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Article

Yield and Marketable Product Quantity of Cucumber Varieties and Hybrids under the Soil and Climate Conditions of Karakalpakstan

Allamjarova Gulbakhar Akhmetovna[1], Erezhepova Gulbakhar Tazhetovna[2]
1. Doctoral Candidate (PhD), Karakalpakstan Institute of Agriculture and Agrotechnologies
2. Associate Professor, Doctor of Philosophy in Agricultural Sciences, Karakalpakstan Institute of Agriculture and Agrotechnologies
Email: gulbaxarallamjarova2@gmail.com[1], gulbaxorerejepova@gmail.com[2]

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Abstract: This study presents a comparative evaluation of the total and marketable yield parameters of 11 cucumber varieties and hybrids under the soil and climate conditions of Karakalpakstan. The research findings revealed sharp differences in average fruit weight and yield. The highest total yield was recorded in the Zena F1 (28.7 t/ha) and Saturn F1 (27.9 t/ha) hybrids. These hybrids also demonstrated the highest marketable yield indicators (Zena F1 – 26.4 t/ha, Saturn F1 – 25.5 t/ha), enabling an increase in productivity of 220.0% and 212.5%, respectively, relative to the standard variety. The largest fruit weight was observed in the Saturn F1 hybrid (125.8 g).

Keywords: Cucumber, Variety, Hybrid, Karakalpakstan, Yield, Marketable Product, Marketable Harvest, Fruit Weight

Introduction

Ensuring a stable, year-round supply of fresh and high-quality vegetable products to the population is one of the priority tasks of modern agriculture. The sharply continental climate and soil salinity of the Republic of Karakalpakstan negatively affect the development of vegetable crops. Under such conditions, selecting varieties and hybrids that not only yield well but also produce a high share of marketable output meeting market demands is of significant scientific and practical importance. In cucumber cultivation, economic efficiency is directly determined by the marketable qualities of the product — that is, the average fruit weight and the share of harvest suitable for sale. In many cases, even when total yield is high, the amount of non-marketable (substandard) product increases due to unfavorable climate conditions. Therefore, identifying varieties and hybrids that are resilient to local soil and climate factors and have high profitability is a pressing breeding task. The purpose of this study is to comparatively examine the dynamics of fruit weight, total yield, and marketable yield

among 11 cucumber variety samples (Uzbekskiy 740, Fontina F_1, Superina F_1, Saturn F_1, Koshan F_1, Mahalliy serhosil F_1, Zena F_1, Orzu F_1, Majad F_1, Samarqand, Lider F_1) under the conditions of Karakalpakstan, and to scientifically substantiate the hybrids with the highest performance for the region.[1][2][3]

Materials and Method

Field experiments were conducted over 2024–2026 at the educational-experimental field of the Karakalpakstan Institute of Agriculture and Agrotechnologies, located in Nukus district. Cucumber varieties and hybrids were studied by planting 11 varieties and hybrids in open ground. The spacing between strips was 140 cm, between rows 70 cm, and between plants 40 cm, with each plot's feeding area totaling 8.4 m^2. Each plot contained 40 plants.[4]

Results and Discussion

The research findings show that, under the soil and climate conditions of the Republic of Karakalpakstan, characterized by high temperatures, low relative air humidity, and an intense evaporation process, the productivity of cucumber varieties and hybrids is directly dependent on their characteristics and their adaptability to environmental factors. From this perspective, the varieties and hybrids studied were comparatively evaluated against the Uzbekskiy 740 standard variety in terms of average fruit weight, total yield, share of marketable harvest, and marketable harvest quantity obtained per hectare.[5][6]

In the Uzbekskiy 740 standard variety, the average fruit weight was 105.5 g, total yield was 14.3 t/ha, the share of marketable harvest was 84.2%, and marketable harvest was 12.0 t/ha. These indicators were adopted as the basis for the comparative evaluation of the other varieties and hybrids.[7]

In the Fontina F_1 hybrid, the average fruit weight amounted to 98.5 g, 7.0 g less than the standard variety's 105.5 g. Total yield was 13.7 t/ha, 0.6 t/ha or 4.2% lower than the standard.

Table 1. Comparative Evaluation of Yield and Marketability Indicators of Cucumber Varieties and Hybrids under the Conditions of Karakalpakstan (2024–2026)

Variety/Hybrid samples	Average fruit weight, g	Total yield, t/ha	Share of marketable harvest, %	Marketable harvest, t/ha	% relative to standard variety
Uzbekskiy 740 – standard	105,5	14,3	84,2	12,0	100
Fontina F_1	98,5	13,7	90,3	12,3	102,5
Superina F_1	73,9	8,5	89,8	7,6	63,3
Saturn F_1	125,8	27,9	91,5	25,5	212,5
Koshan F_1	88,7	15,7	88,6	13,9	115,8
Mahalliy serhosil F_1	98,6	22,5	91,3	20,5	170,8
Zena F_1	95,7	28,7	92,3	26,4	220,0
Orzu F_1	68,5	13,8	88,4	12,2	101,6
Majad F_1	105,2	19,1	91,1	17,4	145,0
Samarqand	85,8	9,1	81,5	7,4	61,6
Lider F_1	80,7	12,9	87,7	11,3	94,1

Marketable harvest amounted to 12.3 t/ha, 0.3 t/ha or 2.5% higher than the standard. Thus, although Fontina F_1 was slightly lower than the standard in terms of total yield, its higher degree of marketability resulted in a marketable harvest quantity above the standard. This indicates a certain advantage of this hybrid in terms of product quality.[8]

In the Superina F_1 hybrid, the average fruit weight was 73.9 g, 31.6 g less than the standard variety. Although Superina F_1 had a high share of marketable product, the quantity of marketable product obtained per unit area remained at a low level.

