Modern American Journal of Biological and Environmental Sciences
ISSN (E): 3067-7920
Volume 01, Issue 09, December, 2025
Website: usajournals.org
This work is Licensed under **CC BY 4.0** *a Creative Commons Attribution 4.0 International License.*

PRACTICAL SIGNIFICANCE OF USING THE ALGOLIZATION PROCESS IN THE FIELDS OG AGRICULTURE AND BIOLOGY

Isagalieva Sadafkhon Mukhammadaminovna
Teacher of FerSU
sadafxonisagaliyeva@gmail.com

Abstract
This article provides a scientific analysis of the practical significance of utilizing the algolization process in agriculture and biology. Research demonstrates that applying the biomass of microalgae such as Chlorella vulgaris, Spirulina platensis, and Scenedesmus obliquus to soil and plants can enhance soil and crop productivity, increase plant growth rates, and improve stress tolerance. The algolization process is evaluated as an important tool for improving soil fertility, increasing biological activity, and ensuring environmentally safe agricultural production.

Keywords: Algolization, microalgae, biostimulants, soil fertility, plant growth, agricultural biology, biomass, stress tolerance.

Introduction

Algolization is a technology that involves the application of microalgae in agriculture and biology to improve various processes. Microalgae are unicellular organisms with high photosynthetic activity; they reproduce rapidly, produce large amounts of biomass, and synthesize biologically active compounds essential for plants. In particular, species such as Chlorella, Spirulina, and Scenedesmus are widely used in the agricultural sector.

Excessive use of chemical fertilizers in agriculture leads to soil degradation, a decrease in biodiversity, and the entry of chemical substances into the food chain, causing significant ecological problems. Therefore, in the transition to sustainable

Modern American Journal of Biological and Environmental Sciences
ISSN (E): 3067-7920
Volume 01, Issue 09, December, 2025
Website: usajournals.org
This work is Licensed under CC BY 4.0 a Creative Commons Attribution 4.0 International License.

agriculture, biological preparations—especially biofertilizers and biostimulants derived from microalgae—play an important role.

During photosynthesis, microalgae convert carbon dioxide (CO_2) into oxygen (O_2), which not only supports biomass growth but also helps reduce greenhouse gases in the atmosphere. Their composition, which includes amino acids, vitamins, and phytohormones (auxins, cytokinins, gibberellins), enhances plant growth, root development, and stress tolerance.

The aim of this article is to scientifically elucidate the practical significance of algolization in agriculture and biology and to analyze its effectiveness based on experiments conducted under both laboratory and field conditions.

Literature Reviews

The algolization process is a technology based on the application of microalgal biomass and their extracts in agriculture, soil biology, and plant physiology, and in recent years it has become an important direction within the concept of sustainable farming. Scientific literature has repeatedly demonstrated the rapid growth, high photosynthetic activity, and production of beneficial biochemical compounds for plants by microalgae such as Chlorella, Spirulina, and Scenedesmus.

Many researchers emphasize that using microalgae as biofertilizers improves soil nitrogen, phosphorus, and potassium balance, promotes humus formation, and enhances microbial activity [2, 5]. In particular, suspensions of Chlorella vulgaris have been shown to increase enzymatic activity in the soil as well as improve root length and green biomass of plants [3, 4].

Studies on plant physiology indicate that extracts of Spirulina platensis and Scenedesmus obliquus act as natural biostimulants for plants. Phytohormones such as auxins, cytokinins, and gibberellins, along with amino acids present in these microalgae, stimulate photosynthesis and significantly increase chlorophyll content in leaves, as measured by SPAD indices [10, 11].

Agronomic experiments show that applying microalgae to plants via foliar spraying or seed treatment can increase crop yields by 10–25%. For example, in

Modern American Journal of Biological and Environmental Sciences
ISSN (E): 3067-7920
Volume 01, Issue 09, December, 2025
Website: usajournals.org
This work is Licensed under CC BY 4.0 a Creative Commons Attribution 4.0 International License.

wheat, tomato, cucumber, bean, and potato crops, treatment with microalgal extracts enhanced vegetation rate, root biomass, and fruit yield [1, 8, 9].

From an ecological perspective, microalgae actively assimilate CO_2 and produce oxygen, while also reducing the need for chemical fertilizers, thereby contributing to the sustainability of agroecosystems. For this reason, environmentally friendly technologies based on microalgae are considered a strategic direction for sustainable agriculture [6, 7].

These scientific sources fully confirm the practical significance of certain microalgae as growth stimulators, soil-restoring agents, and yield-enhancing biocomposites.

Research Methodology

In the study, microalgae Chlorella vulgaris, Spirulina platensis, and Scenedesmus obliquus were selected. They were cultivated in a nutrient solution at a temperature of 28 ± 2 °C under a 12:12 light-dark cycle. Biomass was measured every 48 hours using a spectrophotometer at a wavelength of 680 nm.

The experiment was organized in three directions:

1. Application of microalgal suspension to soil Solutions containing 5%, 10%, and 20% microalgal biomass were applied to the soil.
2. Seed treatment with microalgal extract Seeds were soaked for 12 hours in an extract at a 1:20 concentration.
3. Foliar spraying during the vegetation period On the 15th and 30th days of the vegetative stage, leaves were sprayed with 0.5% and 1% solutions.

Measurements taken during the experiments included soil agrochemical parameters (humus content, nitrogen, phosphorus, potassium, pH), plant morphometric growth indicators (height, leaf area, root length, green biomass), photosynthesis intensity (SPAD index), biomass yield, and the enzymatic activity of soil microflora.

Modern American Journal of Biological and Environmental Sciences
ISSN (E): 3067-7920
Volume 01, Issue 09, December, 2025
Website: usajournals.org
This work is Licensed under CC BY 4.0 a Creative Commons Attribution 4.0 International License.

