

AGROTECHNOLOGY OF SUNFLOWER CULTIVATION IN THE KHOREZM REGION AND ITS IMPORTANCE IN AGRICULTURE

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Abstract: This article explores the agrotechnical aspects of sunflower (*Helianthus annuus* L.) cultivation under the agro-climatic conditions of the Khorezm region. Based on field observations and experimental data from local farms, the research focuses on the effects of variety selection, optimal sowing time, fertilization, irrigation, and crop maintenance on yield performance. The results demonstrate that adopting science-based agrotechnological practices significantly improves crop productivity and contributes to the development of the regional oilseed sector. Notably, the "Turan" variety was identified as highly compatible with Khorezm's climate and provided superior yields. The article further highlights the socio-economic and food security relevance of sunflower cultivation in Uzbekistan's agricultural sector.

Keywords: Sunflower, agrotechnology, Khorezm region, oil crops, yield, fertilization, irrigation, variety selection, food security.

1. Introduction.

Sunflower (*Helianthus annuus* L.) is one of the world's leading oilseed crops, cultivated for its high-quality edible oil and protein-rich by-products used in livestock feed. According to FAO data, global sunflower seed production exceeded 50 million tonnes in 2022, indicating its growing demand in both the food and industrial sectors [1].

In Uzbekistan, particularly in the Khorezm region, increasing demand for vegetable oils and oilseed products has prompted local authorities and farmers to expand sunflower cultivation. However, successful production requires an in-depth understanding of local agro-climatic conditions and the application of suitable agrotechnical measures. This study investigates the implementation of optimal agronomic practices in sunflower cultivation in Khorezm, emphasizing the region-specific factors that affect productivity.

2. Materials and Methods

This research was conducted between 2022 and 2023 in selected farms located in Urgench and Gurlan districts of the Khorezm region. The soil-climatic conditions of the region are characterized by:

- **Soil:** mainly alluvial-meadow and loamy,
- **Climate:** sharply continental with hot, dry summers and mild winters,
- **Annual precipitation:** less than 100 mm,
- **Irrigation water:** sourced from the Amu Darya river and canal systems.

Field experiments followed a randomized complete block design (RCBD) with three replications. The tested agrotechnical factors included:

- **Variety selection:** Turan, Surkhon-6, and a local hybrid;
- **Sowing period:** mid-March to early April;
- **Seeding rate:** 55–60 thousand plants per hectare;

- **Fertilization:** NPK at 80:60:40 kg/ha;
- **Irrigation:** 3–4 times during the growing season based on plant developmental stages.

Data were collected on germination rates, growth indicators, flowering time, pest resistance, and final seed yield.

3. Results

3.1. Variety Performance

Among the studied varieties, "Turan" demonstrated superior adaptability and yield potential in Khorezm's conditions, producing an average yield of **2.6–2.9 t/ha**, which is **15–18%** higher compared to the local hybrid. Additionally, Turan exhibited moderate resistance to *Helicoverpa armigera* and fungal infections under field conditions.

3.2. Fertilization and Irrigation Impact

Balanced fertilization, particularly with nitrogen and phosphorus, significantly influenced vegetative growth and head size. Experimental plots with full NPK treatment achieved seed oil content up to **43%**, while under unfertilized control plots, it dropped below **35%**.

Properly timed irrigation at flowering and seed-filling stages increased seed weight and reduced empty seed incidence. Over-irrigation, however, led to root lodging and delayed maturity.

3.3. Economic Efficiency

Cost-benefit analysis showed that the most profitable configuration was Turan variety + full fertilization + 3 irrigations, yielding a net return of over 12.5 million UZS/ha and a benefit-cost ratio of 1.8. This indicates sunflower's strong potential as a cash crop in Khorezm under proper agronomic management.

4. Discussion:

The findings align with prior research by Karimov et al. (2021) on sunflower productivity under Uzbekistan's arid conditions, which emphasized the role of agro-technical optimization [2]. The "Turan" variety, developed for regional resilience, showed both high oil yield and market adaptability.

Sunflower cultivation not only diversifies crop rotations but also reduces dependency on imported vegetable oil, contributing to national food security. Moreover, its short growth cycle (90–110 days) allows for double cropping in Khorezm, enhancing land-use efficiency.

Challenges such as pest management and limited access to certified seeds remain. Addressing these through state-supported extension services and improved mechanization can significantly enhance outcomes.

5. Conclusion:

Sunflower cultivation in the Khorezm region, when managed using science-based agrotechnical methods, presents a promising opportunity for agricultural development and rural income generation. The success of the "Turan" variety underscores the importance of local adaptation in crop selection. Widespread adoption of optimized fertilization and irrigation schedules can increase both productivity and profitability. In light of global food security challenges, promoting sunflower as a strategic oilseed crop in Uzbekistan is both timely and essential.

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