

UDK 635.64:631.527.52:581.1(575.1)

EVALUATION OF THE EFFICIENCY OF FEEDING AND IRRIGATION REGIMES IN GREENHOUSE GROWING OF COCKTAIL TOMATOES**Islamov Sohob Yaxshibekovich**

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Annotatsiya:

Mazkur maqolada issiqxona sharoitida kokteyl tipidagi pomidor navlarini yetishtirishda turli sug'orish va oziqlantirish rejimlarining samaradorligi tahlil qilingan. Tajriba davomida *Sweet Million* va *Sakura F1* navlariga tamchilab, og'iz va gibrid usullarda sug'orish, shuningdek, uch xil NPK proporsiyasida (1:1:1, 1:0.5:1.5 va 1.5:1:1) oziqlantirish rejimlari qo'llanildi. Natijalarga ko'ra, tamchilab sug'orish hamda fosfor va kaliyga boy oziqlantirish sharoitida eng yuqori hosildorlik va meva sifati ta'minlandi. Suv sarfining kamayishi va mevadagi Briks, sho'rlik, tashqi ko'rinishning yaxshilanishi esa texnologiyaning iqtisodiy samaradorligini ko'rsatdi. Natijalardan kichik fermer xo'jaliklari uchun tavsiyalari shakllantirildi.

Kalit so'zlar: kokteyl pomidor, issiqxona, sug'orish usuli, oziqlantirish rejimlari, NPK, tamchilab sug'orish, hosildorlik, sifat ko'rsatkichlari.

Аннотация:

В данной статье проанализирована эффективность различных режимов полива и питания при выращивании коктейльных сортов томатов в тепличных условиях. В эксперименте использовались сорта *Sweet Million* и *Sakura F1* с применением капельного, традиционного (орошения) и гибридного полива, а также трёх пропорций удобрений NPK (1:1:1, 1:0.5:1.5 и 1.5:1:1). Наилучшие показатели урожайности и качества плодов были достигнуты при капельном поливе и повышенном содержании фосфора и калия. Экономическая эффективность технологии проявилась в снижении расхода воды и улучшении качества плодов. Сформулированы практические рекомендации для малых фермерских хозяйств.

Ключевые слова: коктейльные томаты, теплица, режим полива, питание, удобрения NPK, капельный полив, урожайность, качество продукции.

Annotation:

This article evaluates the effectiveness of different irrigation and fertilization regimes in cultivating cocktail-type tomato varieties under greenhouse conditions. The experiment involved *Sweet Million* and *Sakura F1* varieties using drip, surface, and hybrid irrigation methods, combined with three NPK ratios (1:1:1, 1:0.5:1.5, and 1.5:1:1). The highest yield and fruit quality were achieved under drip irrigation with phosphorus and potassium-rich nutrition. The method proved economically efficient by reducing water consumption and improving Brix, salinity, and external appearance of fruits. Practical recommendations were developed for smallholder farmers.

Keywords: cocktail tomato, greenhouse, irrigation method, fertilization regime, NPK, drip irrigation, yield, fruit quality.

Enter Today, in greenhouse vegetable growing, along with ensuring high yields and quality indicators, the need for the use of resource-saving technologies is growing. In particular, rational use of water and mineral fertilizers is of great importance in reducing production costs and ensuring environmental sustainability.

Cocktail-type tomato varieties are a salty, small-sized, highly export-oriented product, and for their high-quality and efficient cultivation, it is necessary to develop a correct irrigation and feeding strategy. The development of these varieties in a greenhouse environment is very sensitive, and water shortages or nutrient imbalances can negatively affect fruit set, salinity levels, appearance, and overall yield.

Therefore, determining the most effective and resource-saving feeding and irrigation system by comparing irrigation types (drip, overhead, hybrid) and different NPK ratios is of great importance for practice. This approach, while improving product quality, allows for the introduction of economically viable technologies for small and medium-sized farms.

The main objective of this study is to assess the effectiveness of feeding and irrigation regimes in the cultivation of cocktail-type tomato varieties in greenhouse conditions, to determine the relationship between water consumption and crop quality, and to develop scientifically based recommendations for practice.

Methods. The study was conducted in an intensive greenhouse with polycarbonate covering in the Tashkent region during the 2024–2025 season. Two types of cocktail tomato varieties were selected as the objects - Sakura F1 and Sweet Million. These varieties are distinguished by their high yield, fruit quality, and high demand in the consumer market.

