AMERICAN JOURNAL OF MULTIDISCIPLINARY BULLETIN
ISSN: 2996-511X (online) | ResearchBib (IF) = 9.512 IMPACT FACTOR
Volume-3| Issue-6| 2025 Published: |30-06-2025|

UDK 631.527:635.64

ANALYSIS OF THE YIELD AND ECONOMIC EFFICIENCY OF COCKTAIL TOMATOES GROWING IN A GREENHOUSE

https://doi.org/10.5281/zenodo.15741358

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Annotatsiya

Ushbu maqolada issiqxona sharoitida yetishtirilgan Sweet Million va Sakura F1 kokteyl tipidagi pomidor navlarining turli sug‘orish va oziqlantirish rejimlaridagi agrobiologik hamda iqtisodiy samaradorlik ko‘rsatkichlari tahlil qilindi. Tajriba natijalariga ko‘ra, tomchilab sug‘orish va fosfor hamda kaliyga boy (NPK 1:0.5:1.5) oziqlantirish rejimi eng yuqori hosildorlik va mahsulot sifatiga erishishda samarali bo‘lgan. Ariq usulida suv sarfi ko‘p va mahsulot sifati past bo‘ldi. Tomchilab usulidagi texnologiya 30–40% ga yuqori iqtisodiy foyda berdi.

Kalit so‘zlar

kokteyl pomidor, Sweet Million, Sakura F1, issiqxona, sug‘orish, oziqlantirish, hosildorlik, iqtisodiy samara.

Аннотация

В статье проведен анализ агробиологических и экономических показателей урожайности коктейльных томатов сортов Sweet Million и Sakura F1, выращенных в тепличных условиях при различных режимах полива и питания. Наивысшие результаты получены при капельном орошении и питании с преобладанием фосфора и калия (NPK 1:0.5:1.5). Этот режим обеспечил максимальную урожайность и качество плодов. Использование арычного полива привело к перерасходу воды и снижению качества продукции. Экономическая эффективность капельного орошения была на 30–40% выше по сравнению с традиционными методами.

Ключевые слова

коктейльные томаты, Sweet Million, Sakura F1, теплица, орошение, питание, урожайность, экономическая эффективность.

Abstract

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This article analyzes the agrobiological and economic performance of Sweet Million and Sakura F1 cocktail tomato varieties grown in greenhouse conditions under different irrigation and fertilization regimes. The highest yield and fruit quality were observed under drip irrigation combined with phosphorus- and potassium-rich fertilization (NPK 1:0.5:1.5). In contrast, furrow irrigation resulted in higher water consumption and lower fruit quality. The use of drip irrigation led to an economic gain of 30–40% compared to conventional methods.

Keywords

cocktail tomato, Sweet Million, Sakura F1, greenhouse, irrigation, fertilization, yield, economic efficiency.

1. Introduction. In recent years, there has been an increasing interest in greenhouses for the cultivation of high-value, market-demanding agricultural products. In particular, cocktail-type tomato varieties are in particular demand among consumers due to their appearance, high taste qualities, Brix level, and good keeping quality. This article analyzes the cultivation of cocktail tomatoes of the Sweet Million and Sakura F1 varieties based on various agrotechnical measures, their yield indicators, and economic efficiency, and develops recommendations for practice.

2. Materials and methods. The experiment was carried out in 2024–2025 in a modern greenhouse adapted to the climatic conditions of the Tashkent region. Two types of cocktail tomato varieties, Sweet Million and Sakura F1, which are distinguished by their appearance, taste qualities, and keeping quality, were selected for the study.

3. Varieties with different irrigation methods:

4. drip irrigation,

5. ditch irrigation,

6. hybrid (combined) irrigation — were used.

Three different fertilization regimes (nutrition formulas) were applied in each irrigation option:

- NPK 1:1:1 (standard regime),
- NPK 1:0.5:1.5 (low phosphorus, high potassium regime),
- NPK 1.5:1:1 (nitrogen regime priority).

The experiment was carried out based on a factorial design, with each combination placed in three replicates. Temperature, humidity, light and ventilation in the greenhouse were controlled in accordance with agrotechnical requirements. Biometric data, yield, Brix level and economic indicators (costs, income, profit) were evaluated as the main analysis parameters.

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In this study, a total of 18 experimental variants were established for the tomato varieties Sweet Million and Sakura F1 cocktail, based on 3 types of irrigation methods (drip irrigation, ditch irrigation and hybrid method) and 3 different feeding regimes (NPK 1:1:1, 1:0.5:1.5, 1.5:1:1). This approach allowed for a comprehensive assessment of yield and economic efficiency depending on the balance of light, moisture and nutrients. The effect of irrigation method. The irrigation method is one of the factors that directly affects the yield and quality indicators. In the variants under drip irrigation conditions, the Sweet Million variety showed especially high yields. The main factors are the direct delivery of water to the root zone, the continuous supply of microelements and the maintenance of optimal soil moisture. During irrigation through ditches, cases of irregular plant development were observed due to water waste and uneven distribution of water. Hybrid irrigation showed an average effect.

The effect of feeding regimes. Differences in the ratio of nutrients affected the formation of crop quality. In particular:

• NPK 1:1:1 — balanced regime, gave average, stable results.

• NPK 1:0.5:1.5 — a potassium-rich regimen, was effective in increasing fruit juiciness and Brix levels.Sakura F1 was especially beneficial for the variety.

• NPK 1.5:1:1 — nitrogen regime, although it increased the growth mass, weakened the quality of the fruit due to excessive vegetative growth and reduced storage life.

Table 1.

