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YIELD AND MARKETABILITY OF POTATO VARIETIES WITH DIFFERENT NUMBERS OF IRRIGATION SCHEMES AND FERTILIZER STANDARDS IN CASE OF UZBEKISTAN

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Abstract:
In the study, we have been trying to show the results of the middle-ripened varieties of potato at different numbers, schemes, irrigation techniques, and fertilizer rates and their influence on growth, development, and crop formation, yield, keeping quality, transportability, biochemical composition and quality of tubers are presented. The optimal number of irrigation (9 irrigation schemes according to the 1-2-6 scheme), irrigation technique (the length of irrigation grooves is 60 m, and the speed of water flow in the sulcus is 0.1 l/sec) and the fertilizer rate (20 t/ha manure + $N_{200}P_{160}K_{100}$ kg/ha), contributing to favorable conditions for plant growth and development, the formation of a powerful haulm, leaf device, root system and as a result of obtaining a high (32-35 t/ha) yield with high and normal quality.

Keywords: Potato, variety, regime and irrigation technique, fertilizer rates, length of irrigation groove, water flow rate in-furrow, yield, keeping quality.

INTRODUCTION

1.1 Relevance of the topic. Potato growing is an intensively developing industry in world agriculture, planted areas in 2015 amounted to 21.5 million hectares, and gross harvest - 351.2 million tons, and the average yield per hectare - 16-17 tons [10].

In the potato growing industry of developed countries - Holland, Germany, Poland, Belgium, Bulgaria, Russia and others, to provide the population with high-quality and cheap potatoes, when cultivating it, special attention is paid to the use of modern irrigation methods, the use of macro, micro and microbiological fertilizers, the selection of varieties for specific soil and climatic conditions, the development of resource-saving technologies, the introduction of new innovative technologies in this industry [9].

During the years of independence of the Republic, large-scale measures were taken to increase the yield and quality of potatoes, which is one of the most valuable food crops. In particular, new varieties were developed, and technologies for their cultivation were developed and improved for various periods and methods of cultivation, suitable for various soil and climatic conditions. [5, 6].

In the conditions of the Surkhandarya region, increasing the yield of early potatoes with a decrease in irrigation water consumption per centner of the crop largely depends on the correct selection of varieties adapted to the extreme conditions of the region, development of a water-saving regime and irrigation technology, as well as identification of optimal fertilizer standards. Given the above, it is relevant to study the growth, development, yield formation, yield, keeping quality and quality of early potato tubers with different numbers, patterns and technologies of irrigation, as well as fertilizer rates in farm, dekhkan farms and household plots, and based on the results obtained, the establishment optimal regime parameters and irrigation technology, as well as fertilizer standards [1. 2].

A potato plant is a crop that requires possession of soil and air. Humidity requirements change at the stages of plant growth and development. This is due to its biochemical composition (70-85% water), morphological structure, the formation of a large amount of biomass, the formation of leaf surfaces and the relative surface area of the root system. [3].

Potato productivity decreased by 7.5-8.0 t/ha while maintaining 80% of the FH (Field humidity)from seedlings to full ripening and by 3.3-3.8 t/ha while maintaining 80% of the FH (Field humidity) before flowering. [7].

Watering according to the 1-2-5 scheme increases the yield of potatoes by 24-27% compared with the irrigation scheme 1-1-5 used in growing potatoes. [8].

Potato irrigation has a positive effect on yield and dry matter content, as well as on many other factors that determine the quality of the product. [4].

1.2 The study aims to develop elements of a water-saving irrigation technology that contributes to obtaining a high, high-quality and cheap crop of early potatoes in the southern regions with various irrigation schemes and technologies, as well as fertilizer standards for cultivating medium early potato varieties.

1.3 The object of the study was the widespread old-irrigated light grey-earth soils of the Surkhandarya region, the 2nd reproduction of seed tubers of medium-early varieties of potato "*Sante*", "*Yarokli-2010*", 3 options for the number and irrigation schemes, 3 options for fertilizer rates.

2. RESEARCH AND METHODOLOGY.

Field and production experiments, planting, planting care activities, harvesting and metering, observation, counting and analysis were carried out according to generally accepted methods and recommendations of the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan, All-Russian Plant Research Institute, All-Russian Scientific Research Institute of Potato Management, Uzbek Research Institute of Vegetable Melon and Potato, State Commission for Variety Testing buts crop varieties.

These productivity indicators were subjected to statistical analysis by the dispersion method according to B.A. Dospekhov using programs Microsoft Excel.

3. RESULTS AND DISCUSSION.

It was revealed that enhanced growth of the *Sante* and *Yarokli-2010* potato varieties was observed with 9 irrigation according to the 1-2-6 scheme and fertilizers in the norm of 20 t/ha of manure + $N_{200}P_{160}K_{100}$ kg/ha, in the tested *Sante* variety 5 On April 8–8, the plant height was 65 cm, on April 15–18, 79 cm, on April 25–28, 92 cm, on May 5–8, 98 cm, while in the *Yarokli-2010* variety this indicator, respectively, was 72, 85, 95 and 103 cm. The tallest plants (98-103 cm) were obtained by the varieties "*Sante*" and "*Yarokli-2010*" in the variant with 9 irrigation according to the 1-2-6 scheme and fertilizing at a rate of 20 t/ha of manure + N_{200} P_{160} K_{100} kg/ha.

