etlik 1 live vaccine (bovine strain) and 1 subunit vaccine (coctail)] and to determine efficacies in domestic lambs for the control of paratuberculosis diagnosed in anatolian wild sheep (Ovis gmelinii anatolica) in the region of Konya, Turkey.

Material and Method

The Diagnosis of paratuberculosis in anatolian wild sheep. Paratuberculosis were clinically diagnosed in remaining behind the herd and indivual, chronical diarrhea, weak and/or sometimes death in animals

The isolation and molecular characterization of Mycobacterium avium subspecies paratuberculosis strains. The infected/affected animals were brought to Selcuk University, Faculty of Veterinary Medicine, were euthanized. After necropsy, samples of feces, intestinals and nodules of lymph were taken and were cultured on medium of Herold's Egg Yolk. All medium were incubated at 37°C for 3

months (Marsh et al 1999, Sevilla et al 2005, Whittington et al 2001). The isolates of wild sheep and referance strain (Etlik MAP) were analysed by PCR with IS900, IS 901 and IS1311 primers.

Bacteria. A isolate (SUVEF 2009) of wild sheep for local vaccines and a referance strain (Etlik MAP, bovine strain) for live vaccine were used as master seed.

Vaccines. Four different vaccines (Inactive+Aliminium hidroxide, Inactive+Montanid ISA201VG, Live+Montanid ISA201VG and Inactive+ Gamma irridation+Montanid ISA201VG) were prepared using isolate of wild sheep. Also, Etlik live vaccine were prepared from Etlik referance strain (bovine strain).A subunit vaccine were prepared using 2 different antigen (fibronectin binding antigen 85B "QRNDPSLHIPELVGHNTR" and GroEs "AKRIPLDVSEGDTVC, JPT, Germany). In brief, total 6 different kombination of vaccine were manufactured (Inactive+Aliminium hidroxide, Inactive+Montanid ISA201VG, Live+Montanid ISA201VG, Etlik Live+Montanid ISA201VG, Inactive+Gamma irridation+Montanid ISA201VG, Subunit+Montanid ISA201VG). Local vaccines were compared with a commercial (Gudair, Spain) vaccine (OIE 2004b).

Picture 1. Paratuberculosis vaccines are produced in our laboratory

The sterility and safety tests. The paratuberculosis vaccines in steps were performed microbiological analysis (aerobic, microaerofilic, anaerobic, mycoplasma and micotic microorganisms) for sterility. Also, 2 quine pigs were subcutaneously immunized and adverse reactions were recorded for 8 weeks by observation of animal behaviour and local reactions (EMEA 1994, OIE 2004a).

Vaccination. Paratuberculosis vaccines were subcutaneously administered to lambs (2 months) once dose in the region left ear (Picture-2). Totally, total 105 lambs were vaccinated, each groups were included 15 lambs (Table-1). Also, 10 non vaccinated lambs were used as controls. Inactive+Aliminium hidroxide vaccine were administered twice at interval 3 weeks (DeJong and Bouma 2001, Reddacliff et al 2006).

Picture-2. Vaccination and challange of lambs

Challenge trials. The challenge trials were done with a isolate of wild sheep (*Mycobacterium paratuberculosis* SUVF 2010) at 45 days after vaccination. Ten lambs (for each groups) were orally

challenged four times at intervals 4-5 days, with a isolate of wild sheep at $1x10^9$ bacteria/ml (Hines et al 2007)

Table-1. The number of lambs in vaccines and control groups

Groups	Vaccine	Number of lambs
Seropotens groups		**35**
Vaccinated /Control	Inactive+ aliminium hidroxide	5
Vaccinated /Control	Inactive+ Montanid	5
Vaccinated /Control	Live + Montanid	5
Vaccinated /Control	Commercial Control Vaccine (Gudair, Positive Control)	5
Vaccinated /Control	Etlik live+Montanid	5
Vaccinated /Control	Inactive+ Gamma irridation+Montanid	5
Vaccinated /Control	Subunit + Montanid	5
Challenge groups		**80**
Vaccinated/ Challenged	Inactive+ aliminium hidroxide	10
Vaccinated/ Challenged	Inactive+ Montanid	10
Vaccinated/ Challenged	Live + Montanid	10
Vaccinated/ Challenged	Commercial Control Vaccine (Gudair, Positive Control)	10
Vaccinated/ Challenged	Etlik live+Montanid	10
Vaccinated/ Challenged	Inactive+ Gamma irridation+Montanid	10
Vaccinated/ Challenged	Subunit + Montanid	10
Non-Vaccinated/ Challenged	**Montanid** (Negative control)	10

Humoral immunity. Blood samples were collected from vaccinated/non-vaccinated/challenged lambs at the averages of 45-60 days after vaccination. The levels of antibodies in were measured with a commercial ELISA kit (MAP antibody, Pourquier, France) and seropotens were determined (Begg and Griffin 2005).

Cellular immunity. Whole blood samples were taken at intervals 3 months after vaccination. Cellular immunity in vaccinated/non-vaccinated/challenged lambs were determined by Gamma IFN (ELISA kit, Mabtech) test and Lymphocyte Transformation test Prescott et al 2002, Singh et al 2007).

The Microscobic examination of fecal samples. The fecal samples were collected from vaccinated/non-vaccinated/challenged lambs at 3-6 months after vaccination. The microscobic control of the samples were done by stained Zielh-Neelsen method (DeJuan et al 2006, Nielsen and Todd 2008).

The isolation of MAP from fecal samples. The fecal samples were collected from vaccinated/non-vaccinated/challenged lambs at 3-6 months after vaccination. Fecal samples were cultured on medium of Herold's Egg Yolk and were incubated for 3 months (DeJuan et al 2006, Nielsen and Todd 2008).

PCR analysis of fecal samples. The fecal samples were collected from vaccinated/non-vaccinated/challenged lambs at 3-6 months after vaccination. Fecal samples were analyzed with nested PCR (Marsh et al 1999, Sevilla et al 2005, Whittington et al 2001).

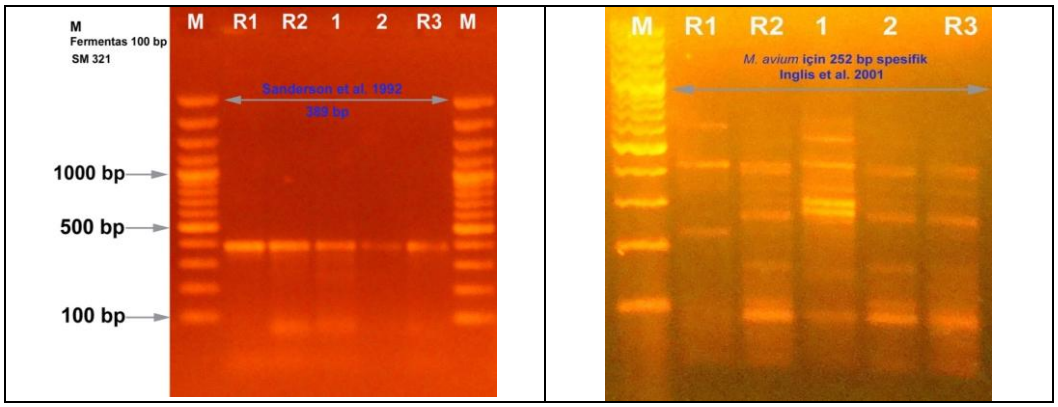
RESULTS

Picture-3. Diagnosis of Paratuberculosis in Anatolian Wild Sheep

Two strains of *Mycobacterium avium subspecies paratuberculosis(MAP)* (SUVF 2009 and 2010) were isolated from anatolian wild sheep .

Picture-4. The isolation of isolate of wild sheep on medium of Herold's Egg Yolk

Two isolates were determined by IS900 as *M. avium subsp paratuberculosis* and by IS1311 as strain of sheep. Also, this isolates were detected not to be *M. avium* by IS901.



Picture-5. PCR analysis of the isolates

Local Reactions. No local reactions were determined by palpating at injection site and any stress or abnormal behaviour of animal were also recorded by observation for 48 hours.

Humoral Immunity

Table 3. The Data of Antibodies (Seropotens) in Vaccinated/ Challenged Lambs

Samples	Inactive AL(OH)3	Inactive Montanid	Live Montanid	Commercial Gudair	Etlik Live	Gamma Montanid	Subunit*	Control
1	0,173±0,021	0,173±0,021	0,173±0,021	0,173±0,,21	0,173±0,021	0,173±0,021	0,00±0,00	0,173±0,021
2	0,191±0,059	0,270±0,066	0,372±0,132	1,750±0,216	0,281±0,050	0,315±0,091	0,524±0,077	0,173±0,021
3	0,816±0,315	1,802±0,440	0,876±0,318	3,500±0,081	1,753±0,405	0,735±0,200	0,696±0,095	0,103±0,010
4	0,335±0,062	2,986±0,124	2,354±0,470	3,211±0,046	2,537±0,589	2,836±0,248	0,674±0,060	0,328±0,097
5	0,475±0,104	2,389±0,525	1,702±0,261	2,756±0,244	1,936±0,240	3,00±0,00	0,708±0,103	0,229±0,050
6	0,214±0,035	1,761±0,252	1,412±0,184	2,793±0,207	1,827±0,214	2,257±0,508	0,754±0,071	0,191±0,087

*ELISA kit were prepared with subunit peptide used preparing vaccine antigen. The levels of antibodies were measured with this ELISA kit in subunit vaccine group

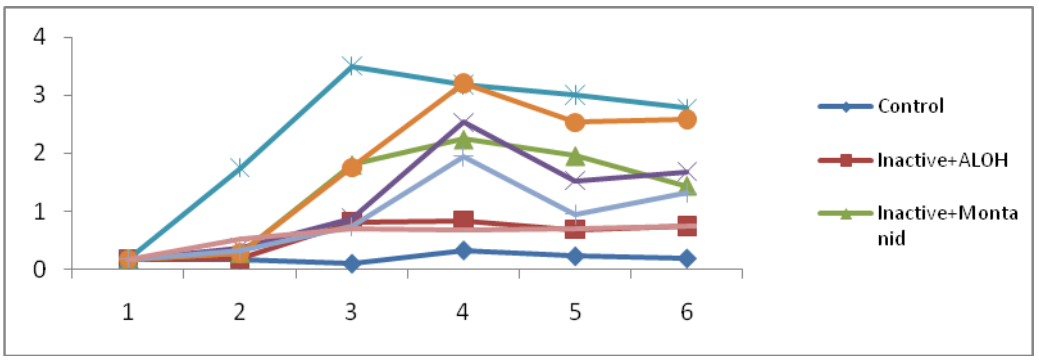


Figure-1. Antibody titers of the vaccine groups

When serological measurements of produced vaccines in this project were compared with commercial vaccine (Gudair) at sampling before and after vaccination, the levels of antibodies in vaccines of Etlik Live and Gudair were higher than others. However, the other 4 vaccines (inactive+Montanid, inactive+gamma+Montanid, live+Montanid and Etlik live) seems to stimulate humoral immunity at 6. sampling. While the levels of antibodies of some vaccines (Gudair, Etlik live, inactive+gamma+Montanid and live+Montanid) were observed in fall at 5. sampling, the titres of inactive+aliminium hidroxide and subunit vaccines were low but the stability is remarkable. Whilst these data given an idea related to the occurrence of humoral immune response, no there is a direct correlation between antibody titers and protection.

Table 4. The data of positive (%S/P) in Vaccinated and Challenged Lambs

Samples	Inactive AL(OH)3	Inactive Montanid	Live Montanid	Gudair	Etlik Live	Gamma Montanid	Subunit*	Control
1	0/10	0/10	0/10	0/10	0/10	0/10	0/10	0/10
2	0/10	0/9	1/10	9/10	0/10	0/10	0/10	0/10
3	2/7	5/7	3/9	7/7	5/8	3/7	0/7	0/10
4	2/7	6/7	8/8	7/7	7/7	6/7	2/7	0/10

5	3/6	7/7	8/8	7/7	7/7	4/7	2/7	0/10
6	0/7	4/6	4/7	7/7	7/7	3/7	7/7	0/10

When positivity data were compared at vaccinated and challenged lambs, all of the samples in lambs vaccinated with Gudair were determined seropositivity. Also, the seropositivity were higher in lambs vaccinated with Etlik live, inactive+Montanid, Live+Montanid and inactive+gamma+Montanid

Table- 5. The ratio of wight of lambs (kg)
(Calculated by weighing all the animals in groups)

Samples		**Inactive $Al(OH)_3$**	**Inactive Montanid**	**Live Montanid**	**Gudair**	**Etlik Live**	**Inactive Gamma Montanid**	**Subunit**	**Control**
Challenged	**1**	34,00±6,46	36,50±3,44	35,60±6,86	36,606,25	37,10±5,08	33,80±3,88	31,22±6,88	31,30±6,37
	2	52,22±6,99	51,11±3,79	51,30±9,56	52,80±6,54	54,70±3,59	52,00±4 33	50,88±7,20	
Sero potens	**1**	33,40±5,72	35,60±4,15	32,25±6,13	36,60±5,72	31,00±6,20	34,80±8,98	35,00±3,00	50,66±6,04
	2	48,00±2,94	53,40±3,50	51,50±10,97	49,40±5,50	49,25±4,34	54,75±5,43	52,00±1,41	

The live weights of lambs were weighed twice at intervals of 6 months. Although differences in the live weights of lambs between groups of seropotens and challenge were, the differences statistically were insignificant.