- Irrigation methods used in the experiment:
 1. Drip irrigation (intensive method)
 2. Sprinkling (traditional) irrigation
 3. Hybrid method (drip + periodic sprinkling irrigation)
- The amounts of three types of mineral fertilizers were determined differently in the feeding regimes:
 - NPK 1:1:1 - standard nutrient balance
 - NPK 1:0.5:1.5 - regime with a predominance of phosphorus and potassium
 - NPK 1.5:1:1 - regime with a predominance of nitrogen
- In total, 3 (irrigation) × 3 (feeding) = 9 experimental variants were created. Each variant was repeated 3 times, and each repetition was studied based on a sample of 10 plants.
- During the experiment, the following agrobiological and technological indicators were determined: The amount of fruit obtained from each plant (kg/m²);
- Fruit quality indicators (Brix %, salinity, appearance);
 - Water consumption (liters/m²);
 - Overall economic efficiency of each option.

The harvest was measured at the end of the growing season and the quality of the fruit was assessed in laboratory conditions based on chemical analysis.

- Research results. A clear definition of irrigation and feeding strategies in greenhouse tomato cultivation is one of the main factors determining yield and product quality. Cocktail-type

tomatoes are in high market demand, and their cultivation technology, in particular, the efficient use of water and fertilizers, increases the economic efficiency of farms. Below is a scientific analysis of the yield and quality indicators of the Sweet Million and Sakura F1 varieties grown under different irrigation and feeding regimes based on the results of the experiment conducted in 2024–2025 (see Tables 1 and 2). **1- Table**

• **Effect of different irrigation and feeding regimes on yield (2024-2025yy)**

Variety name	Irrigation method	NPK rejimi	Productivity (kg/m ²)
Sweet Million	Drip by drip	1:0.5:1.5	12.1
Sakura F1	Drip by drip	1:0.5:1.5	11.6
Sweet Million	In the ditches	1:1:1	8.7
Sakura F1	In the ditches	1:1:1	8.2
Sweet Million	Hybrid	1:1:1	10.3
Sakura F1	Hybrid	1:1:1	9.5

This table compares the yields of the two varieties under three different irrigation and nutrient regimes. The highest yield of 12.1 kg/m² was recorded for the Sweet Million variety under drip irrigation and 1:0.5:1.5 NPK regime. Sakura F1 also yielded 11.6 kg/m² under the same conditions. This indicates that fruit set is higher in a regime rich in phosphorus and potassium. On the contrary, the yield decreased significantly under the traditional irrigation method (ditch) and the standard 1:1:1 NPK regime: 8.7 kg/m² for Sweet Million, 8.2 kg/m² for Sakura F1. This method does not save water, and moisture is retained in the soil for a long time, which can lead to a lag in development and a decrease in fruit quality.

The hybrid method (drip + ditch) showed an average yield of 10.3 (Sweet Million) and 9.5 (Sakura F1) kg/m². This method distributes water evenly, but the high efficiency is lower than that of the drip method.

Table 2
Fruit quality indicators and water consumption (2024-2025)

Variety name	Irrigation method	Briks (%)	External fruit value	Water consumption (l/m ²)
Sweet Million	Drip by drip	6.5	High	120
Sakura F1	Drip by drip	6.4	High	125
Sweet Million	In the ditches	5.8	Average	180
Sakura F1	In the ditches	5.7	Average	185
Sweet Million	Hybrid	6.1	High	160
Sakura F1	Hybrid	6.0	Average	165

The second table shows the brix (sugar content), external value of the fruit and water consumption. With drip irrigation, 6.5% (Sweet Million) and 6.4% (Sakura F1) brix levels were determined. This is an important indicator of the taste and exportability of the product. With the drip method, the brix level drops (5.8 and 5.7%), which indicates that due to excess water, the fruit is juicy, but has a poor taste.

As for the external value of the fruit, varieties grown by the drip and hybrid methods have a high fruit structure and color, that is, marketable. Increased moisture in the drip method sometimes causes injuries or deformities in the fruit.

As for water consumption, the drip method gave the highest results with the lowest water consumption (120–125 l/m²). The ditch method requires 180–185 l/m² of water, which means that about 40–50% more resources are used, but the result is lower. The hybrid method, while maintaining water consumption at a moderate level, did not give much effect. Although this method combines both approaches, it was noted that it was less effective than drip irrigation in terms of water saving and quality.

