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APPLICATION OF DRIP IRRIGATION SYSTEM FOR DIFFERENT MELON VARIETIES AND STUDY OF THE IMPACT ON YIELD

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Abstract
This article presents information on the reasons for yield differences between 15 melon cultivars grown under drip irrigation. In the experiment, despite all varieties being irrigated with the same amount of water, yields varied by up to 6-7 times. This was due to differences in water use efficiency, root system development, and the formation of reproductive organs. The highest yields were observed in the Gulobi, Zar Gulobi, and Sakhovat varieties. These results demonstrate the need to study the water requirements of each variety and determine optimal irrigation rates. The findings support the rationale for optimizing drip irrigation based on varietal characteristics.

Keywords: melon varieties, drip irrigation, yield, water use efficiency, agrobiology, fruit quality, varietal characteristics, optimization.

Introduction:

Ensuring efficient water use in agricultural crops is one of the most pressing agricultural challenges of our time. Global climate change, leading to prolonged periods of drought and a reduction in irrigated land, increases the need for innovative irrigation methods aimed at conserving water resources and stabilizing crop yields. Drip irrigation technology is considered one of the most effective methods, as it delivers targeted water, reduces evaporation losses, and allows for tailoring irrigation regimes to the physiological needs of plants.

Melon (Cucumis melo L.) is an important melon crop, long cultivated in Central Asia and boasting high nutritional value. Melon varieties adapted to various agroclimatic

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conditions are of great practical importance for the republic's agricultural sector. However, the biological characteristics, growth rates, and water requirements of varieties vary significantly. Therefore, developing optimal irrigation rates for melon varieties, determining the water efficiency of each variety, and developing scientifically based approaches to increasing yields remain pressing issues.

The correct choice of drip irrigation regimen has a significant impact not only on yield but also on fruit quality indicators, including sugar content, dry matter content, fruit weight, and marketability. The varying water requirements of different varieties require individual irrigation rates for each. Therefore, in this study, several irrigation options were used on 15 melon varieties to scientifically determine the optimal water volume and assess its impact on yield.

The results of the study are important for the development of resource-saving technologies for melon cultivation, the rational use of water resources, the full development of the biological potential of varieties, and for the formation of scientifically based recommendations for modern melon growing practices.

The issues of improving melon cultivation technology, efficient water use, and optimizing drip irrigation rates have been extensively studied by a number of domestic and foreign researchers. Research conducted by Uzbek scientists has presented important scientific results concerning the agrobiological characteristics of melon varieties, their water requirements, and the impact of irrigation on yield. In particular, R. Komilov [1] studied the mechanisms of physiological adaptation of local melon varieties under conditions of moisture deficiency and noted that moderate irrigation contributes to improved fruit quality. A. Turdiev et al. [2], evaluating the effectiveness of drip irrigation, demonstrated the possibility of increasing the water use coefficient by 25–30%. Furthermore, N. Nazarov [3], analyzing the impact of differentiated irrigation rates on the yield of melon crops, scientifically substantiated significant differences in the water requirements of varieties.

Extensive research has been conducted in the international literature on the agro-ecological benefits of drip irrigation technologies, the development of individual irrigation strategies for different varieties, and the determination of yield efficiency indicators. For example, Kumar et al. [4] compared irrigation regimes for different melon varieties in Indian conditions and noted that the maximum yield was obtained at 80% ET. A study by Al-Mulla [5], conducted in the climatic conditions of the Middle East, found that drip irrigation under high temperature conditions can increase water savings by up to 40%. In addition, Jensen and Hanson [6] proposed methods for modeling irrigation rates based on experiments with various melon crops, assessing water consumption, nutrient movement, and the impact on yield.

Material and Methods

The study included phenological observations, biometric measurements, and productivity determinations according to the "Conducting Experiments on Vegetable,