Table 6. Tuberculin test (PPD Johnin, the number of lambs were recorded as ≥ 3 mm reaction)
(tuberculin test done all the animals in the groups)

Samples		**Inactive Al(OH)$_3$**	**Inactive Montanid**	**Live Montanid**	**Gudair**	**Etlik Live**	**Inactive Gamma Montanid**	**Subunit**	**Control**
Challange	**1**	4/10	6/10	6/10	6/10	4/10	2/10	3/9	1/10
	2	4/9	7/10	8/10	7/10	6/10	5/10	3/9	
Sero potens	**1**	0/5	3/5	2/4	1/5	0/5	2/5	0/3	0/9
	2	1/5	4/5	2/4	2/5	2/4	¾	0/2	

When measurement of skin thickness of lambs were compared in groups of seropotens and challenged after application of PPD Johnin antigen, skin thickness were generally found in challenged lambs. More reaction in challenge groups were determined in groups of inactive+Montanid, Live+Montanid and Gudair vaccines.

Table 7. The ratio of OD in Lenfosit transformation test (LTT)
(5-7 lambs were sampled in each groups)

	Samples	Inactive $Al(OH)_3$	Inactive Montanid	Live Montanid	Gudair	Etlik Live	Iactive Gamma Montanid	Subunit	Control
Sonicated MAP	**1**	0,982±0,35	0,775±0,18	0,911±0,32	0,729±0,17	0,659±0,11	0,745±0,31	0,733±0,19	0,716±0,19
	2	1,887±0,41	1,076±0,32	1,736±0,61	1,591±0,45	1,392±0,35	1,693±0,39	1,569±0,54	1,882±0,41
	3	0,632±0,26	0,680±0,16	0,898±0,41	0,600±0,27	0,858±0,27	0,853±0,33	0,759±0,35	0,690±0,31
	4	0,572±0,11	0,768±0,27	0,795±0,26	0,547±0,11	1,105±0,61	0,672±0,22	0,560±0,20	0,656±0,24
Con A	**1**	0,812±0,19	0,743±0,12	0,773±0,21	0,702±0,10	0,677±0,12	0,817±0,32	0,707±0,26	0,755±0,21
	2	1,309±0,36	0,93±0,32	1,365±0,65	1,497±0,32	1,136±0,24	1,508±0,40	1,045±0,27	1,489±0,60
	3	0,781±0,34	0,578±0,14	0,757±0,38	0,658±0,20	0,787±0,58	0,718±0,35	0,666±0,16	0,912±0,40
	4	0,640±0,37	0,718±0,34	0,712±0,25	0,669±0,26	0,701±0,27	0,610±0,23	0,527±0,23	0,895±0,50

Lymphocyte Transformation Test. OD values were determined at each stage (after incubation for 5 days in incubator, the addition of MTT and after incubation for 4 hours, the addition of DMSO and after 1 overnight incubation) of the test for optimization. Optimization and standardization of the test was performed taking into account the measured values. When compared LLT values of lambs in challenge groups, while results of LLT at 2nd sampling were especially higher in blood samples of lambs in groups of inactive+aliminium hidroxide and control, the differences were statistically insignificant in others sampling periods. Therefore, the high of LLT values in all of groups can be explained by experimental trials at 2nd sampling.

Tablo 8. The data of **INF-γ (OD)**
(5-7 lambs were sampled in each groups)

Samples	Inactive $Al(OH)_3$	Inactive Montanid	Live Montanid	Gudair	Etlik Live	Inactive Gamma Montanid	Subunit	Control
1	0,080±0,009	0,139±0,035	0,087±0,009	0,095±0,009	0,101±0,015	0,096±0,023	0,107±0,032	0,103±0,032
2	**0,208±0,054**	**0,310±0,140**	**0,208±0,084**	**0,201±0,067**	**0,224±0,119**	**0,168±0,073**	**0,245±0,085**	**0,147±0,077**
3	0,112±0,054	0,122±0,048	**0,212±0,274**	0,114±0,037	**0,339±0,539**	0,097±0,007	**0,168±0,139**	0,098±0,019
4	0,098±0,030	0,108±0,033	0,102±0,019	0,092±0,013	**0,243±0,285**	0,101±0,021	0,134±0,056	0,087±0,013

First sampling for IFN- γ before challenge trials and second sampling were done at 45 days after challenge. When levels of IFN- γ compared at all lambs of challenge groups, the values of IFN- γ were higher in all samples of groups at second sampling period, but differences were insignificant statistically. Therefore, the high of IFN- γ values in all of groups can be explained by experimental trials at 2nd sampling. In addition, the values of IFN- γ were found high in some groups (Etlik live, Live+Montanid and subunit) at 3th sampling period. The value of IFN- γ in Etlik live group was only higher than others.

Table 9. The number of lambs as INF-γ positive

Samples	Inactive $Al(OH)_3$	Inactive Montanid	Live Montanid	Gudair	Etlik Live	Gamma Montanid	Subunit	Control
1	0/6	2/6	0/6	0/7	0/7	1/8	1/7	1/7
2	**6/6**	**6/7**	**5/7**	**5/6**	**4/6**	**4/7**	**6/7**	**3/7**
3	2/6	3/7	3/7	3/7	5/7	1/7	3/7	1/5
4	2/7	2/7	1/6	1/9	4/7	3/7	4/7	0/7

*The number of Positive animal/The number of tested animal

When the values of INF-γ in groups of seropotens and challenge were evaluated according to number of positive animal, the more positivity was observed at second sampling period. The number of positive animals for INF-γ at this period were determined in lambs of vaccinated with inactive+aliminium hidroxide, inactive+Montanid, Gudair and subunit vaccines. While the more positivity at 3th sampling was found in lambs vaccinated with Etlik live vaccine, more positive at 4th sampling period were observed in groups of Etlik live and subunit vaccines.

Tablo -10. The results of Bacterioscopy of Fecal Samples in Vaccinated and Challenged Lambs

Sampling	Inactive $Al(OH)_3$	Inactive Montanid	Live Montanid	Gudair	Etlik Live	Inactive Gamma Montanid	Subunit	Control
1- 17.06.10	0/5	0/5	0/6	0/5	0/6	0/5	0/5	0/5
2- 30.07.10	3/5	3/5	4/5	4/6	5/6	3/5	5/7	5/7
3-21.12.10	3/7*	1/7	2/7	0/6	2/7	1/8	3/7	4/7

*: Positive sample/tested

Before vaccination, two samples in goups of Etlik Live and subunit vaccine were found as positive. At 6th days after challenged, different numbers of isolation in fecal samples were done in all lambs of challenged groups. While the lowest rate of isolation were in lambs of Gudair and inactive+Gamma+Montanid vaccine groups, the more positive were cultured at groups of inactive+aliminium hidroxide, Etlik Live and control.

Tablo-11. The results of isolation of fecal samples in vaccineted and challenged lambs

Sampling	Inactive $Al(OH)_3$	Inactive Montanid	Live Montanid	Gudair	Etlik Live	Inactive Gamma Montanid	Subunit	Control

1	0/5	0/5	0/6	0/5	1/6	0/5	1/5	0/5
2*								
3	4/7	3/7	3/7	2/6	4/7	2/8	3/7	4/7

* Bu dönem örneklerinin ekimleri yapılan besiyerleri kontamine olduğundan ekimler tekrarlanmıştır.

Tablo-12. The analysis of Nested-PCR in vaccineted and challenged lambs

Sampling		**Inactive AL(OH)3**	**Inactive Montanid**	**Live Montanid**	**Gudair**	**Etlik Live**	**Inactive Gama Montanid**	**Subunit**	**Control**
1	PCR	0/2	0/5	0/4	0/4	0/4	0/4	0/5	0/5
	N-PCR	**2/2**	**4/5**	**4/4**	**4/4**	**4/4**	**4/4**	**4/5**	**5/5**
2	PCR	0/3	0/5	0/4	0/4	0/4	0/4	0/4	0/2
	N-PCR	**2/3**	**5/5**	¾	**3/4**	**1/4**	**2/4**	**2/4**	**2/2**
3	PCR	0/7	0/6	0/6	0/6	0/6	0/7	0/7	0/7
	N-PCR	**7/7**	**6/6**	**6/6**	**6/6**	**6/6**	**7/7**	**7/7**	**7/7**

Fecal samples were sampled 3 times from vaccinated and challenged lambs. When results of PCR compared, although fecal samples by outher PCR were found as negative, all samples of groups were determined to be positive by Nested-PCR. Almost all fecal samples found positive, it can be explained by choosen spesific method. In addition, the results of Nested-PCR found to be spesific than microscopy and culture.

In conclusion, it has shown that data in laboratuar efficiency tests of vaccine prepared from Anatolian Wild Sheep isolate in domestic lambs could also be protective against paratuberculosis infection for Anatolian Wild Sheep.

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Paper 149

DETERMINATION OF OPTIMAL SIZE OF BIOGAS PRODUCTION SYSTEM IN ANIMAL FARMS CONDITIONS IN ALBANIA.

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Abstract

Agriculture is a important sector in Albania. It provides with 21% in GDP and 58 % of total employment in country.Agriculture in Albania responded for 77% of methane emission and 91% of NO_x. Main resource of CH_4 is enteric fermentation of animal and animal waste that responded 95% of total emissions in country. Cattle sector is main contributes. One of alternative of decrease CH_4 emissions from livestock is anaerobic fermentation of animal waste.
Goal of study is determination of optimal size biogas system in Albanian animal farms conditions. We have studied only animal farms with cow. In 2009 in Albania operated 2977 farms with cow, separated: 1722 animal farms or 58 % with 6 - 10 heads and 1255 animal farms or 42 % with over 10 heads. The amount of gas produced depends on the number of cattle (or other animals) and how it is going to be used.
In these conditions, in farms with 6 – 20 heads should install family size biogas system with 6 or 10 m^3 biogas digester. In farms with 20 – 50 heads should install medium size biogas system composed in 2 – 3 biogas digesters with 10 m^3 capacity each of them. In farms with 50 – 100 heads and over 100 heads should install medium size biogas system composed with some 10 m^3 digester of one or a group of 100 m^3 biogas plant formed into unit.

Key words: methane, biogas, animal waste, cow, biogas system, size.

Introduction

Biogas is a combustible mixture of gases produced by micro-organisms when livestock manure and other biological wastes are allowed to ferment in the absence of air in closed containers [5]. The major constituents of biogas are methane (CH_4, 60 percent or more by volume) and carbon dioxide (CO_2, about 35 percent); but small amounts of water vapour, hydrogen sulphide (H_2S), carbon monoxide (CO), and nitrogen (N_2) are also present. The composition of biogas varies according to the biological material. Biogas has an energy content of about 5.720 kcal / m³, compared to 8.380 kcal / m³ for mashed methane gas, because carbon dioxide is present in the biogas. [4]
There's evidence that biogas was used to heat bath water in Assyria during 10 BC; and the first digestion plant to produce biogas from wastes was built in a leper colony in Bombay India in 1859 [5]
Using biogas also solves the most serious problem of energy supply in rural areas, where people traditionally forage for fuel wood in forest. A 10m^3 digester in rural areas can save 2 000 kg of fuel wood, which is equivalent to reforesting 0.26-4 ha [6]. Africa lost 64 million ha of forest between 1990 and 2005, more than any other continent, and fuel wood gathering was a major cause of forest depletion [5]
The anaerobic digester solves sanitation problems by taking in human as well as animal manure, improving home and farm hygiene and the general environmental conditions. Anaerobic digestion not only yields biogas but also bio-slurry and bio-dregs rich in nutrients, minerals and biologically active compounds that form excellent organic fertiliser for crops and fodder for pig and fish
Biogas can be used directly for cooking, light and for co-generation of electricity and heat, which is especially feasible when the biogas is used at or near the site of generation.

Based on the growing trend of dairy farms in our country 1.7% in the year 2007 [6], this study is focused on the evaluation of biogas potential production from animal waste and optimal size of biogas system in Bushat commune, district of Shkodra.

Material and methods

Goal: Assessment of biogas use from waste animals as an alternate energy resource and determination of optimal size of biogas production system in animal farms conditions in albania.

Objectives:

The trend of livestock development in Bushat Commune

Assessment of animal waste

The potential production of biogas

Determination of optimal size of biogas production system

The study was undertaken in Bushat Commune.

Analyses indicators:

The number of livestock for every category in commune.

The structure and size of farms

Calculations:

Quantity of animal waste according to formula:

Total waste (kg/day) = No animals unit waste (kg/day)/AU *collection factor*.[10]

Quantity of biogas expressed in m^3/day and m^3/year.

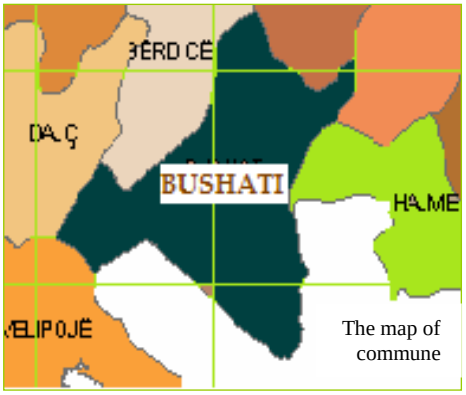
Optimal size of biogas production system according to animal farms size. For this, we referred not only the typical farm in the study area but also the typical farm in our country

In 2009 in Albania operated 2977 farms with cow, separated: 1722 animal farms or 58 % with 6 - 10 heads and 1255 animal farms or 42 % with over 10 heads [7]

Calculations have done according to:

*Fresh manure/day*number of cow*2*retention time(60 days)* [8]

Result and discussion



The map of commune

Bushat commune is located in the district of Shkodra, which lies in the northern area of Albania. It has a surface of 62.5 km2 and includes 9 villages. This commune is situated between two major natural ecosystems, Shkodra lake and Drini river. From observations in the area has been noticed the phenomenon of their pollution. One of the factors of pollution is animal waste of the villages which are not treated but deposited in river flows and into the lake. Analyzing it from local point of view(area of north Albania) and rural development point of view (average level) this commune serves as a reference point for many other communes in Albania. The sustainable development of the area, farming development and increased quality of life has led to increasing demand for energy consumption. Currently the requirements for electricity are covered only by hydro resources of the area. The use of biogas from animal waste is an opportunity to meet potential demand for electricity. In diagram 1 and table 1 is been presented: the number of livestock for category in every commune and the structure and size of farms.