The highest leaf surface area of medium-early potato varieties (for *Sante* variety on one bush is 0.86 m^2, for *Yarokli 2010* variety is 0.93 m^2) and the number of leaves on one bush (for varieties 25-28.03. Respectively, 131-139 pieces, and on 05-08.05 - 253-255 pieces) was observed when 9 irrigations were applied according to the 1-2-6 scheme and fertilizers were applied in the norm of 20 t/ha of manure + N_{200} P_{160} K_{100} kg/ha.

In the variant with 9 irrigation according to the 1-2-6 scheme and the use of mineral fertilizers in the norm $N_{150}P_{120}K_{75}$ kg/ha, an increase in the weight of the root system of potatoes was noted and in one bush this indicator was 29.6-33.3 g, it was found out that from this masses of 27.6-30.7 g or 92.2-93.2% were located in the surface 0-20 cm soil layer. When using organic fertilizers in the norm of 20 t/ha of manure + $N_{200}P_{160}K_{100}$ kg/ha by variety, the mass of roots on one bush, respectively, amounted to 35.1-39.8 g, of this weight 33.5-37.7 g or 94, 7-95.4% were located in the surface 0-20 cm soil layer.

In the research options, the harvest of potato tubers from one bush for the *Sante* variety was 712-792, and for the *Yarokli* 2010 variety 734-816 g, the number of tubers in one bush, respectively, was 6.4-6.6 and 8, 0-8.4 pieces, the weight of one tuber -111.3-120.0 and 90.8-99.5 g. The highest productivity indicator was obtained in the variant with 9 watering's according to the 1-2-6 scheme and fertilizing normal 20 t/ha of manure + $N_{200}P_{160}K_{100}$ kg/ha. The lowest productivity was noted in the variant with 7 irrigation according to the scheme 1-1-5, and the introduction of fertilizer standards $N_{150}P_{120}K_{75}$ kg/ha.

When growing the tested varieties of potatoes "*Sante*" and "*Yarokli-2010*" with different numbers, irrigation schemes and fertilizer rates, the difference in yield per hectare varied from 22.3 to 35.7 tons (table 1).

In the medium-early variety of *Sante* potatoes with 7 irrigation according to the scheme 1-1-5 and applying fertilizers in the norm of $N_{150}P_{120}K_{75}$ kg/ha, the yield per hectare was 22.3 tons, and when applying 20 t/ha of manure + $N_{200}P_{160}K_{100}$ kg/ha productivity 27.2 t/ha.

Table 1. Productivity and marketability of potato varieties with different numbers, irrigation schemes and fertilizer standards (2016-2018)

№	Irrigation		Fertilizer rates		Productivity by years, t/ha			Average yield t/ha	Including commercial harvest	
	the numbers	Scheme	manure, t/g	kg/ha	2016	2017	2018		t/ha	%
Sort *Sante*										
1	7	1-1-5 control	-	$N_{150}P_{120}K_{75}$ (control)	21,6	23,1	22,2	22,3	21,2	95,2
2			20	$N_{150}P_{120}K_{75}$	24,9	26,0	25,5	25,4	24,6	96,7
3			20	$N_{200}P_{160}K_{100}$	26,2	28,3	27,1	27,2	26,4	97,0
4	8	1-2-5	-	$N_{150}P_{120}K_{75}$ (control)	23,8	25,2	24,6	24,5	23,4	95,5
5			20	$N_{150}P_{120}K_{75}$	28,2	28,6	27,2	28,0	27,2	97,1
6			20	$N_{200}P_{160}K_{100}$	29,5	30,2	28,6	29,4	28,6	97,2
7	9	1-2-6	-	$N_{150}P_{120}K_{75}$ (control)	24,5	26,7	27,4	26,2	25,1	95,7
8			20	$N_{150}P_{120}K_{75}$	29,8	30,7	31,3	30,6	29,8	97,4
9			20	$N_{200}P_{160}K_{100}$	32,1	32,4	33,6	32,7	31,9	97,5
				$S_{\bar{x}}$ % =	3,0	1,8	2,1			
				HCP_{05}=	1,4	1,1	2,0			
Sort *Yarokli-2010*										
1	7	1-1-5 control	-	$N_{150}P_{120}K_{75}$ (control)	23,4	24,7	25,5	24,5	23,6	96,1
2			20	$N_{150}P_{120}K_{75}$	27,2	28,5	30,0	28,6	27,7	97,0
3			20	$N_{200}P_{160}K_{100}$	27,5	29,8	31,9	29,7	28,9	97,3
4	8	1-2-5	-	$N_{150}P_{120}K_{75}$ (control)	26,3	27,6	28,3	27,4	26,5	96,6
5			20	$N_{150}P_{120}K_{75}$	31,0	33,2	34,0	32,7	31,9	97,5
6			20	$N_{200}P_{160}K_{100}$	32,1	34,5	35,0	33,9	33,1	97,8
7	9	1-2-6	-	$N_{150}P_{120}K_{75}$ (control)	27,7	29,8	30,3	29,3	28,3	96,8
8			20	$N_{150}P_{120}K_{75}$	32,2	34,0	35,4	33,9	33,2	98,0
9			20	$N_{200}P_{160}K_{100}$	34,0	36,2	36,8	35,7	35,0	98,0
				$S_{\bar{x}}$ % =	2,8	3,9	2,0			
				HCP_{05}=	1,6	2,0	1,4			

