

Selection of the variety of sweet potato and features of their cultivation technology

Anvar Shamsiev¹, Shavkat Ubaydullaev², Toshtemir Ostonakulov³

¹Samarkand Institute of veterinary medicine

²Tashkent institute of irrigation and agricultural mechanization engineers of Karshi branch

³Peter Academy of Sciences and arts

Correspondent authors: anvar-shamsiev@mail.ru, shavkat_57@mail.ru, t-ostonakulov@mail.ru

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Abstract

The article presents the results of a comprehensive assessment of sweet potato varieties in the conditions of the Zarafshan Valley. In 2017-2019, studies were conducted on irrigated meadow-gray earth soils. Eighteen sweet potato varieties were compared. Selected variety samples were studied with a row spacing of 70 and 90 cm with a scheme of 70x25 and 90x20 cm for 1, 2 and 3 seedlings in the nest, at various irrigation regimes according to pre-irrigation soil moisture of 65-70, 70-70 and 70-80% of MWHC and the norms of mineral fertilizers (without fertilizers-control, $N_{100}P_{80}K_{50}$, $N_{150}P_{120}K_{75}$, $N_{200}P_{160}K_{100}$ и $N_{250}P_{200}K_{125}$ kg/ha). To obtain seedlings of sweet potato varieties, 40 tubers were taken and planted on February 20-22 in a film greenhouse at a temperature of 15-18 °C, seeding to a depth of 3-5 cm, the soil moisture was maintained at 65-70%. 7-10 days after planting, the buds began to germinate, and after 43-48 days, seedlings were formed with a height of 12-15 cm, which is ready for planting in the field. Planting seedlings in the field is carried out, according to the scheme 70x20-25x1 cm in the second or third decade of April. After transplanting, after 15-18 days in the field, planting care begins. Care includes - inter-row processing (cultivation), weeding, weed control, top dressing, watering. Harvesting in late September, early October with a potato digger. As a result of research, varieties - Sochakinur, Xar-Bay, and Japan were identified. The cultivation of these varieties according to the scheme 70x25x1 and 90x20x1 cm with an irrigation mode according to pre-irrigation soil moisture of not less than 70-80% MWHC and the application of mineral fertilizers in the norm of $N_{200}P_{160}K_{100}$ kg/ha contributes to a marketable crop yield per hectare of at least 48-52 tons with good qualities and good preservation.

Key words: Varietal specimens; sprouts; early maturity; rate of harvest accumulation; marketable yield; standing density; irrigation regime; Maximum water holding capacity (MWHC); fertilizer rates; tuber keeping quality

INTRODUCTION

Sweet potato (*Ipomea batatas* Lam.) is widely distributed in China, Japan, India, the USA, Korea and European countries as a food, technical and forage crop. Sweet potato - one of the new food crops for Uzbekistan. Batata belongs to the family of bindweed (*Convolvulaceae* L.). More than 400 varieties are included in this family, among them one variety is cultivated I.batatas. Batata - a perennial, tropical plant. The most convenient temperature for

growth and development of batata is +25...+35 °C (Mavlyanova & Mezhidov, 2003; Yoshimoto et al., 2005; Magomedova, 2017; Fedorov, 2018; Zorin, 2018; Zorin & Cheremnykh, 2019). For this reason, in dry, hot climate of Uzbekistan batata is cultivated as annual crop-by seedling method. The success of sweet potato cultivation depends to a large extent on the correct selection and introduction of varieties of this crop (Ostonakulov et al., 2018; Ostonakulov, 2018). In this regard, the purpose of our research is a comprehensive assessment of sweet potato vari-

eties in the Zarafshan valley for precocity, growth, development, intensive reproduction, crop formation, compactness of tubers in the nest, productivity, yield and maturation of tubers and the selection of promising ones, as well as the development of agricultural techniques for obtaining high yields for these conditions.