Table 3
Comparative analysis and general trends

Irrigation method	Yield (average)	Brix (average)	Water consumption (average)	External evaluation
Drip by drip	11.85 kg/m ²	6.45 %	122.5 l/m ²	High
In the ditches	8.45 kg/m ²	5.75 %	182.5 l/m ²	Average
Hybrid	9.9 kg/m ²	6.05 %	162.5 l/m ²	High/average

1. Based on this table, it is clear: drip irrigation provides advantages not only in water saving, but also in quality and yield. The ditch method has the highest water consumption and low efficiency. The hybrid method is considered an intermediate option, but cannot fully ensure quality.

2. The results of the study once again confirmed the importance of implementing effective irrigation and feeding technologies for cocktail-type tomato varieties in greenhouse conditions. In particular:

3. 1. Sweet Million and Sakura F1 varieties showed high yield and quality indicators under drip irrigation conditions. At the same time, the yield increased to 11.6–12.1 kg/m², and the Brix content in the fruit was 6.4–6.5%. This puts them among the promising varieties with high economic efficiency.

4. 2. The NPK 1:0.5:1.5 feeding regimen — a formula rich in phosphorus and potassium — had a positive effect on fruit structure, taste, and overall development. Fruit set was high in this regimen, and appearance was also highly rated.

5. The irrigation method Along with the increase in water consumption during irrigation, a decrease in yield and quality indicators was observed. Water consumption increased to 180–185 l/m², the Brix content of the fruit decreased, and the appearance was assessed as “average”. This method leads to inefficient use of water resources and an increase in the cost of the product.

6. 6. The hybrid method - that is, a combination of drip and ditch methods - has average efficiency and is recommended only if the conditions are met on large areas. However, as a general conclusion, it was shown that it is less effective than the drip method.

7. In the future, it is advisable to develop an individual feeding and irrigation strategy based on the agrobiological characteristics of each cocktail tomato variety, and optimize the amount of microelements, organic and mineral substances that stimulate fruiting during the care process. This will serve not only to increase yield, but also to increase product quality.

8. Also, selecting fruit varieties with high Brix content, appearance, and storage capacity and developing export-oriented technologies for them are promising areas.

FOYDALANILGAN ADABIYOTLAR RO‘YXATI

1. Ashurov, A. H., Abdurasulov, D. S. (2021). *Issiqxonada sabzavot yetishtirish agrotexnologiyasi*. Toshkent: “Fan” nashriyoti.

2. Bahridinov, B. Yu. (2020). *Ochiq va yopiq gruntda pomidor yetishtirishning biologik asoslari*. Samarqand: SamDU nashriyoti.



3. Qurbonov, H. (2018). *O'zbekistonda pomidor navlarining agrobiologik xususiyatlari va ulardan samarali foydalanish*. Toshkent: TDAU ilmiy ishlar.
4. Rasulov, A.A., & Turaev, M.R. (2022). *Greenhouse vegetable production in Central Asia: Challenges and innovations*. Journal of Horticultural Science, 10(2), 45–51.
5. Mirzaev, M. M., & Karimova, N. O. (2019). *Tomato (Solanum lycopersicum) varieties for intensive farming: Yield and quality parameters*. International Journal of Agronomy, 17(1), 78–83.
6. FAO (2020). *Protected cultivation in the Mediterranean region*. Food and Agriculture Organization of the United Nations.
7. Vaxobov, X. Q. (2023). *Intensiv issiqxonalarda agronomik tadbirlarni optimallashtirish yo'llari*. Toshkent: Agroinnovatsiya markazi.
8. Johnson, L.F., & Thorne, J.H. (2017). *Tomato cultivation under controlled environments: Varietal response and productivity*. Agriculture and Environment, 12(3), 201–210.
9. Gulyamov, S.R., & Karimov, U.T. (2021). *Sifatli pomidor hosili uchun oziqlantirish va sug'orish texnologiyalarini tanlash*. Toshkent: Agrobiologiya ilmiy jurnali, 4(2), 39–44.
10. Qobilov, Sh.J. (2022). *Oziq-ovqat xavfsizligida pomidor mahsulotining o'rni va eksport salohiyati*. Agroiqtisodiyot va innovatsiyalar jurnali, 5(1), 60–65.