

Eureka Journal of Agricultural Science & Bio-Innovation (EJASB)

ISSN 2760-4969 (Online) Volume 2, Issue 1, January 2026



This article/work is licensed under CC by 4.0 Attribution

<https://eurekaopenaccess.com/index.php/7>

ECOPHYSIOLOGICAL FEATURES OF INCREASING STRESS TOLERANCE IN PLANTS UNDER GLOBAL CLIMATE CHANGE

Axmedova Yulduz Amonovna

Student of Bukhara State University

E-mail: axmedovayulduz00000@gmail.com

Abstract:

Today, various stress factors (drought, sudden temperature changes, salinization, air pollution) are observed in nature and agriculture due to global climate change. Increasing stress tolerance in plants is an important ecophysiological issue. This article analyzes the main ecophysiological mechanisms of stress tolerance, including protection of photosynthesis, activity of antioxidant systems, osmotic adaptations and hormonal regulation.

Keywords: Plant, stress tolerance, global climate change, ecophysiology, water stress, temperature stress, antioxidant mechanisms, photosynthesis, adaptation.

Introduction

If we talk about the causes and consequences of global climate change, the geological age of our planet is approximately 4.5 billion years. During this period, the Earth has changed dramatically. The composition of the atmosphere, the mass of our planet, the climate - everything was completely different at the beginning of life. The bright ball, very gradually, we turned it into our present form. Gradually, seas and oceans appeared on the cooling planet. Continents appeared and disappeared, their shapes and sizes changed. The Earth began to rotate more slowly. The first plants appeared, and then life itself. Accordingly, over the past billions of years, our planet has undergone dramatic changes in moisture flow,

Eureka Journal of Agricultural Science & Bio-Innovation (EJASB)

ISSN 2760-4969 (Online) Volume 2, Issue 1, January 2026



This article/work is licensed under CC by 4.0 Attribution

<https://eurekaopenaccess.com/index.php/7>

heat exchange, and atmospheric composition. Climate change has occurred throughout the life of the Earth. It is known that living conditions on Earth are not constant and change over time. These changes occur under the influence of natural phenomena, such as global warming, or anthropogenic factors caused by human activity. Since the 20th century, human activity has become one of the main factors of change. Therefore, the existence and survival of living organisms largely depends on their ability to adapt to external environmental conditions, in particular, to the constant change in natural and climatic factors.

Plants are exposed to stress several times during their lives, and a significant part of their lives is spent under the negative influence of abiotic or biotic stress factors. Therefore, the survival of plants under stress conditions determines their longevity and ability to reproduce. Since the end of the 19th century, an increase in the global average temperature of our planet has been recorded. In the middle of the 20th century, a slight cooling occurred, which did not affect the climate as a whole. By the mid-70s, it became warmer again. According to scientists, over the past century, the global temperature of the Earth has increased by 0.74 degrees. The highest increase in this indicator was recorded in the last 30 years. Climate change affects the state of the oceans of the changing world. An increase in global temperature leads to an expansion of water and, therefore, an increase in its level. There will also be changes in the distribution of precipitation, which in turn can affect the flow of rivers and glaciers.

According to observations, over the past 100 years, the level of the World Ocean has risen by 5 cm, climate scientists associate the warming of the climate with an increase in the concentration of carbon dioxide and a significant increase in the greenhouse effect. Scientists have conducted numerous archaeological studies and concluded that the climate of our planet has changed many times. Many hypotheses have been put forward on this score. According to one of the ideas, if the distance between the Earth and the Sun is the same, the speed of rotation of

Eureka Journal of Agricultural Science & Bio-Innovation (EJASB)

ISSN 2760-4969 (Online) Volume 2, Issue 1, January 2026



This article/work is licensed under CC by 4.0 Attribution

<https://eurekaopenaccess.com/index.php/7>

the planet and the angle of its axis, the climate will remain stable. External factors of climate change:

1. Changes in solar radiation lead to changes in solar radiation fluxes.
2. The movements of TECTONIC plates affect the orography of the Earth, as well as the level of the ocean and its circulation.
3. The gas composition of the atmosphere, in particular the concentration of methane and carbon dioxide.
4. Changes in the angles of the Earth's axis of rotation.
5. Changes in the orbital parameters of the planet relative to the Sun.
6. Earth and space disasters.

The causes of climate change are, among other things, due to the interference of humanity in nature throughout its existence. Deforestation, land clearing, land improvement, etc. lead to changes in moisture and wind conditions. When people make changes to the surrounding nature, such as draining swamps, building artificial reservoirs, cutting down forests or planting new ones, building cities, etc., the microclimate changes. The forest has a great influence on the wind regime, which depends on what kind of snow cover it is, how cold the soil is. Green plantations in the city reduce the impact of solar radiation, increase air humidity, reduce the temperature difference between day and night, reduce air dust.

If people cut down forests in the mountains, in the future it will lead to soil erosion. In addition, reducing the number of trees reduces global temperatures. However, this means an increase in the concentration of carbon dioxide in the air, which is not only absorbed by trees, but is also released during the decomposition of wood. All this leads to a decrease in global temperatures and leads to its increase.

The causes of climate change lie not only in general warming, but also in human activity. People have increased the concentration of substances such as carbon dioxide, nitrous oxide, methane, tropospheric ozone, chlorofluorocarbons in the

Eureka Journal of Agricultural Science & Bio-Innovation (EJASB)

ISSN 2760-4969 (Online) Volume 2, Issue 1, January 2026



This article/work is licensed under CC by 4.0 Attribution

<https://eurekaopenaccess.com/index.php/7>

air. All this ultimately leads to an increase in the greenhouse effect, and the consequences may be irreversible.

