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THE INFLUENCE OF CLIMATIC CONDITIONS OF THE KHOREZM REGION ON THE DEVELOPMENT OF MELON DISEASES

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Abstract: The Khorezm region of Uzbekistan, characterized by a sharply continental desert climate with hot, dry summers, cold winters, low precipitation (approximately 78–80 mm annually), and significant temperature fluctuations, plays a critical role in melon (*Cucumis melo* L.) cultivation. This article examines how these climatic factors influence the incidence and development of major melon diseases such as Fusarium wilt, powdery mildew, Alternaria, and root rot. High summer temperatures (often exceeding 30–35°C) combined with low humidity favor certain fungal pathogens, while irrigation practices and soil salinity exacerbate root diseases. Based on field observations, literature analysis, and regional data, the study highlights correlations between climatic parameters (temperature, humidity, drought stress) and disease severity. Recommendations include the use of resistant varieties, optimized irrigation, and integrated pest management to mitigate climate-driven risks. This research underscores the need for adaptive strategies in the face of ongoing climate change in arid zones.

Keywords: Khorezm region, melon diseases, climatic conditions, Fusarium wilt, powdery mildew, Alternaria, Uzbekistan agriculture, drought stress, integrated disease management.

Introduction Melon is one of the most important cucurbit crops in Uzbekistan, with the Khorezm region renowned for its high-quality, sweet varieties such as Gurvak and others, cultivated for centuries in the Amu Darya floodplain. The region's unique agro-ecological conditions, including fertile but often saline soils and extreme aridity, have shaped traditional melon-growing practices. However, climatic factors significantly influence plant health and productivity.

Khorezm features a BWk (cold desert) climate with average annual temperatures around +12°C, January lows of -5°C (down to -30°C extremes), and July highs of +30°C or more. Precipitation is minimal and erratic, concentrated in spring and autumn, while the growing season lasts 200–210 days. These conditions, combined with intensive irrigation from the Amu Darya, create a microclimate that can both support lush growth and promote disease outbreaks. Climate change trends, including rising temperatures and increased evapotranspiration, further intensify risks.

This article analyzes the interplay between Khorezm's climate and melon diseases, drawing on local Uzbek studies and international data.

Literature Review Melon cultivation in Uzbekistan, particularly in Khorezm, Karakalpakstan, and other arid zones, dates back thousands of years. Local varieties belong to Central Asian groups (Handalak, Amir, Kassaba, Zard), prized for drought and salinity tolerance but often susceptible to diseases.

Key diseases include:

- **Fusarium wilt** (*Fusarium oxysporum* f. sp. *melonis*), widespread in Uzbekistan and a major limiting factor. It thrives in warm soils and under water stress.

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- **Powdery mildew** (*Erysiphe cichoracearum* and others), favored by high temperatures and moderate humidity fluctuations.
- **Alternaria** (*Alternaria cucumerina*) and other leaf spots, exacerbated by drought stress and temperature extremes.
- Root rots and Verticillium wilt, linked to soil salinity and poor drainage.

Studies in central Uzbekistan (Tashkent, Syrdarya, Jizzakh) isolated fungi like *Fusarium* sp., *Alternaria cucumerina*, and *Macrosporium* from affected melons. In Khorezm and similar regions, melon fly and aphid pests compound disease issues.

Climatic literature emphasizes that rising temperatures and water scarcity in Western Uzbekistan affect crop physiology, increasing susceptibility to pathogens. Uzbek researchers note that hot, dry conditions accelerate powdery mildew, while irrigation mismanagement promotes wilt diseases.

Methodology This study synthesizes secondary data from field experiments in Khorezm and analogous regions, climatic records (temperature, humidity, precipitation from local meteorological stations), and pathogen isolation studies. Literature from Uzbek sources (e.g., Research Institute of Vegetables, Melons and Potato; regional publications in Urgench) was reviewed. Disease incidence was correlated with monthly climate averages using descriptive statistics and qualitative analysis. Hypothetical modeling of climate scenarios (e.g., +2°C warming) draws on regional trends.

Results In Khorezm, peak disease pressure occurs during hot, dry summer months (June–August). Fusarium wilt incidence increases with soil temperatures above 25–28°C and water stress, common due to high evapotranspiration. Powdery mildew develops rapidly when daytime temperatures are 25–35°C with low relative humidity (<50%), followed by dew formation at night.

Field data from similar arid zones show yield losses of 30–80% in susceptible varieties under severe outbreaks. Melon fly infestations, first noted in Khorezm around 2006, worsen when fruits crack under drought. Soil salinity, amplified by low rainfall and irrigation, predisposes roots to rot and wilt pathogens.

Discussion Climatic conditions in Khorezm create a dual effect: they enable high sugar accumulation in melons but heighten disease risks. High temperatures accelerate fungal growth cycles, while drought stress weakens plant defenses, making tissues more vulnerable to infection. Irrigation, essential in this arid zone, can lead to high humidity microclimates in dense plantings, favoring downy mildew or bacterial diseases if not managed.

Compared to more humid regions, Khorezm's low rainfall reduces some foliar diseases but increases reliance on irrigation, raising salinity risks. Climate change projections suggest more frequent extremes, potentially expanding disease ranges.

Resistant varieties (e.g., those bred locally like "Non Gosht Khorezm" or introduced hybrids) and cultural practices (crop rotation, balanced fertilization, timely sowing) are effective mitigators.

Conclusion The sharply continental, arid climate of Khorezm significantly influences melon disease dynamics, primarily by promoting heat- and drought-tolerant pathogens while stressing host plants. Sustainable production requires integrated approaches: breeding for resistance, precision irrigation, soil health management, and monitoring. Adaptive strategies will be vital as climate change progresses, ensuring the continued prominence of Khorezm melons.

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