MATERIALS AND METHODS

Field experiments were carried out in the conditions of old-irrigated meadow-gray-earth soils of the farm “Raykhon” of the Taylok district of the Samarkand region. The mechanical composition of the soil is medium-loamy with groundwater at a depth of 4-5 m. Agrochemical indicators of the arable horizon are characterized by a low content of humus (0.98-1.11%), nitrate nitrogen (8.41-10.67

mg/kg), mobile phosphorus (25.43-27.61 mg/kg), and exchange potassium (189-216 mg/kg) of the soil.

The object of the study was 18 varieties of sweet potatoes. The selected cultivars – Sochakinur and Xar-Bay were studied at row spacing of 70 and 90 cm with a scheme of 70x25 and 90x20 cm for 1, 2 and 3 seedlings in the nest and with irrigation regimes according to pre-irrigation soil moisture of 65-70, 70-70 and 70-80% of MWHC and the norms of mineral fertilizers (without fertilizers-control, $N_{100}P_{80}K_{50}$, $N_{150}P_{120}K_{75}$, $N_{200}P_{160}K_{100}$ и $N_{250}P_{200}K_{125}$ kg/ha).

The area of the plot is 28-280 m², the repetition is three to fourfold.

All records, observations, analyses, care and harvesting were carried out according to generally accepted methods and agricultural recommendations (Fedorov, 2016; Ostonakulov, 2017, 2018).

Table 1. Productivity and marketability of the studied sweet potato varieties

№	The name and origin of the varieties	Productivity by years, t/ha			Average productivity, t/ha	Including commercial yield		Compared to the standard variety	
		2017	2018	2019		t/ha	%	t/ha	%
1.	Khazina (UZ)-st	35,1	33,0	37,2	35,1	34,1	97,0	-	100,0
2.	Pobeda (RU)	34,3	33,1	35,5	34,3	32,0	93,2	-0,8	97,7
3.	Yellow (JP)	34,0	30,5	33,0	32,5	30,4	93,4	-1,6	92,6
4.	Pumpkin (KP)	42,2	38,8	41,1	40,7	38,0	93,4	4,6	116,0
5.	Sochakinur (UZ)	46,2	43,7	48,4	46,1	45,2	98,0	11,0	131,3
6.	Xar-Bay (CN)	45,5	43,4	44,6	44,5	43,2	97,1	9,4	126,8
7.	Chestnut (KP)	38,4	38,1	41,1	39,2	37,7	96,2	4,1	111,7
8.	Kumara Red (EE)	42,5	39,8	42,8	41,7	39,9	95,6	6,6	118,8
9.	Betty (IT)	40,0	35,6	39,3	38,3	34,5	93,4	3,2	109,1
10.	Beauregard (US)	42,3	37,7	41,5	40,5	37,8	95,8	5,4	115,4
11.	Jewell (US)	30,8	32,2	34,2	32,4	29,7	93,4	-2,7	92,3
12.	Bonita (IS)	44,4	41,6	39,1	41,7	41,2	98,0	6,7	119,1
13.	Sumor (JP)	35,3	40,7	39,8	38,6	37,4	96,8	3,5	110,0
14.	Japan (JP)	45,7	43,2	46,7	45,2	44,2	97,3	10,1	128,8
15.	Porto Rico (PT)	42,8	37,6	43,5	41,3	37,5	94,2	6,2	117,7
16.	Georgia Jet (US)	34,4	37,3	38,1	36,6	34,4	94,7	1,5	104,3
17.	Nency Hall (US)	40,1	42,2	45,8	42,7	41,6	97,0	7,6	121,7
18.	Beige (US)	38,8	41,4	44,3	41,5	40,5	97,0	6,4	118,2
	S_x (%)	2,2	3,6	2,9					
	LSD ₀₅ (t/ha)	1,5	2,7	2,1					

Table 2. Influence of cultivation of sweet potato varieties under different methods and density of standing planting on yield (2017-2019)

