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Plant Adaptation Mechanisms To Climate Change

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Abstract
This article presents an in-depth analysis of the key adaptation mechanisms that ensure plant survival and reproductive success under climate change. The study explores the impact of factors such as global warming, disrupted precipitation, extreme temperatures, soil salinization, and rising CO2 concentrations on plant physiology and morphology.
Keywords: plant, CO2, ecology, climate, precipitation, grain, agriculture, water, abiotic, drought, morphological, anthropogenic.

INTRODUCTION

In recent decades, global climate change has been affecting all components of the biosphere. The increase in atmospheric CO2, global warming, changes in precipitation patterns, and increased abiotic stresses are directly changing the physiological processes of plants. Since plants are sedentary organisms, they adapt to stress through internal biological mechanisms. This article analyzes the main directions of plant adaptation mechanisms to climate change based on scientific literature.

LITERATURE REVIEW

The changes taking place on the Earth as a result of the consequences of climate change are becoming increasingly widespread. Factors such as changing air temperatures, droughts, rising sea levels, and increased meteorological events are negatively affecting social and economic systems. [1] Climate change is currently one of the most dangerous manifestations of global environmental problems, and its consequences on the Earth are increasingly felt on a large scale. Factors such as changing air temperatures, increasing droughts and droughts, and rising sea levels are seriously damaging the stability of natural ecosystems. Therefore, I believe that it is necessary to reduce the negative impacts of climate change, develop adaptation strategies based on the principles of sustainable development, and strengthen environmental protection measures.

Adaptation in agriculture is associated with the transfer of a crop to new areas where it has not previously grown. The process of adaptation to climate plays a major role in plant breeding, especially when forms introduced from other regions are used as starting material. The process of adaptation to climate in agriculture is closely related to the transfer of crops to new areas that were previously unsuitable for growing. This process has been going on in agricultural practice for a long time. For example, the acclimatization of grain crops from different regions has been tested for thousands of years, clearly demonstrating the experience of human farming in adapting to climatic conditions. .[2]

SCIENTIFIC RESEARCH WORK

In the 80s and 90s of the last century, due to the cold winter weather, some types of vines, such as chillaki, husani and soyaki

species, and pomegranate and fig seedlings were planted in November and opened in late March and early April. The average winter temperature dropped to -200C -210 C, the amount of precipitation during the year averaged 70-80 mm, and the thickness of snow reached an average of 25-30 cm. Since the early 2000s, climate change has led to low precipitation and average cold temperatures not falling below -100 C -50 C, so the vine, pomegranate and fig seedlings have not grown. Despite the cold in the early years, the seedlings that grew from the roots have adapted to the climate.[3]Nowadays, vine pomegranate and fig seedlings are not buried. Due to the drought in recent years, heat and cold-resistant plant varieties are being created. Even citrus fruit varieties, including lemon, tangerine, orange, banana, and papaya plants, adapted to the climate of Uzbekistan, are being created. We have 20 lemon seedlings and 2 tangerine seedlings in our house. They were planted in greenhouses to adapt them to the climate. In the early years, water was sprayed on the leaves of seedlings planted in the summer months 2-3 times. In late October and early November, the greenhouses are closed. But the doors and windows remain open. Starting in December, the doors and windows are closed, and depending on the temperature of the air, small windows are opened and closed to change the air. Starting in December, greenhouses begin to be heated. The temperature in the greenhouse should be above -30C. The information above is our experience over the years. Nowadays, climate-adapted plant varieties are being created through selection. Many plant varieties are disappearing due to climate change.For example: Smoke from an aluminum plant in the city of Mirza Tursinzoda, Tajikistan, near the border with Uzbekistan, is damaging pomegranates in the Surkhandarya region. In addition, the rapid changes in climate and soil, i.e. increased salinity, caused by the drying of the Aral Sea in the 1970s and 1980s, are negatively affecting Uzbekistan's flora.

CONCLUSION

Plant adaptation mechanisms to climate change are crucial for maintaining the stability of ecosystems and maintaining agricultural productivity. Climate change-induced high temperatures, droughts, water scarcity, extreme weather events, and changes in soil conditions activate physiological, morphological, and genetic response mechanisms in plants. In this process, plants enhance water-saving strategies, increase the synthesis of protective pigments and stress-resistant proteins. At the genetic level, adaptive varieties are selected, and the most suitable individuals for climatic conditions are preserved within the population.

In general, plant adaptation to climate change is a complex and evolutionary process with many factors, which is becoming increasingly accelerated under environmental and anthropogenic pressure. In-depth study of these mechanisms is of great scientific and practical importance in creating stress-resistant varieties and improving agrotechnical measures.

Table-1. Winter Climate Indicators in the 1980–1990s

Indicator	Value
Average winter temperature	-20°C to -21°C
Annual precipitation	70–80 mm
Snow depth	25–30 cm
Grapevine, pomegranate and fig seedlings	Buried in November, uncovered in late March–early April

Table-2. Climate Changes Since the 2000-2010s

Indicator	Condition
Average winter temperature	Not lower than -10°C to -5°C
Precipitation	Decreased
Burying of seedlings	Gradually stopped
Adaptation process	Root shoots adapted to climate conditions

Table-3. Citrus Plants in Household Greenhouse Conditions

Indicator	Amount / Condition
Lemon seedlings	20 plants
Mandarin seedlings	2 plants
Leaf spraying (summer)	2–3 times
Greenhouse covering	Late October – early November
Full closing	From December
Heating start	From December
Minimum temperature	Above -3°C

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