Diag.1 The number of livestock for every category in Bushat commune

Table 1: The structure and size of farms.

No	The Structure of farms	Bushat
1.	Farms with 1-9 dairy cattle	523
	10– 20	39
	11 – 50	4
	more than 51	2
2.	Farms with 5-10 calves	45
	11 – 50	6
3.	Farms sheep till 50 head	97
	51 – 100	22
	101 – 200	8
	more than 200	1
4.	Farm goats till 50 head	13
	51 – 100	3
	101 – 200	1
5.	Farms sow 1 – 5 head	31
	6 – 10	15
	11 – 50	2
	more than 51	1
6	Poultry farms	1
7.	Turkey farms 21-50 head	47
	50-150 head	1

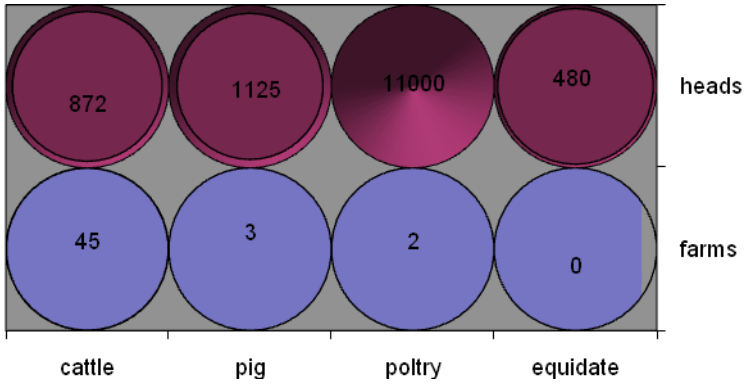
Source: [6] and personal interview

From the analysis of farm size and structure was noticed that livestock production in this commune is about 60% of agricultural production. But the large number of farms with an average size of 0.9-1.4 ha and a very small number of heads shows that these are small family units and not genuine farms. They averagely grow only to cover their family needs 3-4 heads of cattle, 10 sheep and goat, pigs 1-2 and 20-25 birds. These "family farms" constitute approximately 80% of all farms in rural areas not only in Bushat but also in whole Albania.

Based in these data, in order to determine the potential production of biogas from animal waste, there were included only farms which grow over 10 dairy cows or farms which grow 10 animal units. Because of the fact that in our country for ships and goat growth is used only the extensive system and primarily pasture system,

they were not counted in the study. In table 2 is been presented the number of farms and number of animals considered in the research

Diagram 2: The Farms and the number of livestock considered in the research



On this basis the total quantities of animal waste were calculated. Also to have a fair trial it is done their uniformity by using indicator animal unit. [3]

Table 2 The theoretic quantity of the animal waste in farms

	Number of animals	**Animal Unit Factor[1]**	**Numer of Animal Unit**	**Tons animal waste per AU[2]**	**Total (Tons)**
CATTLE	872				
Cow of milk productiviy of 3000 kg	337	0.73	246	10.59	2605
Cow of milk productiviy of 5000 kg	134	1.0	134	11.50	1541
Calf (6-12 month old)	119	0.56	66.7	10.57	705
Heifers	**232**	0.75	174	12.50	2175
Fatling cattle (18-21 month old)	**52**	0.68	35.4	10.59	375
PIGS	1125		0		0
Fatling pigs (one animal from 20-100 kg weight per fatling cycle of 180 d.)	1016	0.04	40.6	14.68	596
Sow	97	0.35	34	6.11	207
Pigs	12	0.4	4.8	6.11	29
POULTRY	11000		0		0
Chicken	8000	0.004	32	11.47	367
Broilers	2900	0.002	5.8	14.95	87
Turkeys	100	0.02	2	9.12	18
EQUIDAE	480		0		0
Horses	300	1.1	330	16.5	5445
Colt/Mare	180	0.8	144	12.35	1778

			1096		**15928**

[1] ***Animal Unit*** *- An animal unit (AU) is one mature cow of approximately 1000 pounds and a calf up to weaning, usually 6 months of age, or their equivalent* [3]
[2] [2]

Ttheoretical potential of animal waste that can be used by the farms surveyed is 15,928 tons/year or 43.6 tons / day. The values represent fresh (as voided) feces and urine. Actual values vary due to differences in animal diet, age, usage, productivity and management [1].
In calculation we took into account the coefficients of animal waste under the terms of Albania.

Tabela 5 The real quantity of the animal waste in Farms

	Head	Total Animal Waste	Collection factor (%)[1]	Total animal Waste (Tons/D.)	Total animal waste (Tons/a)
Cattle	872	7401	80	16.2	5921
Pigs	1125	832	95	2.9	1069
Poultry	11000	472	75	0.9	354
Equidae	480	7223	60	11.9	4334
TOTALI		15928		31.9	11678

[1][6]

The amount of biogas produced by methanisation of these wastes will be: **350340 m3/year or 960 m3/day.**

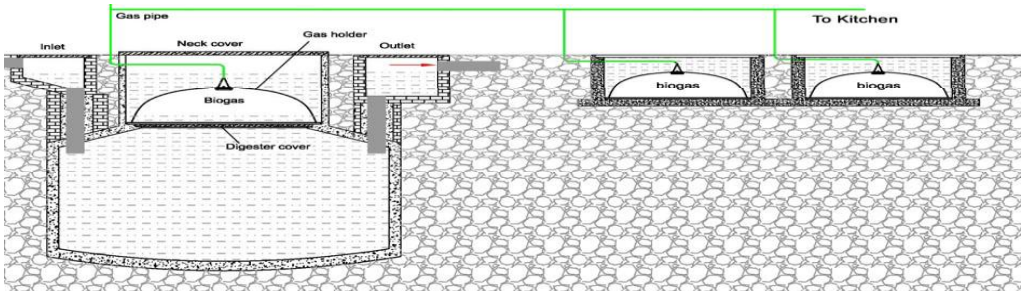
But which system (what capacity) should be implemented in our country?

To answer this question we analyzed farms with cows which were divided in three typical categories according our country: farms with 6 to 20 cow heads, Farms with 20 to 50 cow heads and farms with 50 to 100 cow heads.
Fresh manure/day*amount of cow*2*retention time(60 days)
And 1 cow produces 8 kg fresh excrement per day [8]
Data were analyzed and are summarized in Table 6:

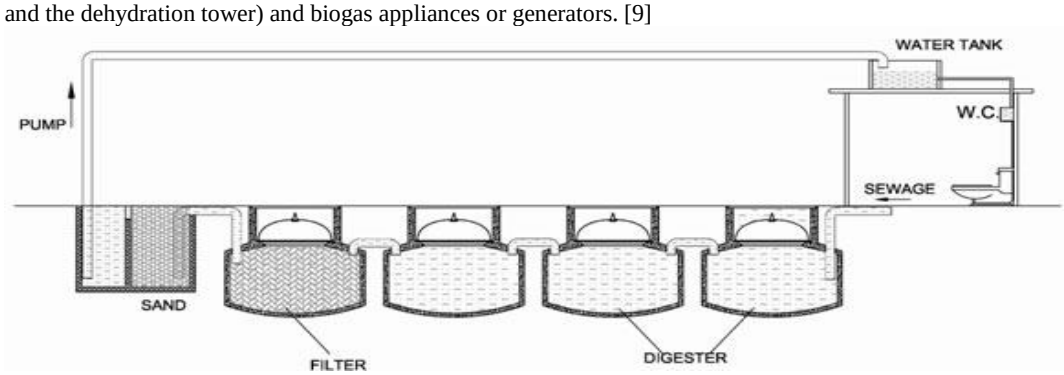
Tabela 6 Size of biogas systems

Type of animal farms with cows	Amount of fresh manure Kg/day	Size of biogas system m^3
With 6 – 10 heads	5760 – 9600	6 – 10
Over 10 – 50 heads	20000 – 48000	20 – 50
Over 50– 100 heads	50000 – 96000	50 – 100

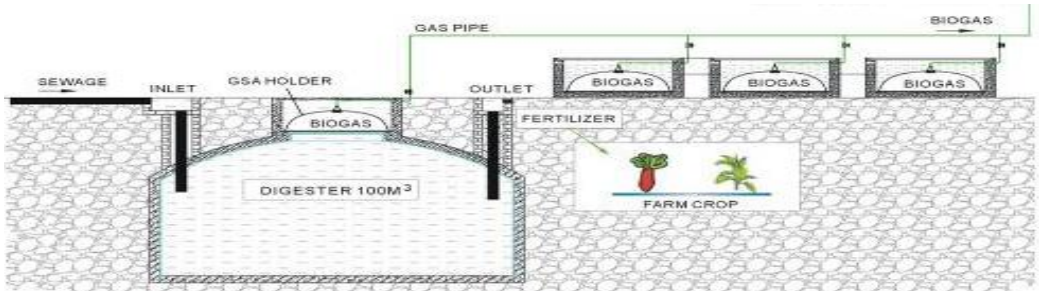
In small animal farms conditions, in limited cooperation between farmers, farmer interest about biogas production and limited financial allowance recommend the use of the following biogas of production system:
In farms with 6 – 20 heads should install family size biogas system with 6 or 10 m^3 biogas digester. In farms with 20 – 50 heads should install medium size biogas system composed in 2 – 3 biogas digesters with 10 m^3 capacity each of them. In farms with 50 – 100 heads and over 100 heads should install medium size biogas system composed with some 10 m^3 digester of one or a group of 100 m^3 biogas plant formed into unit.
Family size biogas system for farms with 6 – 20 heads is composed of a 6 or 10 m3 of capacity digester, pipe routes, gas purify devices and gas appliances or small power biogas generator. This system is mainly applied to farmhouse or domestic house to treat livestock waste, straw, human sewage and food waste. The gas-holder is 1.6 m of diameter, 0.6 m of height and 1 m3 of capacity. [9]



Medium size biogas system farms with 20 – 50 heads for is composed with some digester biogas digesters with 10 m^3 capacity each of them, the feeding system, the biogas purify system, the desulphurization tower and the dehydration tower) and biogas appliances or generators. [9]



Medium biogas plant for farms with 50 – 100 heads and over 100 heads is composed with a concrete digester and several glass fibers reinforced plastic gas holders. The digester is 100 m^3 of capacity. The gas holder is 1.2 m^3 of capacity. [9]



Conclusions

1. Today, the biogas usage in rural areas, is not only an renewable energetic resource, but in the meantime brings positive impacts in the environment, as well as in economic development of Albania
2. Animal waste are a potential energy resource for biogas production for every type of animal farms with over 6 heads.
3. This potential may be used for cooking, lighting, heat water and. electricity
4. in farms with 6 – 20 head should install family size biogas system with 6 or 10 m^3 biogas digester. In farms with 20 – 50 head should install medium size biogas system composed in 2 – 3 biogas digesters with 10 m^3 capacity each of them. In farms with 50 – 100 head and over 100 head should install medium size biogas system composed with some 10 m^3 digester of one or a group of 100 m^3 biogas plant formed into unit.

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Paper 150

ARISTOLOCHIA LUTEA DESF. AND *ARISTOLOCHIA ELONGATA* (DUCHARTRE) NARDI, NEW PLANT SPECIES OF SUBALPINE ALBANIAN ECOSYSTEMS

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ABSTRACT

In this paper is presented the *A. lutea* Desf., a new species from the family Aristolochiaceae. Other aspects related to several subalpine areas of Albania are described, too. Morphological characters of *A. lutea* were discussion and compared with it's closely relatives *Aristolochia elongata* (Duchartre) Nardi reported from the same habitats of South Albania. As the other species like *Aristolochia merxmuelleri* Greuter & Mayer, *A. lutea* is a member of the *Aristolochia pallida* aggregate. Ecological data in growing habitat and area of distribution overall the country is given and mapped. Along with *A. lutea*, in its distribution habitat are recorded several important species for the Albanian flora like: *Campanula hawkinsiana* Hausskn. et Heldr., *Alkanna graeca* Boiss. & Spruner, *Alkanna scardica* Griseb. *Viola acrocerauniensis* Erben, *Viola raunsiensis* W.Becker & Košanin, *Fritillaria thessala* subsp. *jonic* (Halacsy) Kamari, *Fritillaria orentalis* Adams, *Orchis pauciflora* x *Orchis quadripunctata* etc.

Keywords: *Aristolochia lutea, A. elongata,* new species, subalpine ecosystems, important species

INTRODUCTION

The genus *Aristolochia* (Aristolochiaceae) consists of about 500 species, growing mostly in tropical and subtropical areas (Neinhuis *et al.,* 2005). The Mediterranean region, including Turkey, Caucasus and Near East, comprises more than 60 species of *Aristolochia*, which are monophyletic based on molecular phylogeny (de Groot, et al., 2006; Wanke, 2006). They occur in different type of habitats, particularly in subalpine humid or semidry grasslands.
Mediterranean climate as influenced also in differentiation of morphological characters and adaptation of *Aristolochia* species to substrate, mostly in limestone. Most of species are geophyte, which allow them to pass the dried summer period in dormancy whereas the growth including flowering, in spring time (Wanke, 2006; Costa, 2008). The west Mediterranean *Aristolochia* species, based on chromosomal numbers, according to Ball (1964) and Mayer & Greuter (1985) are grouped in 4-species complex: *A. rotunda, A. sempervirens, A. fontanessii* and *A. pallida* complex.
The flora of Albania includes 5- *Aristolochia* species, from which *A. pallida* complex is represented with only one species, *A. pallida*. On the other hand *Aristolochia merxmuelleri* Greuter et E. Mayer, from this complex, were described recently by Shuka *et al.,* (2011). The rest of species, included in the flora of Albania, according to Paparisto *et al.,* (1988) are: *A. clematis*, *A. longa*, *A. macedonica* and *A. rotunda*. Here after we are described and two other species, which can be considered as new for the Flora of Albania.