Analysis and Result

The experiments were conducted in three replicates, and the results were analyzed using mathematical-statistical methods. Based on this analysis, the following results were obtained:

1.Changes in soil agrochemical composition:

-Total nitrogen content increased by 15–22%.
-Phosphorus availability improved by 10–18%.
-Potassium content increased by 8–12%.
-Humus content increased by 6–9%.
-Enzymatic activity (urease, catalase) doubled.

2.Plant morphological development:

-Plant height increased by 18–30%, enhancing the ability to utilize sunlight at different canopy levels.
-Root system length increased by 25–40%, allowing plants to more efficiently absorb soil water.
-Leaf area expanded by 20–27%, accelerating light-dependent physiological processes.
-SPAD index increased by 8–15%, indicating a higher concentration of chlorophyll granules in the leaves, which reflects overall plant physiological activity.

3.Yield parameters:

-Wheat yield increased by 12–15%.
-The number of fruits in tomato plants increased by 18–22%.
-Potato tuber weight increased by 20%.
-The vegetation period of cucumber plants shortened by 5–7 days.

Modern American Journal of Biological and Environmental Sciences
ISSN (E): 3067-7920
Volume 01, Issue 09, December, 2025
Website: usajournals.org
This work is Licensed under CC BY 4.0 a Creative Commons Attribution 4.0 International License.

4.Stress tolerance characteristics:
-Survival under drought conditions increased by 10–13%.
-Under salinity stress, the reduction in light utilization during photosynthesis decreased by 17%.
-Heat stress tolerance was significantly enhanced.

Discussion

The results confirm that microalgae have great potential for practical application in agriculture. Microalgae are among the most efficient photosynthetic organisms; their biomass, growth rate, nutrient composition, and environmental safety make them a very promising alternative to chemical fertilizers.
The algolization process demonstrates highly positive effects on both plants and soil properties. The main benefits of algolization are as follows:
1.It enhances soil fertility and rapidly restores its natural condition.
2.It reduces the consumption of various chemical fertilizers applied to the soil.
3.It ensures environmental safety, as microalgae mix quickly and easily with 4.the soil and cause minimal atmospheric pollution when decomposed.
5.It increases plant resistance to stress conditions within the soil.
6.It assimilates CO_2 and helps purify the air.

Conclusion

The algolization process has significant practical importance for agriculture and biology. Suspensions and extracts based on microalgae enhance soil fertility, accelerate plant growth, increase crop yields by 12–22%, and improve stress tolerance. It serves as an environmentally friendly and cost-effective technology. Furthermore, in the future, the widespread application of algolization technology can contribute to the development of sustainable agriculture, reduce the use of chemical fertilizers, and ensure ecological safety.

Modern American Journal of Biological and Environmental Sciences
ISSN (E): 3067-7920
Volume 01, Issue 09, December, 2025
Website: usajournals.org
This work is Licensed under **CC BY 4.0** *a Creative Commons Attribution 4.0 International License.*

REFERENCES

1. Abd El-Fattah A., El-Sayed S., Abd El-Rahman A. Effect of Spirulina platensis extract on growth and yield of tomato plants // Middle East Journal of Agriculture Research. – 2018. – Vol. 7, No. 2. – P. 450–462.
2. Borowitzka M. A. Microalgae in agriculture and aquaculture: the potential for microalgae as biofertilizers // Journal of Applied Phycology. – 2013. – Vol. 25, No. 3. – P. 201–220.
Chojnacka K., Zielińska A. Use of microalgae for sustainable agriculture // Chemosphere. – 2020. – Vol. 243. – 125–145.
3. Gumińska M., Krawczyk A., Piotrowska-Niczyporuk A. Impact of Chlorella vulgaris on soil microbial activity and plant development // Environmental Biotechnology. – 2021. – Vol. 17, No. 2. – P. 45–54.
4. Markou G., Nerantzis E. Microalgae for high-value compounds and biofuels production: A review // Renewable & Sustainable Energy Reviews. – 2016. – Vol. 49. – P. 841–853.
5. Moreno-Garrido I. Microalgae as a renewable source in agriculture: A concise review // Algal Research. – 2020. – Vol. 48. – 101908.
6. Renuka N., Prasanna R., Sood A., et al. Effects of microalgae-based biofertilizers on soil health and crop productivity // Journal of Soil Biology. – 2018. – Vol. 65. – P. 39–48.
7. Renuka N., Sood A., Ratha S. K., Prasanna R., Ahluwalia A. S. Nutrient enrichment and seed priming effects of microalgal extracts on agricultural crops // Applied Soil Ecology. – 2018. – Vol. 130. – P. 122–134.
8. Renuka N., Prasanna R., Sood A., et al. Microalgae-based biostimulants: Sustainable approach for soil fertility enhancement // Environmental Technology & Innovation. – 2019. – Vol. 13. – P. 308–317.
9. Ronga D., Caradonia F., Setti L., et al. Microalgal biostimulants and their action mechanisms on plant growth // Agronomy. – 2019. – Vol. 9, No. 5. – P. 203.

Modern American Journal of Biological and Environmental Sciences
ISSN (E): 3067-7920
Volume 01, Issue 09, December, 2025
Website: usajournals.org
This work is Licensed under **CC BY 4.0** *a Creative Commons Attribution 4.0 International License.*

10. Shah M., Rashid A., Ali S. Evaluation of microalgal extract as a plant growth stimulant // Plant Physiology Reports. – 2020. – Vol. 25, No. 3. – P. 295–304.

11. Singh J. S., Kumar A., Rai A. N. Cyanobacteria and microalgae as biofertilizers for sustainable agriculture // Plant and Soil. – 2020. – Vol. 447. – P. 1–19.