

## INFLUENCE OF MOISTURE AND SALINITY LEVELS ON THE GROWTH OF SUNFLOWER

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### **Abstract:**

Among oilseed crops in agriculture, sunflower is considered a plant of significant economic importance. Its productivity depends on many ecological factors, particularly soil moisture and salinity levels. In this study, the effects of different moisture levels and soil salinity on the vegetative development and productivity of sunflower were investigated. During the experiments, plant height, number of leaves, biomass formation, and overall development indicators were analyzed under various moisture conditions and salinity levels. The results showed that sunflower develops well under optimal moisture conditions, whereas an increase in salinity slows down the plant's growth rate and reduces productivity. The findings of this study are important for developing effective agrotechnical measures in agriculture.

**Keywords:** sunflower, moisture, salinity, growth, soil, productivity, ecological factors.

### **Introduction**

Sunflower (*Helianthus annuus* L.) is one of the widely cultivated and important oilseed crops in the world. It is widely used in the food industry, livestock production, and for technical purposes. The oil obtained from sunflower seeds is of high quality and occupies an important place in human nutrition.

In recent years, climate change, decreasing water resources, and soil degradation have had a significant impact on the productivity of agricultural crops. In particular, soil salinization and moisture deficiency are widespread problems in the regions of Central Asia. These factors affect the physiological processes of plants, the absorption of nutrients, and their overall development.

As a result of soil salinization, the concentration of salts in the soil solution increases, making it difficult for plant roots to absorb water. Consequently, plants experience stress conditions, photosynthesis decreases, and growth processes slow down. At the same time, soil moisture also plays an important role in plant development. Insufficient moisture reduces the process of photosynthesis and weakens the vegetative growth of plants.

Although sunflower is considered relatively drought-resistant, its maximum productivity is achieved under certain moisture conditions. Therefore, studying the interaction between soil moisture and salinity levels is of great scientific importance for agricultural practice.

The main objective of this study is to determine the effect of soil moisture and salinity levels on the growth process of sunflower plants.

The objectives of the study are as follows:

- to study the growth indicators of sunflower under different moisture conditions;
- to determine the effect of soil salinity levels on plant development;
- to analyze the interaction between moisture and salinity factors.

### Materials and Methods

The experiments were carried out under laboratory and field conditions. One of the locally selected sunflower varieties was used in the experiment. Before sowing, the seeds were selected and planted under identical conditions.

The experiment was conducted under three different moisture levels:

- 1 Low moisture (40–50%)
- 2 Moderate moisture (60–70%)
- 3 High moisture (80–90%)

In addition, soil salinity was artificially created at three different levels:

- 1 Non-saline soil (control)
- 2 Moderately saline soil
- 3 Highly saline soil

Each experimental variant was repeated three times. The following plant indicators were regularly measured:

- plant height (cm)
- number of leaves
- root system development
- vegetative biomass

During the experiment, the plants were observed for 45–60 days. The obtained data were analyzed using statistical methods.

### Results

Under low moisture conditions, the height of the plants was on average 20–25% lower. The number of leaves was also observed to be significantly lower. The main reason for this is the slowdown of the photosynthesis process.

Although plants developed well under high moisture conditions, excessive moisture in some cases slowed down the development of the root system.

The level of soil salinity also had a negative effect on plant development. In moderately saline soil, sunflower growth slowed slightly, while in highly saline soil both plant height and the number of leaves decreased significantly.

Under conditions of high salinity, the following symptoms were observed:

- yellowing of leaves
- slowing of growth rate
- reduction in biomass accumulation

The results showed that conditions with optimal moisture and low salinity levels are the most favorable for sunflower growth.

### Discussion

The results of this study are consistent with the findings of other scientific research. Many studies have reported that salinity negatively affects the growth process of plants.

Under saline conditions, plant roots face difficulties in absorbing water. This disrupts the plant's water balance and leads to physiological stress. As a result, the process of photosynthesis decreases and plant growth slows down.

Moisture is one of the main ecological factors in plant life. Water maintains turgor pressure in plant cells, ensures the transport of nutrients, and participates in metabolic processes.

According to the results of the study, sunflower develops best under moderate moisture conditions. As the salinity level increases, the plant's tolerance to stress decreases.

Therefore, it is important to apply the following agrotechnical measures in agriculture:

reducing soil salinity

implementing efficient irrigation systems

using salt-tolerant varieties

These measures can help increase sunflower productivity.

### Conclusion

Based on the conducted research, the following conclusions were drawn:

1 Soil moisture has a significant effect on sunflower growth.

2 Under optimal moisture conditions, the vegetative development of the plant improves.

3 Soil salinity reduces the growth rate of the plant.

4 Under highly saline conditions, sunflower biomass production decreases significantly.

5 To increase productivity, an optimal irrigation system and soil reclamation measures are necessary.

The results of this research can serve as an important scientific basis for improving agrotechnical practices in sunflower cultivation.

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