MATERIAL AND METHODS

During years 2007-2010, the authors of this paper have carried out many field works in South Albania. In the mean time, the first author has undertaken additional field works over all the country, where hundreds specimens are collected and herbarised. Voucher specimens are deposited in national herbarium of Faculty of Natural Sciences, Tirana University and in private herbarium of the first author. Morphological and ecological data in the growing locality are recorded. The coordinates were recorded with the aid of GPS Alan Map 500. The diagnostic features measurements of the morphological characters of the new species were

taken from measurements of 15-living plants. Special attention in plant collection and measurements is indicated to the form and size of tuberous rootstock system.
The new species were defined based on Flora of Albania (Paparisto *et al.,* 1988), Flora Hellenica (Strid & Kit Tan, 1977) Nardi (1989) and Flora Europaea (Tutin *et al.,* 1964). The data, collected in field are analysed and compared with data's taken from literature and herbarised specimens from Botanical MuseumBerlin-Dahlem. Description of new species is illustrated with photos and their distribution is mapped.

RESULTS AND DISCUSSION

On the 23 May of 2009, authors were in the field work in the area of Pogoni, Gjirokastra District. The aim of this expedition was to study the plant diversity of this area, in the frame of PhD thesis of S. Malo.
Hundred meters, above the Poliçani Village, just to the old spring of the village, we observed the new species, *A. lute*a, un-described before for the flora of Albania.

***Aristolochia lutea* Desf.** (in Ann. Mus. Natl. Hist. Nat. 10: 295, 1807)
Syn. *A. attica* Lojac.
Syn. *A. croatica* Horvatic.

Location: Above Poliçani Village, on May 15, 2009, at the side of pebbly limestone of the delta created from the tributary of Nemërçka Mountain. The species was observed at the altitude from 800 up to 1200 m and coordinates N 40^0 07'; E 020^0 21'. New species occurs in shadow, bare limestone rocks, at margins of thermophilous oak woods, including *Cercis siliquastrum* and *Pinus nigra* cultivated woods. It is well-adapted in highly-drained limestone substrates with shallow soil layer. Together with *A. lutea* above Poliçani village we have observed two other important species for the flora of Albania: *Campanula hawkinsiana* Hausskn. et Heldr. and *Orchis pauciflora* x *Orchis quadripunctata,* which are not reported before from this region.

Species description: Perennial with rootstock globose, 3–4 × 3–4 cm diam. with several stems, erect, 20-30 cm, simple or several. Leaves cordate or triangular, glabrous in both sides, rare puberulous, petiole 2–18 mm, petiole almost as much as pedicel, 5–15 mm long, blade 30–60 × 30–55 mm. Flowers solitary, perianth green or greyish, sometimes violet to brown, particularly in higher altitudes, 40–65 mm including limb and utricle, utricle 8–12 mm, pitcher-shaped, tube straight, 3–4 cm long. Limb clavate, green or with a brown to black blotch in inner part, particularly in throat which is covered within with brown cilia, equalling with tube, lanceolate or triangular-lanceolate, 1–1.5 cm long two to three time shorter than the tube. Capsule 3 × 1.8 cm, elongated or elipsoid form dehiscing from apex. Flowering April (rare at the end of March) and fruiting in May or June (Fig. 1).

Figure 1. *Aristolochia lutea* in its natural habitat. A -habit, B -flower and C -rootstock

Other specimens collected: New finding of *A. lutea* in Poliçani Village, Zagoria Valley were following by several other sites, like in: Llogora Pass, 25 May 2008, altitude 1150 m, in limestone substrate; Pass of Plum (Qafa e Kumblles)**,** above Kalimashi tunnel, 14 May 2010, altitude 1300 m, in serpentine substrate; along the road to Razëm Village, 24 May 2010, altitude 800 m, in limestone substrate; Munella mountain, 21 Aprill 2011, altitude 1100-1350 m, in serpentine substrate.
***Distribution of A. lutea*:** Acording to Strid & Kit Tan (1997) *A. lutea* is an widespread species begining from Anatolia to SE Europe, including almoust all of the Balkan countries.

The grassland ecosystems in Pass of Plum, Kukesi district, were *A. lutea* accurs are habitats and for subendemic species like *Alkanna scardica* Griseb. *Viola raunsiensis* W. Becker & Košanin and *Fritillaria orentalis* Adams. In limestone grassland of Llogora Pass can be found also two endemics taxa: *Viola acrocerauniensis* Erben and *Orchis pauciflora* x *Orchis quadripunctata*. Other important species growing in this mountain are *Fritillaria thessala* subsp. *jonic* (Halacsy) Kamari and several endangered orchids species of the genus *Ophrys* and *Orchis*.
The new records overlap the distribution habitat of *A. Elongata,* mentioned by Nardi (1989) in south Albania. The species is reported based on the collection of F.K Meyer during his visit in Dhembeli and Nemërçka Mountain ranges, on first of May, 1960 and collection of Alston and Sandwith, in subalpine grasslands of Çajupi Mountain, above Zheji village, on June 11, 1933. Both species are collected in altitudes from 700 up to 1600 a.s.l, and in the same habitat type where our collection is observed.

In fact, morphologically *A. lutea* and *A. elongata* are very similar and sometimes they have similar growing habitat, so it is very difficult to distinguish them. The most distinctive futures among them is form of rootstock, almost globose to the first and elongated or oblong to cylindrical to the second one. As above is with interest to emphasizes that E. Nardi has not been in Albania and we did't know if the vouchers of Meyer and Alston together with Sandwith, have tuber or only the areal parts of the plants.
To solve this controversy, we have dug up about 10-plant tubers above Poliçani location and all of them were globose. On the other hand, we have not seen the collection of Meyer and Alston & Sandwith and did not observe A. *elongata* species in the Gjirokastra Mountains, in despite of several field trip carried out during years 2005-2010. The presence of both species in Gjirokastra and Permeti districts, still unclear.
Regardless of the above, during a field work in Gjergjevica Valley, Korcha district, on 7 May 2009 and 12 April 2010, the presence of *Aristolochia elongata* in this area was recorded.

***Aristolochia elongata* (Duchartre) Nardi.** (in Webbia 38: 94, 1984).
Syn. *A. pallida* var. *elongata*.
Syn. *A. attica* Lojac.
Location: Gjergjevica Valley, on open shallow soil of serpentine substrate or shadow places of *Buxeto-Festucopsidetum serpentini* plant communities. The most abundant woody plants where *A. elongata* occurs are: *Buxus sempervirens*, *Pinus nigra*, *Juniperus communis*, *Juniperus oxycedrus* and *Fraxinus ornus. A. elongata* as much as in the case of *A.*

Figure 2. *Aristolochia elongata* in its natural habitat. A -habit, B -flower and C –rootstock

lutea grows in altitude 1000 up to 1300 m a.s.l and coordinates N 40^0 35'; E 020^0 34'. It is well adapted to the dry serpentine habitats, having a early spring vegetation life cicle and passing the dryed summer in dormance.

Species description and distribution: Perennial, rootstock elongated to fusiform or cylindrical, 10 × 25 mm in diam. Stems erect or subterranean, 10–20 cm, simple and several for each tubers. Leaves cordate or reniformes, slightly puberulous in both sides, petiole 2–15 mm, petiole longer than pedicel, 2–10 mm long, blade 30–50 × 20–35 mm. Flowers solitary, perianth green or yellowish, sometimes tinged violet to brown, narrow below and gradually broadened above, 30–50 mm including limb and utricle. Limb similar to that of *A. lutea* but narrower. Capsule 3 × 1.8 cm, elongated, prickly or pear shaped, dehiscing from apex, seeds 3-4 x 3 mm, brown or brown to black. Flowering April and fruiting in May to June (Fig. 2).
A. elongata was companied in its growing habitat with plants that are adapted to the ophiolithic substrate. The most common endemic and sub endemic associated species are: *Haplophyllum boissieranum* Vis. et Pancic, *Polygonum albanicum* Jav., *Silene schwarzenbergeri* Halacsy, *Lilium calcedonicum* L., *Festucopsis serpentini* (C. E. Hubbard) Melderis, *Arenaria conferta* Boiss. subsp. *serpentini* (A. K. Jackson) Strid, *Thymus teucrioides* Boiss. & Spruner, *Centaurea ptarmicifolia* Halacsy *ex* Hayek, *Minuartia baldaccii* (Halacsy) Mattf. subsp. *baldaccii* and *Campanula hawkinsiana*.

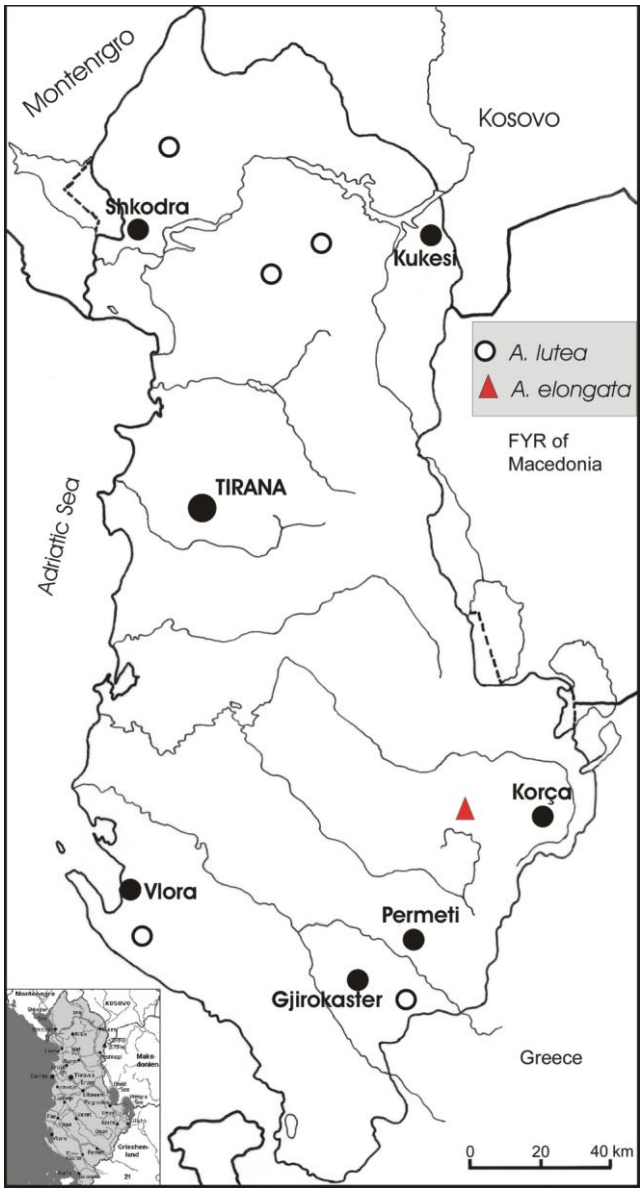

Figure 3. Distribution of *A. lutea* and *A. elongate* in Albania

***Distribution*:** *A. elongata* is distributed in limestone and ophiolitic substarates of Greece and South Albania.

Other specimens seen: Determination of our collected specimen is done with similar specimens deposited in Herbarium of Botanic Garden and Botanical Museum Berlin-Dahlem, Freie Universität Berlin (ww2.bgbm.org/herbarium/Access.cfm).
Specimens seen from this virtual herbarium are listed below.

A. elongata

Greece: Nomos Kozanis, SO Siatista. 17.04.2002, Leg.: E. Willing 141; Nomos Grevena. N Dhafnero, 17.04.2002, Leg.: E. Willing 171; Nomos Grevena. W Mavranei. 18.04.2002, Leg.: E. Willing 196; Nomos Preveza. 0,3 km S Pende Pigadhia. 27.05.1994, Leg.: E. Willing 71d; Nomos Trikala. 2,4 km NO Koniskos. 29.04.2000, Leg.: E. Willing 232; Nomos Etolia-Akarnania. 5,0 km S Monastiraki. 23.05.1991, Leg.: E. Willing 315c.

A. lutea

Italy: Grojna bei Görz [Val Grojna, Gorizia]. 3/1873, Leg.: Glow s.n; 18.06.1957, Leg.: G. K. Schulze-

Menz & F. Knoll 171; Volosca. 25.3.82, Leg.: Hutchy s.n.
Croatia: Opcina. 11.04.1897, Leg.: M. Hellweger s.n.; Pola. 22.05.1899, Leg.: K. Hutchy s.n.; Recinathal. 13.04.1881, Leg.: Hutchy s.n.; Fiume. 16.04.1881, Leg.: E. Witting s.n.
Slovenia: Adelsberg [Postojna]. 08.06.1908, Leg.: J. F. N. Bornmüller s.n.; Divaca. 5/1974, Leg.: D. Baumbach s.n; 22.05.1955, Leg.: Tone Wraber s.n.; Divaca. 5/1974, Leg.: D. Baumbach s.n.
Romania: Kronstadt, am Kl. Stangenstein. Alt.: 750 - 800 m. 1.7.1912, Leg.: J. F. N. Bornmüller s.n. Notes: "im Gebiet s. selten"
Macedonia: 5.5.1918, Leg.: J. F. N. Bornmüller 4908.

CONCLUSSION

- The new records of two above mentioned *Aristolochia* species within Albanian territory make the subalpine grasslands and fascies important for the species of this genus. Two species of the *Pallida* complex: *A. elongata* (Duchartre) Nardi and *A. merxmuelleri* Greuter et E. Mayer, are with intrest for the Flora of Europaea as Albanian sub endemics.
- Natural dry grasslands and scrubland fascias on calcareous and ophiolithic substrates of *Aristolochia lutea* and *A. elongata* are important sites and for other endemics and sub endemic species.
- Definition of this two new species comprises a contribution for the flora of Albania and the floristic composition of subalpine grassland habitats of the country.