№	Planting methods, cm	Density of standing 1 ha, thousand. pcs.	Yield from one bush, g	Productivity, t/ha	Including commercial yield	
					t/ha	%
Xar-Bay						
1	70x25x1	57,1	1044	43,6	41,0	94,0
2	70x25x2	114,2	950	35,8	33,0	92,2
3	70x25x3	171,3	902	32,7	29,0	88,6
4	90x20x1	55,5	1138	46,2	44,0	95,1
5	90x20x2	111,1	981	40,5	38,1	94,0
6	90x20x3	166,5	923	37,0	33,3	90,0
LSD ₀₅ =1,9-2,4 t/ha						
Sochakinur						
7	70x25x1	57,1	1108	45,3	43,6	96,2
8	70x25x2	114,2	965	37,6	35,1	93,4
9	70x25x3	171,3	923	34,2	31,0	90,5
10	90x20x1	55,5	1186	47,8	46,6	97,5
11	90x20x2	111,1	994	42,4	40,3	95,2
12	90x20x3	166,5	942	39,1	36,0	92,1
LSD ₀₅ =2,5-3,1 t/ha						

RESULTS AND DISCUSSION

It was revealed that the yield of seedlings from 1 seed tuber by varietal types varied from 5.6 to 19.8 pcs. The highest yield of seedlings was observed in the varieties Sochakinur (19.8 pcs.), Japan (16.9 pcs.), Pobeda, Jewell (15.6-15.9 pcs.), Khazina, Xar-Bay, Bonita (14.7-14.9 pcs.), and the lowest yield of seedlings (5.6-9.7 pcs.) were in the samples Chestnut, Porto Rico, Kumara Red, Georgia Jet.

The vegetation period of the studied varieties was from 121 to 141 days. The ripening (days 121-129) was varieties of sweet potato Sochakinur, Xar-Bay. Other varieties had a growing season of 134-143 days, while the standard Khazina variety had 140 days. Biometric surveys showed that plant height, number of lateral shoots and foliage of a bush at the tested genotypes differed significantly even in the early growing season (30 days after transplanting) and varieties plant height ranged from to 19.1 (Yellow) to 29.1 cm (Sochakinur), the number of side shoots, 2 to 4, and the foliage of plants from 33 (Pumpkin) to 68 pieces (of Sochakinur). The tall-

est (26.0-29.1 cm) with the largest lateral shoots (3-4 pieces) and leafy (62-71 pieces) plants were observed in the varieties Sochakinur, Japan, Xar-Bay. This advantage was maintained during the growing season and on the 120th day after planting, respectively, 157.2-188.9 cm, 14-15 pieces and 234-260 pieces.

Intensive plant growth was observed for 30-90 days after planting seedlings in the field. For example, the standard Khazina variety had a plant height of 22.0 cm on the 30th day after planting seedlings in the field, 70.4 cm on the 60th day, 122.1 cm on the 90th day, and 149.1 cm on the 120th day plant growth was 47.6, 51.7 and 27.0 cm, respectively.

The studied sweet potato varieties differ significantly in the rate of crop formation of tops and tubers during the growing season, and on the 30-day after planting seedlings in the field, the mass of tops from the Bush was 215-293 for varieties, and the mass of tubers was 138-213 gr. The highest rate of crop formation from a bush of tops (293 g) and tubers (213 g) was observed in the Sochakinur variety. These advantages were maintained until the end of

the growing season. The relatively high rate of accumulation of crop tops and tubers was observed in cultivars Xar-Bay, Japan, Bonita, Beauregard, Kumara Red, which at the end of the vegetation mass of foliage from the bush made 453-571 and tubers 991-1188 g. From standard varieties of sweet potato Khazina on 30th day after transplanting in the field the mass of foliage from the bush was 229, tuber yield 169 g, 60-day, respectively, 336 and 377, 90-day and 376 741, and 120-days after transplanting 971 403 and the Intense pace of formation of the yield of foliage and tubers of different sweet potato varieties of Sochakinur, Xar-Bay, Japan.

It is revealed that tuber yield per plant ranged by grades from 885 to 1265 g the number of tubers in the bush from 6.2 to 10.1 units, the mass of one tuber from the bush from 99 to 154 g the highest productivity (1265 g, 8,2 pcs, average weight of tuber 154 g) was obtained in the variety of Sachakinur. All the batata varieties studied did not differed in the compactness of the tubers in the nest, that is, all varieties had a compact arrangement of the tuber crop in the nest.

