Effects of Air Pollution on Agriculture

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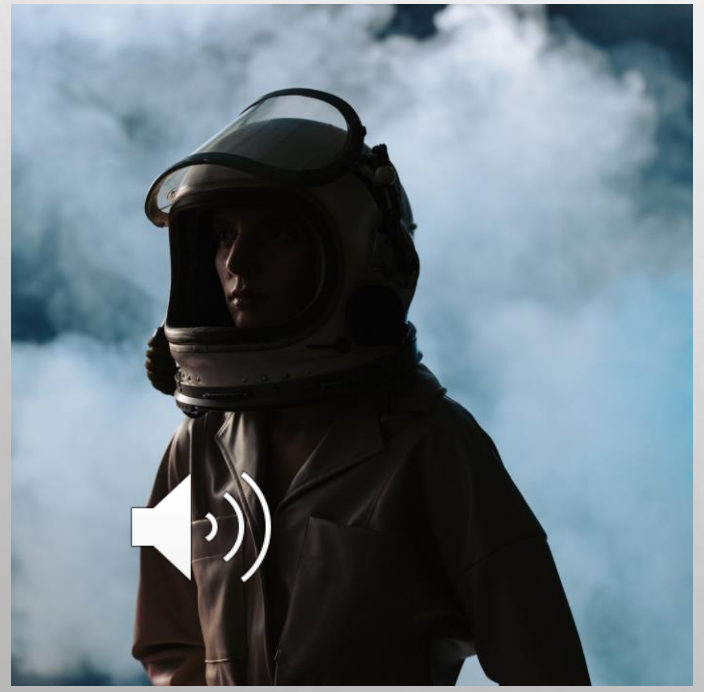
CLIMATE CHANGE AND AIR POLLUTION

- In recent years, the temperature of the world has increased, especially with the increase in anthropogenic activities. Global climate change still continues with the increase in greenhouse gas emissions.
- According to stern, the temperature will continue to rise between 0.5 and 1.0 degrees every decade in the coming years. Again, according to Stern's report, it is estimated that the world will increase by 1.4 to 5.8 degrees in the next century if no action is taken in this regard.

- Industrial facilities, traffic and domestic heating are shown as the 3 main sources of air pollutants in urban areas. Especially industrial facilities are significant sources of pollutants such as; VOC (volatile organic compound), PM, SO_2 and NO_2.
- The air quality index (AQI) scale has been developed for outdoor air quality. The AQI scale is divided into 6 categories with different colors. This scale has been developed for pollutants such as particulate matter (PM), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2) and ground-level ozone (O_3).



- Table 1: Sources of air pollutants and their effects on human health

Pollutant	Source	Negative Effects on Health
SO_2	fossil fuel combustion	respiratory diseases
NO_x	traffic and industry	respiratory diseases
O_3	traffic	respiratory diseases
CO	incomplete combustion product and traffic	circulatory system diseases
PM	industrial and agricultural activities	circulatory and respiratory diseases
Heavy Metals	traffic and industry	circulatory, respiratory and neurological diseases

- Increasing air pollution as a result of human activities adversely affects not only human health, but also the whole ecosystem, including clean water resources, vegetation, and biodiversity.
- In the research of (Yücedağ et al, 2016), the negative effects of air pollution caused by industrial, urban and agricultural activities on plants were investigated. It was concluded that when the roots, stems and leaves of plants are exposed to these pollutants for a long time, deformations occur and growth and photosynthesis are inhibited.
- In another study, the effects of air pollution caused by the combustion of fossil fuels on plants were investigated in the literature and it was concluded that pollutants adversely affected the growth and development mechanisms of plants. Suggestions that can reduce these negativities have been presented.



Table 2. Plant species affected by air pollutants originating from vehicles and their effects summary table

Pollutant	Affected Types	Effects
SO_2	Cucumbers, apples, radishes, barley, wheat, oats and cotton	It prevents the stomata from closing and causes water loss
NO_x	Young seedlings, conifers	Root growth can cause serious reductions in respiration and photosynthesis
O_3	Wheat, soybean, tobacco, potato and tomato species	It negatively affects photosynthesis and plant growth and causes a decrease in yield
PM	Fruits and leaves (apple leaves), oak, beech	It can prevent pollination and light absorption with problems such as bud burst. Accumulation of cement dusts in vegetation can inhibit respiration and photosynthesis in leaves.
CO	There is no clear information about which species it directly affects.	Causes leaves to change from horizontal to vertical (epinastia), shedding of leaves and fruits (abscess), and chlorosis.
Heavy Metals	In general, it has toxic effects on many plant species.	However, overdose inhibits the growth of plants. They cause disruptions in photosynthesis and enzyme mechanisms and inhibit chlorophyll synthesis and germination.

- Along with global climate change, air pollution makes the lives of people who earn their living from the soil difficult, and also puts food security at risk. Food security is defined by the World Agriculture Organization as the physical and economic access of all people to healthy, safe, and nutritious food to lead an active and healthy life. A possible food crisis and endangerment of food security are expected to cause more significant problems in the economic, social, and political fields on a global scale. Grain is an important staple food for humans.
- Some countries have developed several strategies to secure their citizens and economies in the fields of grain production and consumption. Turkiye ranks first in wheat production, flour production, and pasta exports worldwide. There has been an increase in wheat imports in Turkiye, especially in recent years.

- Wheat has a very important place in human nutrition and therefore it is considered a strategic product throughout the world. Flour obtained from wheat, pasta, bulgur wheat, starch, etc.
- While the products are used in human nutrition, the stems of the wheat plant are used in the cardboard and paper industries and the field of livestock. Bread wheat (triticum aestivum L.), in particular, is among the three most important basic crops with approximately 700 million metric tons produced annually. According to different climatic conditions, the production of some of these wheat varieties can come to the fore in some regions.
- As climatic conditions are effective on wheat species, factors such as production quantities and quality are also affected.
- If climate change becomes more effective in agriculture in the coming years, inevitably, more than one billion people in the world will not be able to reach basic food sources easily and steadily.

- It is estimated that countries located in northern latitudes such as Canada and Russia may have the opportunity to engage in agricultural activities in larger areas due to air pollution.
- Global estimates are that grain production will decrease by 20% to 30% in the future due to air pollution. In developing countries, it is expected that there may be a decrease in agricultural products in 2050 compared to 2000 and that the highest product loss in these countries will be in rice and wheat grown with irrigation systems.
- Agricultural product losses due to climate change in South East Asian countries such as Indonesia, Philippines, Singapore, Vietnam, Cambodia, and Thailand are expected to decrease in productivity and product quality of all product groups.
- For all these reasons, the damage caused by traffic and industrial air pollution to agriculture should not be ignored. In light of this information, it is a fact that the negative effects of climate change and air pollution on plants will not only be limited to plants but also enter the food chain through agriculture. For this reason, studies should be carried out to ensure food safety all over the world.

THANK YOU…

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