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Paper 160

EFFECTS of DIFFERENT IRRIGATION TECHNIQUES on DRY BEAN YIELD and WATER USE EFFICIENCY

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ABSTRACT

This study was conducted to determine the effects of different drip lateral spacings, and the full and deficit irrigation on grain yield and irrigation water use efficiency of dry bean under Middle Anatolian climatic conditions in Konya–Gembos irrigation areas, Turkey. Irrigation treatments consist of two different lateral spacing (45 and 90 cm) and two different irrigation water levels (full and %50 deficit irrigation).In the full irrigation treatment, soil water deficit in the 90 cm soil profile depth was replenished to field capacity. For deficit irrigation treatment, 50% less water was applied as compared to full treatment. A 14-day irrigation interval was used in the study. The highest seasonal water use (ET) was determined in the T-1 treatment as 362 mm; and the lowest ET was found in the T-4 treatment. Lateral spacings and irrigation levels resulted in significantly different yields. The highest grain yield was obtained in T-1 treatment with 3797 $kgha^{-1}$, and the lowest yield was found in T-4 treatment with 2877 $kgha^{-1}$. The highest irrigation water use efficiency (IWUE) was found in T-2 and T-4 treatments (1.39-1.41 kg m^{-3}) and the lowest one was found in T-3 treatment(1.03 kg m^{-3}). Thus a lateral spacing of 0.9 m (one drip lateral per two crop rows) was recommended for drip-irrigated dry bean in the Middle Anatolian Region under those specific conditions.

Keywords: Dry bean, Drip Irrigation, Lateral spacing, Deficit irrigation, Grain yield, Water use efficiency

1. INTRODUCTION

It is impossible to meet the crop water requirement during the vegetation period by rainfall due to the drought conditions in arid and semi-arid regions. Especially low or almost none rainfall events, recently facing frequent drought conditions, well management of water resources has been great interests. To obtain minimum or none yield loss in drought periods, efforts have focused on irrigation programs. The purpose irrigation program is to determine the correct irrigation time, right amount of water to be applied as well as application methods.

Fresh water resources are scant in nowadays and about 75% of this has used in agriculture. However, increase in residential and industrial water uses, contamination of available water resources and wiping out some water resources, water amount to be allocated for agriculture will be limited in near future. This situation has resulted efficient water uses in agriculture and has forced obtaining the highest crop yield from unit water (Tekinel et al. 2000; Korukçu and Büyükcangaz, 2003; Stikie et al. 2003; Shahnazari et al. 2007).

One of the efficient techniques in areas where the fresh water resources are limited is to increase the pressurized irrigation systems. As we all know that high application efficiency may be obtained from those systems under well management. Pressurized irrigation systems have applied as 14% of total irrigated lands of the world. Asia has the 70% of irrigated land potential of world but, has applied pressurized irrigation system low as 4.5%. Those systems are widely used in USA (56% in 2003) and Russia (78% in 2007) and Europe. Their uses in Italy at 2000, Spain at 2007, UK and France are 56%, 67% and 100%, respectively. According to 2006 year records, it has used as 7.2% at 5.13 million hectares in Turkey (Gopalakrishnan, 2008). The ratio in Turkey is low and world average of 50%.

The other way of efficient water resources use is management of water resources according to the deficit irrigation programs in arid and semi-arid regions. The deficit irrigation is the way of obtaining high application efficiency. It is the sustainable production strategy for arid and semi-arid regions where the water resources are limited (Liu et al. 2006; Shahnazari et al. 2007; Geerts and Raes, 2009). In deficit irrigation, crops are exposed the drought conditions with a certain ratios at any vegetation periods or all irrigation season without reducing crop yield or wasting irrigation water (Kırda, 2002). In this program, first water-yield relationships should be determined and such program should be performed according to this. Some researchers reported linear relationships between crop water requirement and relative yield reduction and they defined this relationship as crop response factor (Stewart et al. 1977; Kanber, 1977; Doorenbos and Kassam, 1979; Baştuğ, 1987; Kırda, 2002; Yazar et al. 2002).

Konya plain has 10% of total arable land potential of Turkey. It is closed basin with arid climate characteristic. In most parts of plain, average annual rainfall is about 300 mm and almost 38% of this rainfall has recorded in vegetation period. It is almost impossible to obtain crop production without irrigation. Thus, irrigation is necessarily prerequisites in Konya plain of Turkey. On the other hand, water resources are very scant and should be used efficiently.

Konya plain has 12% available water potential, 2.5% of total available water potential and 11% of irrigation areas of Turkey. By considering current crop patterns within 610000 ha irrigation areas, net irrigation water requirement of those patterns is 2.82 billion m^3 and current applied irrigation water of 3.98 billion m^3 but, available water potential of basin is 2.45 billion m^3. Thus, about 1.53 billion m^3 water has over extracted from groundwater resources of basin. This case has not resulted efficient or sustainable water resources uses (Topak et al. 2008). Therefore, for the current areas opened to irrigation and opening new areas for irrigation, low water use or high efficient irrigation techniques should be developed as well as proper irrigation technologies are necessary.

The objectives of this study were to determine the effects of different drip lateral spacing, and full and deficit irrigation on yield and irrigation water use efficiency of dry bean under Konya Closed basin climate conditions of Turkey.

2. MATERIALS AND METHODS

The study was conducted in Konya–Derebucak province in the Middle Anatolian region of Turkey during the growing seasons of 2009. The experimental site is located at 37^o 24' N latitude and 31^o 30' E longitude, 1235 m above sea level (Anonymous, 2007). Some physical properties of the experimental field soil are presented in Table 1.

Table 1. Some physical properties of experimental field soil

Depth (cm)	Clay (%)	Sand(%)	Loam (%)	Texture	Bulk density (g cm^{-3})	Field capacity (%)*	Wilting point (%)*	Available water (mm)
0-30	25.92	33.32	40.77	C	1.35	30.46	15.92	43.62
30-60	30.41	37.19	32.40	CL	1.35	27.78	15.00	38.34
60-90	30.80	45.13	24.07	CL	1.35	29.20	16.32	38.64

* % water by volume

The experimental site has rainy winters and hot dry summers, with low rainfall during summer. Some climatological data on the experimental site are given in Table 2. According to the long-term data, the annual average temperature, relative humidity and precipitation in the area are 11.8 ^{o}C, 64% and 770 mm, respectively.

Table 2. Long-term monthly climatic data of the experimental area (1975-2009).

Months

Climatic data	1	2	3	4	5	6	7	8	9	10	11	12	Annual
Temperature (C)	0.07	1.11	5.67	10.9	15.6	20.2	23.6	23.3	18.9	13.0	6.67	2.06	11.8
R. humidity (%)	79	76	68	1	4	5	4	6	3	1	73	79	64.3
Rainfall (mm)	124	95	75	62	61	55	49	50	55	65	103	139	770
Wind speed (m s^{-1})	2.1	2.3	2.3	59 2.6	46 2.2	26 2.2	13 2.2	13 2.0	20 1.9	58 1.7	2.0	2.1	2.1

In this study, the dry bean cultivar 'Great Northern 59' was used as the plant material. Seeds were sown by machine on 05 June 2009. The spacing between rows was 0.45 m and plant spacing was 0.10 m with a plant density of almost 200,000 per hectare. The experimental site was fertilized with 40 kg N ha^{-1} and 80 kg P_2O_5 ha^{-1} during the sowing season.

A drip irrigation system was designated for the experiment. The control unit of the system had a disk filters, a flow meter, control valves and pressure gauges. The distribution system consisted of PVC pipes as mainline (50 mm diameter) and manifolds (32 mm) for supplying and discharging water to each plot. Irrigation laterals that were 16 mm in diameter and 10 m in length had inline emitters spaced 0.25 m apart with a 2 L h-1 flow rate at a pressure of 100 kPa.

The experimental design was a randomized plot design with three replications. Each plot dimension was 10 m long and 2.7 m wide (six plant rows). Irrigation management treatments consist of two different lateral spacing (45 and 90 cm) and two different irrigation water levels (full and %50 deficit irrigation) with drip irrigation method. In 45 cm, one drip lateral was laid out at the center of two adjacent crop rows and in 90 cm, one lateral served two plant rows. The amount of irrigation water applied to full treatment was estimated as the quantity equal to replenishing the soil moisture deficit to field capacity in the 90 cm soil profile depth. For deficit irrigation treatment, 50% less irrigation water was applied as compared to full irrigation. A 14-day irrigation interval was used in the study. Irrigation management treatments and its description in Table 3 was given.

Table 3. Irrigation treatments and its descriptions

Treatments	Description
T-1	One lateral design (45 cm) in the middle of each two plant rows by 14-day intervals with an amount of irrigation water application equal to replenishing the soil moisture deficit to field capacity in the 90 cm soil profile depth.
T-2	One lateral design (45 cm) in the middle of the each two plant rows by 14-day intervals with 50% irrigation water application of T-1-1 treatment.
T-3	One lateral design (90 cm) for two plant rows by 14-day intervals with an amount of irrigation water application equal to T-1 treatment.
T-4	One lateral design (90 cm) for two plant rows by 14-day intervals with 50% irrigation water application of T-1 treatment.

In study, plant and soil water measurements and observations of crop growth were started at sowing and were terminated 113 d after sowing depending on the harvest date. All plots were irrigated by sprinkler system 5 d after sowing with a watering volume of 50 mm and soil moisture deficit of the 90 cm soil profile depth was replenished the field capacity. Irrigation treatments were started on 17 July 2009. Irrigations were terminated on 27 August 2009.

Soil water content in the root depth for every treatment was measured at 30 cm increments down 120 cm by the gravimetric sapling method. Soil water contents were monitored every before irrigation throughout the growing season and during harvest.

Crop water use (ET) was estimated using the water balance method. Seasonal water use was obtained by summing up the seasonal water depletion (from planting to harvest), rainfall and irrigation water during the same period. Deep percolation was assumed to be negligible. There was no water table in the experimental fields, thus no capillary rise was assumed. Water use efficiency (WUE) and irrigation water use efficiency (IWUE) are defined in two equations as follows:

$$WUE=\frac{Ey}{ETc}$$

$$IWUE=\frac{Ey}{I}$$

where E_y is bean yield (kg ha^{-1}), ET_c is the seasonal evapotranspiration (mm) and I is the amount of irrigation water (mm).

Upon reaching physiological maturity, the plants were harvested manually on 26 September 2009. The harvest areas in each plot were 14.4 m^2 (four rows, each 8 m long). Statistical analysis of all results, including grain yield, were made according to the randomized plot design (Yurtsever, 1984).

3. RESULTS AND DISCUSSION

Total rainfall during the growing season was 20 mm on 30 June 2009. Irrigation treatments were started on 16 July 2009. The seasonal amount of irrigation water applied, irrigation date and water use (ET) data are given Table 4. Treatments received irrigation water varying from a low of 206 mm in deficit irrigation plots (T-2 and T-4) to a high of 308 mm in full irrigation plots (T-1 and T-3) during the season. A total of five applications were made and treatments received irrigation water depths varying from 50 to 76 mm in full irrigation plots; and 28 to 55 mm in deficit irrigation treatment plots.

Table 4. Irrigation Dates, irrigation water amounts and crop water use

Treatments	Irrigation Date					Seasonal irrigation water (mm)	Water use (mm)
	10.06.09	16.07.09	30.07.09	13.08.09	27.08.09		
T-1	50	55.1	65.9	60.13	75.76	307.9	362
T-2	50	55.1	33.0	30.05	38.0	206.5	296
T-3	50	55.1	62.0	56.0	74.2	307.9	368
T-4	50	55.1	31.0	28.0	37.1	206.5	291

Seasonal evapotranspiration (ET) changed between 291 and 368 mm. The highest water use was observed in treatment T-3 (368 mm), and the lowest was found in T-4 treatment (291 mm). Since the rainfall received during the dry bean-growing season was not significant, the crop water consumption partically depended only on the amount of the irrigation water supplied to the plots. Seasonal water use of dry bean under the same region has been reported 400 mm by Anonymous (1982). Beyce (1991) and Ertaş (1976) found that seasonal water use in dry bean was 438 and 500 mm, respectively, depending on full irrigation regime in Konya conditions. Also, Doorenbos and Kassam (1979) and Allen et al. (2000) reported that net water requirement for a 90–100 day dry bean crop ranges from 350–500 mm depending upon the soil, climate and cultivar. Efetha et al.(2010) found that seasonal water use in dry bean varied between 275 and 305 mm depending on irrigation regimes in Kanada conditions.

The grain yield, 1000-grain weight, water use efficiency and irrigation water use efficiency data are given Table 5. Grain yields varied from 2877 to 3797 $kgha^{-1}$ among treatments. The highest average grain yield was observed in T-1 treatment as 3797 $kgha^{-1}$, and the lowest yield was found in T-4 treatment as 2877 and T-2 treatment as 2907 $kgha^{-1}$. Yield from wider (lateral spacing=0.9 m) dripline spacing with full irrigation was 16% lower, than closer dripline spacing (lateral spacing=0.45 m) with full irrigation. But different among T-1 to T-3 was no significant as statistical ($P<0.05$). Thus a lateral spacing of 0.9 m (one drip lateral per two crop rows) was recommended for drip-irrigated dry bean in the Middle Anatolian Region under those specific conditions. As for the Duncan classification made, the T-1 and T-3 treatments receiving the full irrigation in all two lateral spacings, resulted in significantly higher grain yields than deficit irrigation in both lateral spacings.

Table 5. Dry bean grain yield, 1000-grain weight, water use efficiency and irrigation water use efficiency data

Treatment	Grain yield (kg/ha)	1000 –grain weight(g)	WUE (kg m^{-3})	IWUE (kg m^{-3})
T-1	3797a	274.7a	1.05	1.23ab
T-2	2907b	195.7b	0.98	1.41a
T-3	3173ab	238.0ab	0.86	1.03b
T-4	2877b	221.3ab	0.99	1.39a
$LSD_{0.05}$	662.63	55.66	0.198	0.268

The highest water use efficiency (WUE), averaging 1.05 kgm^{-3}, was obtained in treatment T-1 while the lowest one was found in treatment T-3 (0.86 kgm^{-3}). For T-2 and T-4 treatments, WUE values were almost the same. In general, WUE values decreased with decreasing water use and 0.9 m lateral spacing conditions.