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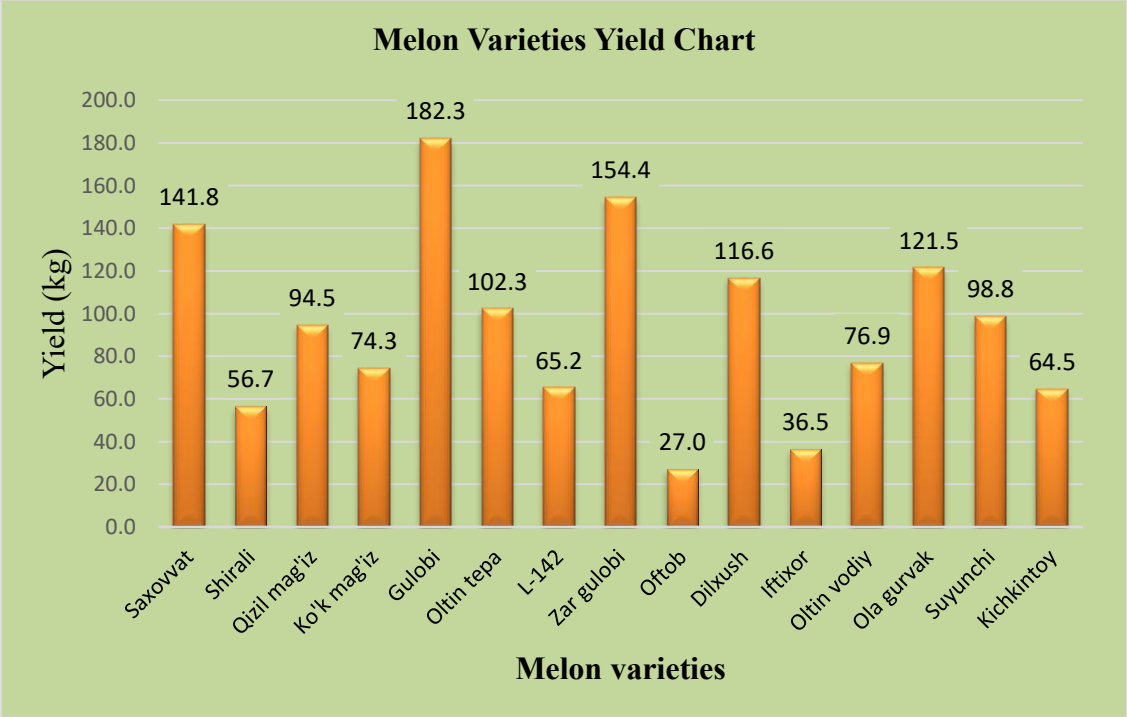
Melon, and Potato Crops" methodology (T., 2023). Mathematical data processing was based on the field experiment methodology of Dospekhov (1985).

Results analysis: In the study, 15 melon varieties were grown in identical plots under drip irrigation. The data obtained revealed significant yield differences between the varieties. These differences are primarily related to the physiological characteristics of the varieties, the degree of root development, and transpiration rates.

According to the experimental results, the Gulobi, Zar Gulobi, and Sakhovat varieties demonstrated the highest yields, reaching 182.25 kg, 154.4 kg, and 141.75 kg, respectively. These varieties demonstrated high fruit set density during the growing season, and the average fruit weight was higher than that of other varieties. Furthermore, their root systems efficiently utilized the moist soil layer, demonstrating a specific frugality in water consumption.

The medium-yielding varieties include Ola Gurvak (121.5 kg), Dilkhush (116.6 kg), Oltin Tepa (102.33 kg), and Suyunchi (98.8 kg), which demonstrated stable yields, indicating their good adaptation to drip irrigation. These varieties exhibit high photosynthetic activity, and the ratio of vegetative mass to reproductive organs is optimal.



Low-yielding varieties—Oftob (27 kg), Iftikhor (36.5 kg), and Shirali (56.7 kg)—showed negative results even under identical irrigation conditions. This may be due to their slow growth rates, low fruit set rates, or physiological limitations in water uptake. In some varieties, vegetative growth prevailed over generative development, leading to a sharp decline in yield.

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The results showed that melon varieties adapt differently to drip irrigation conditions. High-yielding varieties demonstrated high water use efficiency, with optimal water delivery to the reproductive organs. For low-yielding varieties, excessive water consumption on vegetative growth or poor root development resulted in reduced productivity. Consequently, a single irrigation rate for drip irrigation does not ensure consistent results for all varieties; instead, it is necessary to establish a customized rate that matches the physiological rhythm of the variety and its environmental requirements.

Conclusions:

1. Significant yield differences were found among melon varieties under identical drip irrigation conditions, confirming their relationship to the biological and physiological characteristics of the varieties.
2. The Gulobi, Zar Gulobi, and Sakhovat varieties are recommended for use as they exhibit the highest water efficiency.
3. Low-yielding varieties failed to demonstrate high yields due to low water absorption efficiency.
4. The study results substantiate the need for individualized irrigation rates for different melon varieties. This practical recommendation promotes the economical use of water resources, optimizes agricultural processes, and increases yields.

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