Combinations of options used in the experiment (by variety, irrigation method and feeding regimes)

№	Tomato ety		Nutritional regimen K)
1	Sweet on	Drip irrigation	1 : 1 : 1
2	Sweet on	Drip irrigation	1 : 0.5 : 1.5
3	Sweet on	Drip irrigation	1.5 : 1 : 1
4	Sweet on	Irrigation ugh ditches	1 : 1 : 1
5	Sweet on	Irrigation ugh ditches	1 : 0.5 : 1.5
6	Sweet on	Irrigation ugh ditches	1.5 : 1 : 1
7	Sweet	Hybrid method	1 : 1 : 1

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	on		
8	Sweet on	Hybrid method	1 : 0.5 : 1.5
9	Sweet on	Hybrid method	1.5 : 1 : 1
10	Sakura F1	Drip irrigation	1 : 1 : 1
11	Sakura F1	Drip irrigation	1 : 0.5 : 1.5
12	Sakura F1	Drip irrigation	1.5 : 1 : 1
13	Sakura F1	Drip irrigation	1 : 1 : 1
14	Sakura F1	Drip irrigation	1 : 0.5 : 1.5
15	Sakura F1	Drip irrigation	1.5 : 1 : 1
16	Sakura F1	Hybrid method	1 : 1 : 1
17	Sakura F1	Hybrid method	1 : 0.5 : 1.5
18	Sakura F1	Hybrid method	1.5 : 1 : 1

Efficiency depending on the characteristics of the variety. The Sweet Million variety showed maximum yield and high Brix levels, especially under drip irrigation and NPK 1:0.5:1.5 regime. The Sakura F1 variety fully developed under hybrid irrigation and balanced fertilization and formed export-oriented fruit quality.

The analysis of the table shows that drip irrigation and a potassium-dominant feeding regime (1:0.5:1.5) are recommended as the most effective technological approach for cocktail tomato varieties. In this way, the juiciness, shelf life and marketability of the fruit will be high. It was confirmed that the compatibility of the variety and agrotechnical elements is a decisive factor in ensuring crop quality.

When choosing any technological solution in agribusiness, its economic efficiency - that is, the amount of income received in relation to the costs incurred - is of decisive importance. By analyzing the profitability of various agrotechnical measures used in the cultivation of cocktail-type tomatoes in greenhouse conditions, the most economically optimal and profitable methods were identified.

According to the results of the analysis, drip irrigation and a potassium-dominant feeding regime (NPK 1:0.5:1.5) were formed as a technological approach that brings the highest economic benefit for the Sweet Million variety. This method saved water and fertilizer consumption, while the market price was high due to the high Brix level and shelf life of the fruit. At the same time, the Sakura F1 variety gave relatively stable income under hybrid irrigation and a balanced feeding regime (1:1:1).

The ability to compare the profitability coefficient (benefit/cost), total income and costs for each option serves as an important criterion for implementing the research results in practice. Therefore, when choosing technological methods,

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special attention should be paid not only to agrobiological, but also to economic indicators.

During the experiment, two different cocktail-type tomato varieties - Sweet Million and Sakura F1 - were grown using different irrigation methods (drip, ditch, and hybrid) and three different feeding regimes (NPK 1:1:1, 1:0.5:1.5, 1.5:1:1). A total of 18 agrotechnical options were created (Table 1). The experimental results showed that the drip irrigation options gave the best indicators in terms of yield and economic efficiency. In particular, the Sweet Million variety, the 1:0.5:1.5 feeding regime and drip irrigation option yielded 140 t/ha and recorded a net profit of up to 150 million soums (Table 2). The profitability level was 115.4%, which is the highest indicator.

In the Sakura F1 variety, the hybrid irrigation and NPK 1:1:1 regime option was relatively stable and efficient - a yield of 115 t/ha and a net profit of 104 million soums were recorded, and the profitability was 82.5%.

It was found that irrigation through ditches in all cases led to a decrease in yield and an average distribution of water during irrigation. Therefore, this method was considered less economically efficient.**2-jadval.**

Economic efficiency of cocktail tomato growing methods (sample calculations per 1 ha)

№	Navi	Irriga nod	Nutrient regime K)	Yield)	Revenue lion soums)	Expendit (million ns)	Net it lion ns)	Profitabilit)
1	Swee lion	Drip ation	1:0.5:1.5	140	280.0	130.0	150.0	115.4
2	Swee lion	Thro the nes	1:0.5:1.5	110	220.0	125.0	95.0	76.0
3	Swee lion	Hybr ethod	1:0.5:1.5	125	250.0	128.0	122.0	95.3
4	Sakur	Drip ation	1:1:1	120	240.0	132.0	108.0	81.8
5	Sakur	Thro the nes	1:1:1	100	200.0	124.0	76.0	61.3
6	Sakur	Hybr ethod	1:1:1	115	230.0			

The results of the experiment showed that the best results for the Sweet Million variety were achieved with drip irrigation and a fertilizing regime with an NPK ratio of 1:0.5:1.5. This method resulted in high yields and efficient use of water

and fertilizers.For the Sakura F1 variety, hybrid irrigation and a fertilizing regime with an NPK ratio of 1:1:1 were the most sustainable and beneficia methods.Drip irrigation was superior in terms of water conservation, accurate fertilizer delivery, and high fruit quality. On the contrary, irrigation through ditche wasted water, resulting in low yields and low profits.

It was found that economic income can be increased by up to 2 times by choosing the right irrigation method and fertilization regime. Therefore, it is advisable for farmers to choose effective technologies based on the results of this experiment.

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