Irrigation water use efficiencies (IWUE) varied from 1.03 to 1.41kgm^{-3}. The highest IWUE averaging 1.41 kgm^{-3} was obtained in treatment T-2 and T-4 and the lowest was found in treatment T-3 with value of 1.03 kg m^{-3}. Generally, in deficit irrigated treatments the IWUE is higher than in the full irrigation treatments.

Deficit irrigation led to smaller grain compared to those gained from the full irrigation cases. There was significant difference on 1000-seed weights considering irrigation management treatments (Table 5).

4. CONCLUSION

This study conducted to evaluate the effects of full and conventional deficit irrigation and two different lateral spacing on grain yield and irrigation water use efficiency of dry bean under Konya–Derebucak-Gembos irrigation area conditions. According to results obtained from study, deficit irrigation at dry bean led to decrease in grain yield and seasonal evapotranspiration. The irrigation water was used most efficiently at the treatments T-2 and T-4. The full irrigation treatments (T-1 and T-3) could be used for dry bean grown in semi-arid regions without water shortage. On the other hand, the T-2 and T-4 deficit irrigation treatments could be used for dry bean grown in semi-arid regions where irrigation water supplies are limited.

In conclusion, this study revealed that if water is limited and deficit irrigation is spread over growth season of the dry bean, IWUE may be improved under T-2 and T-4 deficit irrigation schedule. The findings in this study strongly recommend that full irrigation in dry bean would be advantageous if the farmer's goal is to maximize grain yield. But if the goal is to put more area into production under limited water supply, 50% water deficit and one lateral design (90 cm) for two plant rows in dry bean may be feasible.

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EVALUATION OF TROPHIC AND SAPROBIC DIATOM INDEX IN ALBANIAN RIVERS

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ABSTRACT

This paper aims to evaluate the efficacy of a bio-monitoring approach to monitor the water quality in soma important Albanian Rivers. Monitoring period was from May 2002 to March 2004. Monitoring of water quality was based on calculation of Shannon Diversity Index (H'), Trophy Diatom Index (TI_{DIA}), Saprobe diatom Index (SI), using benthic diatoms. The Shannon Index gave evidence of biodiversity variations over the seasons and some differences between sampling sites. Results show that cleanest stations, upstream part of Mati (Ma1, respectively 1.4, oligo-mesotrophic) and upstream of Tirana river (Is1), which are populated by many species. The poorest stations in species were Lana (Is2) and Ishmi (Is3). The water quality in rivers was classified from meso-eutroph to eutroph, showing a certain pollution level. Trophic index of Mati and Fani water is meanly lower (mesotroph), other stations had low value of trophic index, which oscillated from eutroph (Tirana and Shkumbini in Labinot-Fushë) to polytroph (Lanë and Ishëm). Most of other station (downstream of Shkumbini, Osum, Gjanicë, Seman) are eu-polytroph. After the Saprobic Index (SI), the saprobic state and the water quality of most of the rivers was limited to oligo-beta-mesosaprobic (class I-II) to beta-mesosaprobic (class II). Only in the river sites of Lana, Ishmi and Gjanica, the saprobic values were high, corresponding to the quality class III-IV, characterized by very strong organic pollution (alfa-mesosaprobic to polisaprobic).To provide more information and increase public awareness for the protection of these aquatic ecosystems, monitoring of the water quality is of highest priority.

Key words: Rivers, Biomonitoring, Trophic Diatom Index, Saprobic diatom Index.

INTRODUCTION

Albania is rich in aquatic resources with high natural and biological values. Nevertheless, waters still continue to be endangered, especially in western Adriatic Lowland areas, so is important to monitor them continuosely. Biological monitoring has several advantages over chemical monitoring as it summarizes the response of biota to a range of pollutants occurring in rivers over time [5,10,14,15,16]**.** Monitoring of waters with benthic diatoms is based on two EU standards, [1, 2]. Benthic diatom species composition responds directly to nutrients [13], and can be a more stable indicator of trophic state than measurements of nutrient concentrations.Diatoms are a large and diverse group of single-celled algae. They are distributed throughout the world in nearly all types of aquatic systems and are one of the most important food resources in marine and freshwater ecosystems. Because there are many thousands of taxa with diverse ecological requirements, their siliceous remains are used extensively as environmental indicators in studies of climate change, acidic precipitation and water quality [19]. Diatoms are abundant and the most species-rich primary producers in rivers, living in almost all habitats from the source to the mouth [1, 4]. They have a short lifecycle and rapidly follow environmental changes. Structure of microscopic algae may give better view of quality of waters, like for organic pollution also for inorganic too. So excist a correlation between structure of diatomes community and quantity of trophy and saproby in water. In this paper, we are focused on the calculation of Shannon Diversity Index [Shannon and weaver], Trophic and Saprobic Diatom Index [15,16]. Algal growth is dependent on sunlight and nutrient concentrations. An abundance of algae is indicative of nutrient pollution

[6]. Several studies have clearly demonstrated that diatom communities change with increasing concentrations of both organic and inorganic load of substances, making them the preferred organism group for in situ bio-monitoring studies in Europe, the US and Asia [7,8]. This report describes the analyses of the diatom population from two years sampling period in four rivers of Albania to study the water quality. The variation of the diatom population between sites and seasons is quantified by calculating different indices to evaluate their value for monitoring the relatively water of the Albanian rivers.

MATERIAL AND METHODS

- **Study Site**

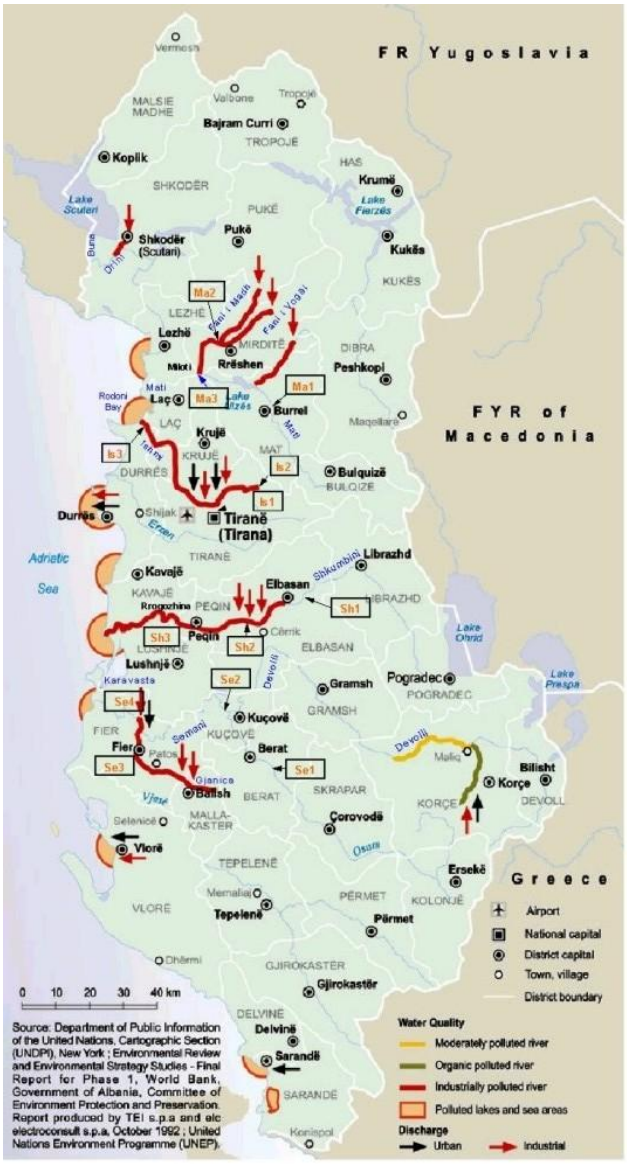


Figure 1: Map of Albania hydrological with Sampling stations **[20].**

Bio monitoring was carried out in 4 rivers (respectively in 13 stations), (*Fig. 1*): Mati (Shkopeti: Ma1, Miloti: Ma3) with the effluent Fani (Rubiku: Ma2); Ishmi (Fushekruja: Is3) with the effluents Tirana (Brari: Is1) and Lana (Kashari: Is2); Shkumbini (Labinoti: Sh1, Paperi: Sh2, Rrogozhina: Sh3); Semani (Mbrostari: Se4) with its effluents Gjanica (Fieri: Se3) and Osumi (Berati: Se1, Uravajgurore: Se2). The stations represent different levels of human impact, [12]. The environmental conditions change along the 4 rivers and along every station. First station in every river was considered less polluted, second and third station is polluted. Between stations the valley narrows and trees at the riverside limit the exposure of the riverbed to the sun. The water velocity is similar at the 4 sampling rivers. Algal samples were collected most often during seven trips low-flow conditions, between May 2002 and March 2004.

- **Sample Collection and Slides Preparation**

The biological investigation was based on a microscopic examination of diatom communities growing up over talus of *Cladophora*, in clay, over stones or other substrates. Algal material was collected from the surface of stones by scrubbing with a brush and rinsing into a collection bottle.

Moss was also collected when present at a site and the material was fixed in formaldehyde 4%. [4,15].
The cleaning of diatom frustules was done boiling the material, first with HCl*cc* and then, after washing, boiling them again with H_2SO_4*cc*, adding during the last procedure some crystals of KNO_3, as described by Krammer & Lange-Bertalot [9].
Microscopic slides were prepared using Naphrax (index 1.69) and examined using the optic microscope LEICA DML (objective 63x PL APO). Determinations were made using Krammer & Lange-Bertalot keys [9]. To obtain reliable (95 %), more than 500 valves were counted.

- **Data Analysis**

Data Analysis while the Shannon Diversity Index (H'), Trophic index (TI_{DIA}) and Saprobic index (SI) are widely present in the literature, this is the first report on a monitoring using the SI.
The diversity index was calculated from Shannon and Weaver, [17].

$$H' = -\sum_{i=1}^{n} p_i \log_2 p_i \quad [17]$$

$$SI = \frac{\sum_{i=1}^{n} S_i G_i p_i}{\sum_{i=1}^{n} G_i p_i} \quad [16]$$

$$TI_{DIA} = \frac{\sum_{i=1}^{n} TW_i G_i p_i}{\sum_{i=1}^{n} G_i p_i} \quad [15]$$

The trophic and saprobic index for the diatoms was calculated using the formula of the respective values for each species and the trophy classes were taken from [15] and [16].
Both the biological and physic-chemical parameters were analyzed statistically using computer programming in Excel, Sigma Plot 8.0 program.

RESULTS AND DISCUSSION

A total of 300 different diatoms species were determined in12 sampling station during may 2002-March 2004. The number of species varied from 103 species (November 03) to 169 (May 03).

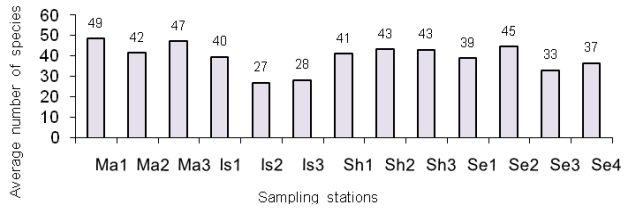


Figure 2: Average number of species in Albanian rivers

However, the average number of species in each station oscillated from 27 (Is2) to 49 (Ma1), (Fig. 2). This results show that cleanest stations dominated by many species. Mati River in its upstream part (Ma1) was the richest in species.
The poorest stations in species were Lana (Is2) and Ishmi (Is3). *Achnanthes minutissima var. minutissima*, *Diatoma moniliformis*, *Fragilaria capucina* etc., described as a tolerant species was present in all samples; it furthermore often dominated, with up to 72.8 % of the total number of valves counted. Biodiversity was highly correlated with the number of species.

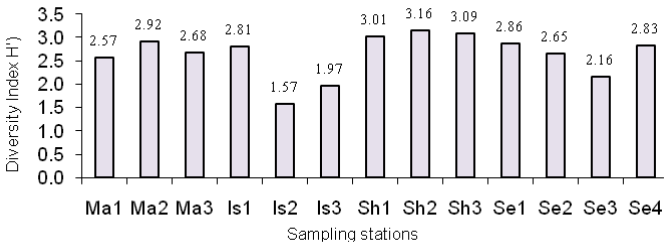


Figure 3: Average number of Diversity index (Shannon Index)

Higher diversity values were observed in clean stations (Sh1-approximately 3.01). Towards polluted stations dropped gradually to low values (Is1-approximately 1.57), (Fig.3). Low values

of H' were the result of a small number of genera and a high abundance of a few common species.

ECOLOGY OF WATERS

Considering the value of the trophic (TI_{DIA}) and saprobic indexes (SI), the water quality in rivers was classified from meso-eutroph to eutroph, showing a certain pollution level. Average values of trophic index are generally high. They oscillated from 2.0 (Ma1) to 3.3 (Is2), (Fig. 4). Trophic index of Mati and Fani water is meanly lower (mesotroph), others station had low value of trophic index, which oscillated from eutroph (Tirana and Shkumbini in Labinot-Fushë) to polytroph (Lanë and Ishëm). Most of other station (downstream of Shkumbini, Osum, Gjanicë, Seman) are eu-polytroph.