The yield of sweet potato varieties per hectare varied from 32.5 to 46.1 t/ha (Table 1). The highest yield (44.5-46.1 t/ha), of which an increase in yield of 9.4-11.0 t/ha or 126.8-131.3%, was obtained from the varieties Sochakinur, Xar-Bay, and Japan. At the same time, these varieties have the highest yield of commercial tubers, which amounted to 43.2-45.2 t/ha or 97.1-98.0%.

In the study of transplanting 1, 2 and 3 pieces in the nest with a width between rows 70 and 90 cm scheme 70x25x1 (the plant density of 57100 1 ha), 70x25x2 (114200 1 ha) and 70x25x3 (171300 1 ha), 90x20x1 (the plant density 55500 per 1 ha), 90x20x2 (111000 1 ha), 90x20x3 cm (166500 1 hectare) of the selected varieties of sweet potato Sochakinur and Xar-Bay found that the highest yield (of 45.3-47.8 t/ha) obtained when transplanting according to the scheme 70x25x1 and 90x20x1 cm (Table 2).

With increase plant density seedlings per 1 ha with a width of 70 cm from 57,1 to of 171.3 thousand, and at 90 cm from 55,5 to 166,5 thousand productivity of the Bush, yield and marketability of the crop is greatly reduced and varieties 902-942 g, to 32.7-36.0 t/ha, marketability - the 88.6-92.1% of or 142-244 g, yield of 8.7-11.1 t/ha, the marketability of 3.4-5.7% lower compared to scheme 70x25x1 (90x20x1)cm, a density of 55.5-57.1 thousand per 1 ha.

The research results showed that maintaining the irrigation regime for pre-irrigated soil moisture of not less than 70-80% of the PEF extended the vegetation period by 3 days, the plants were tall (179.6-196.3 cm) with optimal leaf surface areas (48.5-52 , 5 thousand m² per 1 ha) and due to this, the highest yield was obtained (53.1-55.4 t/ha). In this case, the yield increase was 7.2-7.8 t/ha or the yield per 1 m³ of irrigation water was 1.64-1.66 kg more, and the irrigation water consumption per 1 centimeter of crop was 5.0-5.6 m³ less in comparison with the control regime of irrigation 65-70% PPV. It was revealed that the shelf life of sweet potato tubers under the irrigation regime of 70-80% of MWHC decreased slightly and the yield of standard tubers after storage of 93.8-94.5% was estimated at 5.5-5-6.2 points, that is, "satisfactory".

A study of the influence of different norms of mineral fertilizers in the selected sweet potato varieties found that the highest marketable yield (49.3-50.2 t/ha) was observed when mineral fertilizers were applied in the norm N₂₀₀ P₁₆₀ K₁₀₀ kg/ha. In this case, the yield increase was 18.5-18.7 t/ha, and the shelf life of the tubers was rated "satisfactory". A further increase in fertilizer rates contributes to an unreliable yield increase (within the limits of experimental error). In addition, the quality and keeping quality of tubers during storage is significantly reduced.

CONCLUSIONS

It can be noted that in the conditions of irrigated meadow-gray-earth soils of the Zarafshan valley, ripening sweet potato varieties Sochakinur, Xar-Bay and Japan are distinguished by early maturity, sprout formation, intensive crop formation, compactness of tubers in the nest, productivity and yield. Wide cultivation of these varieties according to the placement schemes of 70x25x1 (90x20x1) cm, plant density 55500-57100 per 1 hectare, irrigation mode according to pre-irrigation soil moisture of not less than 70-80% MWHC or 12 irrigation during the growing season according to scheme 5-7 (there are 5 irrigations from planting seedlings to closing the tops of row-spacings, 7 watering's from closing the tops of row-spacings to ripening) and the application of mineral fertilizers in the norm of N₂₀₀ P₁₆₀ K₁₀₀ kg/ha provide the possibility of obtaining a stable

high yield (48-52 t/ha) with good storage and commercial quality.

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