Agriculture in Uzbekistan is one of the main sectors of the country's economy, characterized by irrigated areas and flat terrain, as well as warm climatic conditions. Crops in this region mainly consist of cotton, wheat, grain, fruit and vegetable crops, and pastures. The climate of Uzbekistan is dry continental, characterized by high temperatures (sometimes $+45^{\circ}\text{C}$) and drought in the summer months, and cold and snow in the winter. Therefore, the adaptation of plants to external conditions and stress resistance are of great importance for the country's agronomy.

In the northern regions of Uzbekistan, in particular, in the Karakalpakstan, Khorezm and Syrdarya regions, winters are cold, in some places the temperature drops to -20°C . Wheat and barley varieties grown in these regions are selected for their frost resistance. Uzbek scientists (K. Tashkulov, M. Karimov, 2005–2015) conducted research on the selection of frost-resistant wheat varieties. As a result, new varieties resistant to low temperatures were developed in the Syrdarya, Jizzakh and Kashkadarya regions. These varieties are able to adapt to a lack of light and low temperatures in winter and maintain productivity. In many regions of Uzbekistan, the temperature rises to $+40\text{--}45^{\circ}\text{C}$ in the summer months and soil moisture decreases sharply. Under these conditions, cotton, wheat, grain and vegetable crops are stressed. Studies show that under conditions of high temperature and drought, plants reduce photosynthesis, disrupt water balance, and reduce productivity [Shibaeva et al., 2023a].

Studies conducted by Uzbek scientists have shown that micro-greens (broccoli, arugula, mizuna) have increased resistance to high temperatures and antioxidant content when grown indoors [Shibaeva et al., 2022b]. At the same time, irrigation systems and drip irrigation technologies in agriculture help increase plant resistance to drought stress.

Eureka Journal of Agricultural Science & Bio-Innovation (EJASB)

ISSN 2760-4969 (Online) Volume 2, Issue 1, January 2026



This article/work is licensed under CC by 4.0 Attribution

<https://eurekaopenaccess.com/index.php/7>

In areas near industrial cities and industrial areas, an increase in the content of heavy metals (lead, cadmium, zinc) in soil and water is observed. For example, some industrial areas in the Tashkent region and the Zarafshan Valley are subject to metal pollution.

According to studies by Uzbek scientists (A. Talanova, 2009; Sh. Kaznina, 2014), cotton, vegetable and grain crops show reduced growth and yield in areas with high metal pollution. Therefore, the selection of metal-resistant varieties and the use of metal removal technologies are important. In Uzbekistan, ecological physiological studies are widely used in the fields of selection and agrotechnology. For example:

1. Low-temperature resistant varieties - increasing winter yields in the Northern and Central regions.
2. High-temperature and drought-resistant varieties - maintaining stable yields in Surkhandarya, Kashkadarya and Bukhara regions.
3. Heavy metal-resistant varieties - stable growth in industrial areas and metal-contaminated lands.

Also, irrigation technologies, growing micro-greens in closed areas and modern selection methods provide practical results for the agronomy of Uzbekistan.

Conclusion

The adaptation of plants to the external environment in Uzbekistan is directly related to the climate and agro-ecological conditions of the region. Studies have shown that the development of varieties resistant to low temperature, high temperature, drought and metal stress, irrigation technologies and cultivation in closed systems ensure sustainability in Uzbek agriculture. These results serve to develop ecological physiology and agro-ecological monitoring in the country. Ecological physiology and selection research in Uzbekistan is of strategic importance in the development of agriculture. The following recommendations are highlighted:

Eureka Journal of Agricultural Science & Bio-Innovation (EJASB)

ISSN 2760-4969 (Online) Volume 2, Issue 1, January 2026



This article/work is licensed under CC by 4.0 Attribution

<https://eurekaopenaccess.com/index.php/7>

1. Selection and selection of plant varieties suitable for each agro-ecological zone.
2. Widespread use of drip irrigation and modern agro-technologies.
3. Use of biological substances and preparations that increase the stress resistance of plants in drought and high temperature conditions.
4. Development of varieties resistant to metal stress and introduction of bioindicators in industrial areas.
5. Formation of sustainable agroecological systems through territorial monitoring and scientific research.

If these recommendations are implemented, Uzbekistan's agriculture will increase its sustainability and maintain productivity in stressful conditions.

References

1. Drozdov, A.I. i dr. Physiology of plants. — Moscow: Nauka, 1976.
2. Balagurova, L.N. Ecological physiology of plants. — Tashkent: Fan, 1982.
3. Tashkulov K., Karimov M. Selection and selection of frost-resistant wheat varieties. — Tashkent: Agricultural Publishing House, 2010.
4. Shibaeva, N.I. Drought stress and antioxidant mechanisms in plants. — Tashkent, 2022.
5. Shibaeva, N.I., Vakhidova, S. Technologies for growing microgreens in closed conditions. — Tashkent, 2023.
6. Talanova A. Selection of plants resistant to metal stress. — Tashkent: Science and Technology, 2009.
7. Kaznina Sh. Heavy metal pollution in Uzbekistan and plant adaptation. — Tashkent: Scientific publications, 2014.
8. Kaznina, Sh., and dr. Plant metal detoxification mechanisms in Uzbekistan conditions. — Journal of Agroecology, 2016.
9. Ministry of Agriculture of the Republic of Uzbekistan. Agroecological monitoring reports. — Tashkent, 2020.