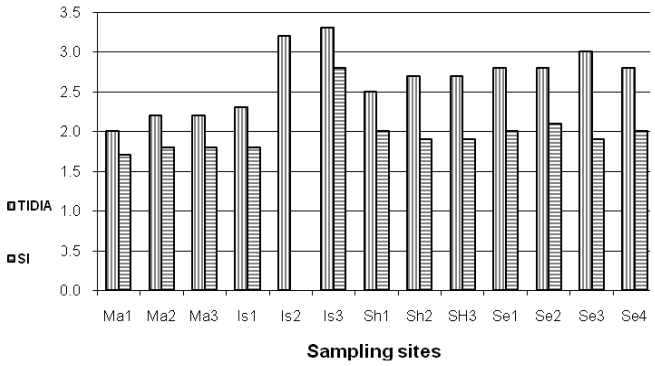


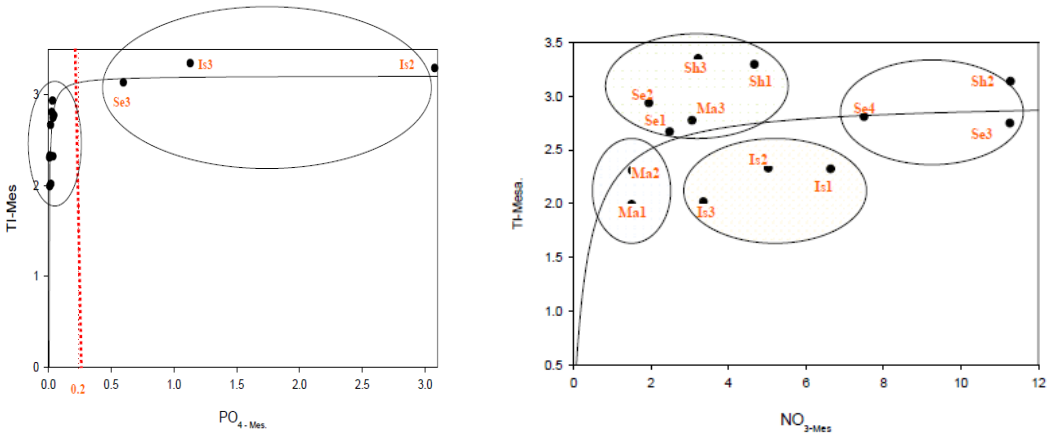
Figure 4: Average number of Trophic and Saprobic Index in Albanian rivers

According to saprobic index, mean value oscillated from 1.7 (oligo- to β-mesosaprob), in Mati (Ma1), to 2.8 (α-mesosaprob), in Ishmi (Is3) (Fig.5). The lowest values of saprobic index are found in Brari (Is1, September 03), respectively 1.4 (oligo-β-mesosaprob) while, high value of saprobic index are found in Lana (Is2, July 03), respectively 3.4 (α-meso-polisaprob). According to above, we can note that the high value belong to Lana and Ishmi, [12]. These values show the high pollution of organic matter. The Shannon Diversity Index is a good and widely used tool to compare organismic communities independent of pollution effects. The Saprobic Index [15,21] and Trophic Indices [**4**] describe, by definition, the capacity for two different biological processes, the degradation of organic material and the primary productivity, respectively. The ammonium and phosphates values reached up to 2.8 PO_4 mg/l in Lana and up to 18.1 NH_4 mg/l in Lana too, (Table 1). The high level of ammonium and phosphates indicates reducing conditions in Lana, Ishmi and Gjanica due to high organic load. It is a direct consequence of untreated waste water from Tirana, Berati, Rrogozhina, and Fieri town.
Both ammonium and phosphorus are main nutrients which influence the growth cyanobacteria and algae. Furthermore, the concentration of oxygen in Lana, Ishmi and Gjanica were below the EC limits [**1**] and [**2**].

Table 1: The average value of ammonium, nitrites, nitrates and phosphates in Albanian rivers

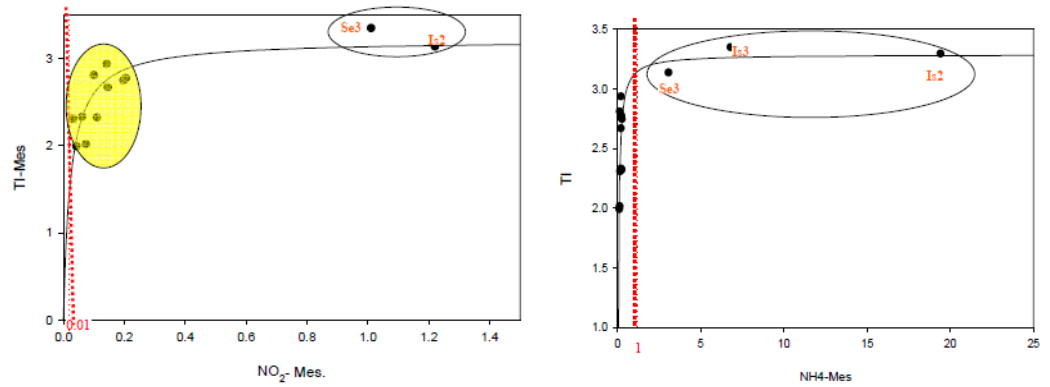
	Ma1	Ma2	Ma3	Is1	Is2	Is3	Sh1	Sh2	Sh3	Se1	Se2	Se3	Se4
NO3, mg/l	*1.7*	*1.9*	*3.2*	*6.0*	*5.2*	*3.8*	*4.8*	*10.3*	*3.6*	*2.5*	*2.2*	*10.6*	*7.1*
NO2, mg/l	*0.0*	*0.0*	*0.1*	*0.1*	*1.6*	*1.1*	*0.1*	*0.2*	*0.2*	*0.1*	*0.1*	*1.1*	*0.1*
NH4, mg/l	*0.2*	*0.2*	*0.2*	*0.3*	*18.1*	*7.2*	*0.3*	*0.3*	*0.3*	*0.3*	*0.4*	*2.8*	*0.2*
PO4, mg/l	*0.0*	*0.1*	*0.0*	*0.1*	*2.8*	*1.0*	*0.3*	*0.0*	*0.0*	*0.0*	*0.0*	*0.5*	*0.0*

The correlation (Sigma Plot Sigma Plot 8.0 program) was made between mean value of Trophy Diatoms Index (TI_{DIA}) and mean values of chemical elements: PO^-_4, NO^-_3, NO^-_2 and NH^+_4. (Figure 5 and 6).



a. **b.**

Figure 5: Correlation between trophy diatom index and: **a**. phosphates (PO_4 mg/l); **b.** nitrates (NO_3 mg/l) in Albanian rivers.



c. **d.**

Figure 6: Correlation between trophy diatom index and: **c**. nitrites (NO_2 mg/l); **d.** ammonium (NH_4 mg/l) in Albanian rivers.

grow concentration of each trophy elements in water, have initially a high gradient of trophy index, and after critical value is reach of this indexes. We can notice the same situation for the correlation between indexes and phosphates, nitrites, nitrates, ammonium. This statistical analyses show that with arising of pollution, arise trophy index of diatoms.

Diatom indices indicated relatively high nutrient conditions at all sampling sites, and between-site differences were consistent with measured values. Both the diatom indicators of enrichment and the measured nutrient concentrations showed a marked increase in Is2, Is3, Se3. The concentration of phosphates and ammonium were below the EC limits, (Figure 5-a & Fig. 6-d). For nitrites all samples don't have correlation with trophic diatom indexes, this value were below the EC limits.

CONCLUSION

Data of this study show that Coastal Adriatic Lowland is much polluted. Low quality of waters represents also risk of human health. Trophy index, in the upper flow of Tirana River, is meanly meso-eutroph (Fig.4; Tab. 1). We can notice slate pollution from the village nearby. Nevertheless this quality can be considered very good, like of Tirana river before entry on Tirana city. These rivers, passing Tirana city, are converted into sewage collector and their quality is totally otherwise. Not only the value of chemical and biological parameters, but also their panoramic is very terrible. Diatom indices indicated relatively high nutrient conditions at all sampling sites, and between-site differences were consistent with measured values. Both the diatom indicators of enrichment and the measured nutrient concentrations showed a marked increase below the Ishmi (Is2, Is3) and Semani (Se3) rivers. In conclusion, the composition of the diatom population indicated medium organic and inorganic pollution (α/β- mesosaprobic) in Mati, upstream of the rivers of Tirana, Shkumbini and Osumi, as already suggested by the levels of nitrogen and phosphorus. However, most of the tributaries (Lana, Ishmi, downstream Shkumbini and Gjanica) were in β- mesosaprobic to polysaprobic state, (*Fig.4-5; Tab. 1*). Ishmi River and its tributaries Tirana and Lana are extremely impacted. As above, in all sampling stations nutrients were higher than the EC guide values for surface water, (Fig. 5 & 6). For more, oxygen (O_2) concentration is lower than the EC guide values, NIVA [**3**] and [**18**]. From the correlation between trophy index and nutrient elements in water and especially phosphates and ammonium, result that Lana, Ishmi and Gjanica station are many times higher than EC guide values [**1**] and [**2**] that show a much polluted situation for this rivers.

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Paper 165

BIOLOGICAL CHARACTERISTIC OF GROWTH OF RUTILUS RUBILIO BONAPARTE,1837 IN THANA LAKE.

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ABSTRACT

The aim of this study is to demonstrate a model for the study of some biological aspects in species with commercial interest with the scope to determined scientific principes of responsabile fishing. Like model in which is worked are the local groupings inside population of Rutilus rubilio in Thana lake.
During this study was seen the age structure of Rutilus rubilio population in Thana lake according to experimental fishing and also is done determination of Rutilus rubilio concentration zones in Thana lake and possibility of existence of permanent " local populations".
Also is done the evaluation of some indicators of grouth inside population of Rutilus rubilio. In this frame is judged about grouth of individuals based in the study of allometric coefficient "b" in length-weight relation, condicion coefficient (Kf) and relative rate of growth (Sw).

Key words: responsabile fishing, Rutilus rubilio, indicators of grouth.

INTRODUCTION

The implementation of the principles of responsible fishing, which aims to preserve the economic interests of professional fishermen, would reside on real basis if it would rely on the results of research activity in the field of theoretical and applied ichthyology Rrakaj at al. (1990). On the other side, legal provisions and fishing regulations will be applicable if as their foundations they would have those natural events that have been highlighted by the research activity and that are necessary to be placed under the protection of public institutions.Regarding internal water ichthyofauna exist spontaneous and inconsistent studies, which have been carried out in habitats such as the lakes of Ohrid, Prespa and Scutari. Ecological changes, that have occurred in such relatively closed natural lakes and habitats such as watershed and water reservoirs, often invalidate some of the conclusions from previous studies. The intensification of the fishing activity, on one hand, and the alterations occurring in the natural aquatic ecosystems, on the other, are offering an important aspect to theoretic and applied studies in ichthyology. The research work on different aspects of fish biology closely linked to the economic and social aspects of fishing activity, will enable this activity to be profitable and not harmful in terms of preserving natural balances.The actual study was conducted in the Thana lake. This is an artificial water basin with an area of about 800-900 ha, located on the border between the districts of Elbasan and Lushnja, and in the southern part borders Kosova e Madhe village.

MATERIAL AND METHODS

The data presented here are quantitative indicators of specific (local) groups of the population of rovella (lat. Rutilus rubilio, alb. skort) in the Thana lake. The methodology that we have used to evaluate the studied parameters is based on sample individuals. But, since samples are selected at random and the number of individuals are extracted from the mass of the fish, the samples in each quay test respond to the requirements of the methodologies used in ichthyologic studies. The results obtained after evaluation of each sample

represent the typical characteristics of the population. The above conclusion has great practical importance because quantitative biological parameters of ichthyic populations or any other particular local group represent indispensable variables during determination of fishing prognosis.Since we are dealing with natural populations, we have chosen three parameters to judge the characteristics of the population growth of rovella in Thana lake.Allometric coefficient value "b" of the length-weight relationship (LWR), Condition factor (CF). Relative growth rate (SW)
From the above three parameters, the first two ones have a "static" nature in the sense that they provide information on the physiological status of the population at the point when observations are carried out and the samples are taken. The third parameter is "dynamic" for the fact that its values show the way of growth of members in the population within a defined time interval.
We have carried out sampling at two local groups of rovella. In order to determine the values of "b" and CF samples were taken during three standard time periods representing different physiological conditions of the population:
15 days prior to reproduction
15 days after reproduction
2 months after reproduction
These periods were chosen in such a way to identify the physiological condition of the population to serve fishery management of this species. To evaluate the relative speed of growth "SW", for two groups of local rovella have been effectuated fishing research at two-months interval, including samples of members aged two years. In total, there have been carried out 12 samplings and based on them we have assessed the dynamics of the values of this parameter during two years of life.

Determination of allometric coefficient value "b" of the length – weight relation (LWR)
The characteristics of individual growth in a fish population is assessed by calculating the values of coefficient "b" in length - weight relation (LWR) (Muller-Fuega, A., 1990 , Anderson, OR 1996, da Costa RA, Araújo FG2003) . The relation length - weight (LWR) gets to the basic fact that the increase in weight of a fish is proportional to allometric power coefficient “b” of zoological length "L". The formula for calculating the coefficient "b" is:
$W = aL^b$
where
W weight measured in grams
b allometric coefficient
L zoological length
The values of "b" in a normal growth vary from 2.5 - 3.5.
Values of "b" <3.0 (up to 2.5) show that the allometric growth of population’s members is negative.
Values of "b" = 3.0 show an isometric growth
Values of "b"> 3.0 (up 3.5) show an allometric positive growth of population’s members.
These values show the way how various habitat components respond to population demands for substances and energy. The values of "b" indicate that the environmental conditions guarantee a good growth of the population. A computer program was used to calculate the values of "b", having as a basic indicator for analysis the zoological length (Lcm) and the general weight (Wg).

Calculating the value of condition index (CF)

Even this parameter can be used as a quantitative index to assess the general condition of the fish population (Le Cren, ED 1951, Wiliams, EJ 2000, FAO (1995).The calculation of the condition index may be effectuated by means of formula Le Cren, 1951, which we have shown below or by the formula proposed by Vazzoller 1996, where instead of the standard length "l" is introduced the zoological length "L" and in place of “3” exponent is introduced the allometric coefficient "b". In the case when the classical formula is used, the values of "CF " over 1.0 (up to 2.0) show a better physiological condition of the population and favorable nutrition conditions. Values lower than 1.0 indicate the opposite situation.In our calculations the value of CF has been determined by means of the formula:

$$CF = \frac{W}{l^3} \times 100$$

where:
W general weight (g)
l standard (industrial) length measured rom the tip of the head (mouth closed) to the extremity of the caudal fin (with the caudal rays squeezed together).
3 coefficient
Calculation of relative growth velocity (SW)
Index of the relative growth velocity is calculated with the formula:

$$Sw = \frac{\log W2 - \log W1}{\log e\,(t2 - t1)}$$

Sw- relative growth velocity (according to weight Wg)
W1 and W2 are the weights of fish measured at the beginning and at the end of the growth control.
t1 and t2, fish age (in months or years) at the beginning and at the end of the growth control.
log e switching module from natural logs to base 10 (= 0.4343).