The Saturn F_1 hybrid demonstrated one of the highest results in terms of productivity indicators. The average fruit weight was 125.8 g, 20.3 g higher than the standard variety's 105.5 g. This is the highest result for average fruit weight among the varieties and hybrids studied. Total yield amounted to 27.9 t/ha, 13.6 t/ha or 95.1% higher than the standards 14.3 t/ha — that is, almost double. Marketable harvest amounted to 25.5 t/ha, an increase of 13.5 t/ha or 112.5% over the standard variety's 12.0 t/ha.[9]

In the Koshan F_1 hybrid, the average fruit weight was 88.7 g, 16.8 g less than the standard. Nevertheless, total yield amounted to 15.7 t/ha, 1.4 t/ha or 9.8% higher than the standard. The share of marketable harvest was 88.6%, 4.4 percentage points higher than the standard. Marketable harvest reached 13.9 t/ha, 1.9 t/ha higher than the standard.

In the Mahalliy serhosil F_1 hybrid, the average fruit weight amounted to 98.6 g, 6.9 g less than the standard. However, total yield amounted to 22.5 t/ha, 8.2 t/ha or 57.3% higher than the standard. Marketable harvest amounted to 20.5 t/ha, 8.5 t/ha higher than the standards 12.0 t/ha.

The Zena F_1 hybrid delivered the highest result among all the varieties and hybrids studied in terms of total and marketable yield.

The average fruit weight was 95.7 g, 9.8 g less than the standard variety's 105.5 g. However, despite the relatively smaller fruits, total yield amounted to 28.7 t/ha. This was 14.4 t/ha higher than the standard variety's 14.3 t/ha, indicating that yield increased almost twofold. The share of marketable harvest was 92.3%. Marketable harvest amounted to 26.4 t/ha, 14.4 t/ha more than the standard variety.

In the Orzu F_1 hybrid, the average fruit weight amounted to only 68.5 g, 37.0 g less than the standard. The share of marketable harvest amounted to 88.4%, 4.2% higher than the standard. As a result, marketable harvest amounted to 12.2 t/ha, 0.2 t/ha or 1.7% higher than the standard.[10]

In the Majad F_1 hybrid, the average fruit weight was 105.2 g, almost equal to the standard's 105.5 g. The difference amounted to only 0.3 g or 0.3%. Total yield was 19.1 t/ha, 4.8 t/ha higher than the standard. The share of marketable harvest amounted to 91.1%, resulting in a marketable harvest of 17.4 t/ha, 5.4 t/ha higher than the standard variety.[11][12]

In the Samarqand variety, the average fruit weight was 85.8 g, 19.7 g less than the standard. Total yield amounted to only 9.1 t/ha, 5.2 t/ha lower than the standard. Marketable harvest amounted to 7.4 t/ha, 4.6 t/ha less than the standard.[13][14]

In the Lider F_1 hybrid, the average fruit weight was 80.7 g, 24.8 g less than the standard. Total yield amounted to 12.9 t/ha, 1.4 t/ha or 9.8% lower than the standard. The share of marketable harvest was 87.7%, 3.5% higher than the standard.[15]

Conclusion

Differences in total and marketable yield were observed among the cucumber varieties and hybrids studied under the conditions of Karakalpakstan. In the Uzbekskiy 740 standard variety, total yield amounted to 14.3 t/ha, the share of marketable harvest was 84.2%, and marketable harvest was 12.0 t/ha.

In the Zena F_1 hybrid, the highest total yield of 28.7 t/ha and marketable harvest of 26.4 t/ha were recorded. This represents an increase over the standard variety of 14.4 t/ha or 100.7% in total yield, and 14.4 t/ha or 120.0% in marketable harvest.

The Saturn F_1 hybrid had the highest average fruit weight at 125.8 g, exceeding the standard by 20.3 g or 19.2%. Total yield amounted to 27.9 t/ha and marketable harvest to 25.5 t/ha, 95.1% and 112.5% higher than the standard, respectively.

The Mahalliy serhosil F_1 hybrid produced 22.5 t/ha total and 20.5 t/ha marketable harvest, with marketable harvest 70.8% higher than the standard. Majad F_1, meanwhile, had a marketable harvest of 17.4 t/ha, 45.0% higher than the standard.

As a result of a comprehensive evaluation of the combined phenological, morphological, and productivity traits, the Zena F_1 and Saturn F_1 hybrids stood out as the most promising hybrids for the conditions of Karakalpakstan. Zena F_1 demonstrated superiority through its high total and marketable yield, long fruiting period, and high marketability, while Saturn F_1 showed superiority through its high field germination, earliness, large fruits, and high marketable harvest. For this reason, selecting these hybrids for further agrotechnical trials is scientifically well-founded.

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