With 9 irrigations according to the 1-2-6 scheme and fertilizing in the norm of $N_{200}P_{160}K_{100}$ kg/ha, the yield was 26.2 tons, in the version of 20 t/ha of manure + $N_{150}P_{120}K_{75}$ kg/ha -30.6 tons, and in the variant when applying 20 t/ha of manure + $N_{200}P_{160}K_{100}$ kg/ha, the yield was 32.7 t/ha, which, accordingly, provided 3.9 per hectare; 5.2 and 5.5 tons or 117.5; 120.5 and 120.2% of the additional crop.

In the *Yarokli-2010* potato variety, with 7 irrigations according to the scheme 1-1-5 in variants with fertilizer, the yield, respectively, was 24.5; 28.6 and 29.7 t/ha, and with 9 irrigation according to the 1-2-6 scheme - 29.3; 33.9 and 35.7 t/ha, the resulting additional potato crop was 4.8; 5.3 and 6.0 t/ha.

By increasing the number of irrigations from 7 to 9, it was ensured that 118.5-120.5% of the additional crop was obtained for varieties of potatoes, and due to fertilizers, 115.7-124.8%. The highest productivity in both tested varieties (31.9-35.0 t/ha or 97.5-98.0%) was obtained by watering 9 times according to the 1-2-6 scheme, with 20 t/ha of manure + $N_{200}P_{160}K_{100}$ kg/ha. In our studies, the proportion of degenerated tubers in the varieties and varieties tested was different but did not exceed 0.3–2.3%. In both test varieties, when irrigating according to the 1-2–6 scheme and applying organic fertilizers in the norm of 20 t/ha of manure + $N_{200}P_{160}K_{100}$ kg/ha of degenerated tubers, no degenerate tubers were observed. It was found that in the studied variants and the tested varieties, in general, the total losses ranged from 3.8 to 6.7%, and the retention rate was good and excellent and amounted to 5.2-7.9 points. The tested number of potato tubers, the irrigation patterns and fertilizer rates did not adversely affect

the transportability of potato tubers; the transportability was rated "good" and amounted to more than 95.1%. It was found that when delivering potatoes over long distances (700 km), an increase in the number of irrigation from 7 to 9 times contributed to an increase in the transportability of tubers by variety by 0.1-0.4%, and due to fertilizer rates this figure decreased by 0.2 -0.6%.

4. CONCLUSION

The intensity of the formation of tops and tubers of potatoes, as well as productivity indicators for the tested varieties, in relation to the number and pattern of irrigation, as well as fertilizer rates, had a difference: if on the 50-53 day of the growing season the mass of tops of one bush in the experimental variants was 224-268 g, the tubers are 161-233 g, then during the growing season, on the basis of the pattern for 60-83 days, an increase in indicators was observed and when counting at the end of 90-93 days of plant vegetation, the mass of tops of one bush was 290-387, and the tuber yield was 711 -805 g. The highest productivity indicators by variety (tuber yield 792-816 g, the number of tubers 6.6-8.2 pieces and the average weight of one tuber 99.5-120.0 g) were obtained with 9 watering's according to scheme 1 -2-6 and fertilizing in the norm of 20 t/ha of manure + $N_{200}P_{160}K_{100}$ kg/ha.

When growing the tested varieties of potato *Sante* and *Yarokli-2010* with different numbers and irrigation schemes, as well as fertilizer norms, the difference in yield per hectare varied from 22.3 to 35.7 tons. The highest yield (32.7-35.7 t/ha) or, compared with the control option, obtaining 5.5-6.0 t/ha (120.2%) of the additional crop was provided with 9 irrigation according to scheme 1-2-6, fertilizer application rate of 20 t/ha of manure + $N_{200}P_{160}K_{100}$ kg/ha, with a commodity yield of 31.9-35.0 t/ha or 97.0-98.0%. When cultivating early potato varieties at different numbers, irrigation schemes, and fertilizer rates, there was a difference in the proportion of degenerate tubers, shelf life and transportability, as well as the biochemical composition. With 9 irrigations according to the 1-2-6 scheme and fertilizing in the norm of 20 t/ha of manure + $N_{200}P_{160}K_{100}$ kg/ha/ha, no degenerate tubers were recorded in the crop, the storage and transportability were assessed as "good".

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