RESULTS AND DISCUSSION

By abstracting the allometric coefficient values "b" in the length - weight relationship, it results that:
15 days after the reproductive period:
For the group formed close to the water flow b = 2.9115
For the group formed in shallow coastal area b = 2.7815
2 months after reproduction period
For the group formed near the water flow b = 3.0859
For the group formed in shallow coastal area b =3.0041
15 days prior to reproduction period
For the group formed near the water flow b = 3.0245
For the group formed in shallow coastal area b =3.0050
Basing on the values of allometric coefficient "b" as shown above, we can make the following comments:
Allometric coefficient values indicate an almost isometric growth (with a positive allometric tendency) of rovella population during the period prior to reproduction and two months after the reproduction. 15 days after the reproduction the population growth turns out to be a negative allometric one.
As it can be observed in the three physiological states studied above, the values of allometric coefficient of the group concentrated in the macrophyte zone, at the point where the water flows into the reservoir, are higher comparing to the group populating the shallow coastal area. This fact affirms that there where exists fresh circulation water, there are a series of conditions that determine a better growth for rovella population.
For both local groups studied above, the values of "b" lesser than 3, 15 days after the population growth, should be considered as an indicator of the individuals' fragility in this life stage, and not as a lack of opportunities for that population within the lake ecosystem.
Condition factor (CF).
As indicated in the methodology, even for this parameter the sampling has been carried out during three life intervals. The results are shown in table nr.
We may draw these conclusion regarding the condition coefficient values:
The CF values demonstrate that after the reproduction, the organs' system of rovella population juvenile members is fragile. This concept illustrates in a commercial terms the fact that the value or the quality of this species as a commercial product is not high during this period of time. Prior to population growth, rovella like other ichthyic species, has consumed a lot of energy reserves for gender cell maturation. The energy consummation reduces the values of several technical indicators, such as muscles mass range, the fat content in the abdominal area and the percentage of intramuscular fat.

Table Nr. CF values for two groups of local rovella species in Thana watershed during three physiological states.

Nr	Habitat	15 days after the reproduction	60 days after reproduction	15 days prior to reproduction
1.	Coastline near water flow	1.703	1.962	1.887
2.	Coastal shallow area	1.678	1.860	1.803

CF values are the result of gonads enlargement, but they do not show the true value of fish full development. The progressive increase of the CF values after the reproduction, which is proven by the parameters values in our research 60 days after this stage of life, is caused mainly by the gain and interstitial fat tissues.
During rovella fishing planning one should take into consideration the changes of values of the length - weight relationship coefficient b and the seasonal variability of the condition coefficient values. If the fishing activity is focused in the time interval commencing from 45 – 60 days after and 30 – 45 days prior to population growth, the quality of production is guaranteed. Fishing activity must be paused prior to reproduction period for two reasons:
First, to ensure the renewal of this relatively rare species stock, which needs to be protected (as a component of biodiversity).
Second, despite the presence of the gender glands, fish in this period is fragile.

Relative growth velocity index (SW)

Dynamics of change of relative growth velocity values of the individuals is the same for both rovella local groups. These values have been higher during the first sampling intervals, which correspond to groups of age at two years. During the third year the drop in SW values has been almost uniform (samples 7-12).
Historical variations of SW values follow the changes in the rhythm of weight gain along with progressive aging.
Variability of real values of SW has been more intense in the group populating point in the lake zone where the water flows in. This is due to greater scale of poliformism of the body weight of this group. In the other group, that populates the shallow area of the coastline, the members' weight has resulted to be lower. The same occurs with the index poliformism.

CONCLUSION

Rovella tends to concentrate in shallow circulating waters (1 – 3 m). Such zone are to be found at the point where water flows into the lake. Other rovella concentration zones in Thana Lake are those rich in macrophyte vegetation. In this vegetative mass the juvenile members of Cyprinidae family find their shelter.
The values of allometric coefficient b of length – weight relationship show an isometric growth (with positive allometric tendency) of the rovella population during the period prior to reproduction and two months after the reproduction. Fifteen days after the reproduction the population growth results a negativ allometric one.
During the three physiological states, the intrapopulated group was concentrated in the macrophyte zone, at the point where the water flows into the lake, and it has higher allometric coefficient values comparing to the group that populates the coastal shallow zone.
During the consecutive samplings there has been no any data to confirm any abrupt drop of SW values. This fact attests that the environmental conditions of Thana lake favor the life and growth of separate groups of rovella populations.

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Paper 168

THE MEASURES TO CONTROL THE AMMONIA EMISSION FROM AGRICULTURAL SOURCES IN ALBANIA

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ABSTRACT

The control and the reduction of sulfur, nitrogen oxides (NOx), ammonia and other volatile organic compound (VOCs) emissions from the human activity were the main objective of Gothenburg Protocol. These compounds have adverse effects on natural ecosystems and human health due to the acidification, eutrophication and the increase of ozone concentration in troposphere.
This study analyzed the measures needed to be taken in order to control the ammonia emissions from agricultural practices. Albania as a participant of this Protocol is required to compile, publish and disseminate a manual or guide to good agricultural practices to control ammonia emissions. The specific conditions within the country will be taken into account when compiling this code; the code will also include provisions on: nitrogen management while taking into account the whole nitrogen cycle; livestock feeding strategies; low-emission manure spreading techniques; low-emission manure storage systems; low-emission animal housing systems; and possibilities for limiting ammonia emissions from the use of mineral fertilizers.
The implementation of good agricultural practices regulates the activities in some of the areas referred to the Protocol, including land use, the use of fertilizer, livestock breeding and animals welfare, manure management, plant protection, water management and water pollution, agricultural systems and biological diversity.

Keywords: Ammonia, emission, agricultural practices, nitrogen.

1. INTRODUCTION

Ammonia (NH_3) is a compound comprised of nitrogen and hydrogen. It is a colorless gas with a characteristic pungent odor. Ammonia contributes significantly to the nutritional needs of terrestrial organisms by serving as a precursor to food and fertilizers. Ammonia due to its volatility can easily volatilize into the atmosphere. Ammonia is produced as a by-product of the microbial decomposition of the organic nitrogen compounds in manure. Ammonia is an issue of concern because of its potential to create odors and negatively impact on air and water quality as well as on animal and human health.
Ammonia can have a negative impact on human health. Exposure to even low levels of ammonia can irritate the lungs and eyes. Ammonia is also typically considered a threat to indoor air quality by livestock and poultry farmers because the gas often accumulates inside poorly ventilated or poorly managed animal facilities. High levels of ammonia can have a negative impact on animal health and their products.
Agricultural activities have been identified as the major sources of atmospheric ammonia emission. Ammonia emissions occur at several different stages of livestock production. These emissions vary significantly among farms due to differences in methods of collecting, storing, and treating manure. In general, the greatest ammonia losses are associated with land application of manure (35%-45%) and housing (30%-35%). Significant losses can also occur from grazing land (10%-25%), if applicable, and manure storage (5%-15%)

(Meisinger and Jokela, 2000). As a result, there are multiple opportunities to reduce ammonia emissions from management of animal production.
Therefore, agricultural producers have to minimize the ammonia emission as air quality issues are of high environmental concern. Two different ways can be used to reduce ammonia emissions from animal production operations. The first is to reduce the amount of ammonia that is generated on the farm. The second way is to limit ammonia emissions from animal agriculture by treating or managing manure post-excretion.
The introduction of NH_3 and ammonium (NH_4^+) into the environment can result in the eutrophication and acidification of ecosystems. In addition, ammonia can have a negative impact on the environment by contributing to the formation of an air pollutant known as particulate matter (PM) (U.S. EPA 1997).
The ammonia emission is dependent on different environmental factors and manure application methods. Manure type and characteristics play an important role on ammonia volatilization. Thus, liquid manure and slurry have a high rate of ammonia emission compared to solid manure. High temperatures and an increased wind speed will lead to the increase of rates of ammonia volatilization. Therefore, manure application under cold conditions (in winter) and when wind speed is low will result in low rates of ammonia volatilization. Rainfall after manure application will reduce ammonia volatilization as the rain help infiltration of ammonia in to the soil and reduce volatilization.
Manure application methods have a considerable effect on ammonia volatilization. Thus, direct incorporation of manure into the soil reduces ammonia volatilization significantly. Soil properties and conditions have an effect on ammonia volatilization from soil, thus volatilization is higher in sandy and loamy soil than clay soil, it is also increased in soils with a higher pH value.
The understanding of these factors can help to reduce ammonia emission through their modification and the application of the best agricultural techniques on manure application.
However, ammonia emissions from livestock and poultry operations have recently received significant attention. New air quality standards that cover ammonia emissions are regulated by Gothenburg Protocol. These regulations will have a significant impact on the future of animal production operations.
The purpose of this study is to provide an overview of ammonia production and emission in Albania associated with recommendations for measures to control ammonia emission from agricultural sources as greater attention is required when it comes to environmental and air quality.

2. MATERIALS AND METHODS

The ammonia emission inventory is mainly focused on animal husbandry. The considered manure productions come from these animal categories: cattle (cows and other cattle), sheep and goat, swine (sow and other pigs) and poultry (chickens and other poultry). The number of animal categories was found in the Statistical Years Book 2009 prepared by Albania's Ministry of Agriculture, Food and Consumer Protection.
The content of ammonia corresponding to the manure type and manure production from each animal category per year were found in literature (see Table 1). Using these data, total manure and ammonia productions were estimated based on annual average animal numbers for each animal category.

Table 1. Manure production and content of ammonia

Manure type	Production (t/year)	Ammonia content (kg/t)
Beef (cattle) manure	8	0,8
Sheep/goat manure	0,6	1,9
Swine manure	0,9	2,4
Poultry manure	0,02	4,2

Ammonia emissions at the country level were calculated using ammonia production and percentage of ammonium volatilization (or ammonium losses) according to the technique of manure management.
As Albanian data about ammonia emission factors based on field experiment results are very limited, the calculations were based only on manure animal productivity and land manure application.

3. RESULTS

The results of manure production for each category of animal for the year 2007, 2008 and 2009 are presented in the Table 2. Manure production is dependent on the number of animals and animal categories, thus highest amounts of manure production occur in cattle groups then followed by sheep and goal species.

Table 2. Manure production according to animal categories

Year	2007		2008		2009	
Animal categories	Number	Production (t/year)	Number	Production (t/year)	Number	Production (t/year)
Beef (cattle	577000	4616000	541000	4328000	494000	3952000
Sheep/goat	2729000	1637400	2620000	1572000	2540000	1524000
Swine	147000	132300	161000	144900	160000	144000
Poultry	7135000	142700	8100000	162000	8313000	166260
Total		6528400		6206900		5786260

The amounts of ammonia production for each animal category and year are calculated based on the manure production and the ammonia content in the manure type. These results are shown in the Table 3.

Table 3. Ammonia production according to animal categories

Year	2007		2008		2009	
Animal categories	Production (t/year)	% of total production	Production (t/year)	% of total production	Production (t/year)	% of total production
Beef (cattle)	3692,8	47,83	3462,40	46,31	3161,60	44,52
Sheep/goat	3111,06	40,29	2986,80	39,94	2895,60	40,78
Swine	317,52	4,11	347,76	4,65	345,60	4,87
Poultry	599,34	7,76	680,40	9,10	698,29	9,83
Total	7720,72	100,00	7477,36	100,00	7101,09	100,00

The results show that ammonia production, as in the case of manure production is higher in the manure originating from cattle livestock in an amount of 44,52 % of total calculated ammonia production. Therefore, management of this type of manure is of high importance to reduce ammonia emission into the atmosphere. The ammonia production from sheep and goat manure is about 41 % of the total ammonia production. The farms with sheep and goats in Albania currently using grazing land, therefore high amounts of ammonia will be emitted into the atmosphere. The amounts of ammonia produced by swine and poultry manure are lower, approximately 5% and 10 % respectively. Anyhow, the best management techniques for these manure types are also necessary to reduce ammonia emissions.

The amount of ammonia emission into the atmosphere depends not only on the content of ammonia in manure or ammonia production but also on the manure management method. Thus, animal housing systems, manure storage systems, livestock feeding strategies and manure spreading techniques seriously affect the ammonia volatilization or emission into the atmosphere. The average of ammonia volatilization from manure varies from 25% when the manure is incorporated in soil within one day after application to up to 66 % when is not incorporated into the soil. Based on ammonia production in Albania for the year 2009, the calculated ammonia volatilization or emission into the atmosphere vary from 1775.3 to 4686.7 tons when the manure is incorporated in soil within one day after application and when is not incorporated, respectively. This high variability of ammonia volatilization indicates the importance of manure application methods on ammonia emission into the atmosphere. Thus, the manure incorporation within at least one day after application is required to reduce the ammonia emissions.

Furthermore, according to the obligation of Gothenburg Protocol different measures such as livestock feeding strategies, appropriate manure storage systems, suitable animal housing systems, proper manure application methods and the use of mineral fertilizers based on urea have to be applied in order to control the ammonia emission from agricultural sources. The mentioned measures should be included in an advisory code of good agricultural practice. This code is required to be established, published and disseminated from the countries as part of this protocol.

4. CONCLUSIONS

The control of ammonia emissions is of great importance in order to improve the state of the environment and the quality of human life.
Taking appropriate measures for the reduction of ammonia emission from agricultural sources is required based on environmental conditions and agricultural development.

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