UDC:633/635.002.33; 676.034, 635.21; 631.811
DOI 10.37128/2707-5826-2022-1-3

YIELD AND SEED PRODUCTION OF POTATO VARIETIES DEPENDING ON THE ELEMENTS OF GROWING TECHNOLOGY

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The article presents the results of the research, aimed at studying the influence of doses and methods of fertilizer application and mass of planting material on the formation of the yield, seed productivity and yield structure of potato tubers in conditions of Vinnytsia region.

As a result of the researches carried out by us during 2019-2021 it was established that the yield and yield of seed potatoes change depending on a dose and a way of application of fertilizers, weight of garden tubers and variety features. The highest indicators of structure of a crop yield and yield were received on the variant of experience, where on a background of action of the half-digested manure brought under the precursor and phosphorus-potassium fertilizer under the basic potato processing were brought into rows (locally) Nitroammophoska ($N_{45}P_{45}K_{45}$). At the same time, the number of tubers under a bush increased from 9.0 to 9.5 pieces and the average weight of tubers from 78.1 to 79.5 g, the yield increased from 38.3 to 41.1 t / ha with increased fraction of seed tubers . At intensification of potato growing the highest rates due to varietal peculiarities of Granada variety tubers yield, the size of which on the greatest transverse diameter of 28-60 mm were obtained on the experiment variant, where on the background of half-digested manure introduced under the predecessor and phosphate-potassium fertilizer under potato, into rows (locally) Nitroammophoska ($N_{45}P_{45}K_{45}$). At the same time, the share of tubers of this fraction varied depending on the weight of planting material from 44.9 to 54.6%.

On average over three years, the highest yield of tubers grade Granada received on the experiment variant, where on the background of the action of semi-digested manure and phosphate-potassium fertilizer made into rows (locally) Nitroammophoska ($N_{45}P_{45}K_{45}$) fraction >60 mm - 41, 1 t/ha, which is 32.6% higher than the control (no fertilizer) and 1.5 t / ha more compared to the yield obtained with the same dose and method of fertilization, but with a fraction of garden tubers 28-60 mm. However, when pointing out the yield gains from planting large tubers, it is necessary to mention the cost of planting material. That is, the difference in planting material expenditure between the best two potato varieties in the experiment, the Granada, was 1.85 t/ha. Consequently, the expenditure of planting material was greater than the yield increase we achieved. A similar pattern was obtained for the early maturing potato variety Laperla and the medium maturing variety Memphis.

The important indicator of seed productivity of potatoes is multiplication factor, which changed depending on fertilizer, mass of garden tubers and variety features. The highest values of the reproduction factor as for quantitative as for mass value were observed in the variety Granada, on the experiment variant, where on the background of the action of half-decomposed manure introduced under the predecessor and phosphate-potassium fertilizer under potatoes, introduced into rows (locally) Nitroammophoska ($N_{45}P_{45}K_{45}$). At the same time the multiplication factor by the quantitative value varied from 8.3 to 8.7 and by the mass value varied from 7.4 for planting tubers of largest fraction to 17.8 for planting tubers of smallest fraction. It was proved that only at planting by fraction of seed tubers of 28-60 mm the reproduction coefficients both on quantitative and mass value were maximally approached to each other and made 8,5 and 10,7 pieces.

This points out to optimum ratio of seed material reproduction just at planting by weight of planting tubers of this fraction.

Key words: potatoes, seeds, doses, fertilization methods, planting tuber fraction, yield, yield structure.

Table 3. Fig. 4. Lit.14.

The right choice of horticultural tuber size and scientifically based planting density is a crucial factor in solving the problem of the yield/planting rate relationship that makes it uneconomical to grow this crop. This is not the first time that science and practice have turned to establishing the most efficient planting rate for potatoes. Weight norms have gradually been replaced by quantitative norms. They began to be based on the number of tubers planted per hectare, depending on the soil and climatic conditions of the zone, then they adjusted for tuber size, variety and finally began to take into account the stem-forming capacity of tubers and the optimum stems in the area. According to the results of O.V. Mazur and G.V. Mironova. [12], the interaction of factors affecting these elements of technology, the ratio of levels of yield and plant nutrition, size of planted tubers and their quantitative and spatial location remained out of the researchers' attention [1-5].

According to the results of research Molotsky M.Y., Fedoruk Y.V., Krikunova O.V. [4] The influence of the fraction of planting material on the yield of seed tubers was the least in potato varieties Fantasia, Bagryana, Kolokola. In varieties Dnepryanka, Virineya, in the variant of planting of tubers of fraction 71-90 g the multiplication factor was 6, and at 30-50 g - 9. The highest multiplication factor was in the variety Yavir when planting tubers with a fraction of 30-50 g - 10.

As a number of academics believe L. Biliavska, Y. Biliavskiy, O. Mazur [6] The use of varieties with high adaptability to certain natural, climatic and phytosanitary conditions is the main component in obtaining consistently high yields, including potatoes. Larger tubers formed a higher yield: compared to tubers weighing 50-80 g, for planting tubers weighing 81-100 g, the yield increased by 7-8%. [1].

According to the results of studies by Baranchuk Y.V., Molotsky M.Y. [1], Mazur O.V., Mazur O.V., Letka G.V., Mironova G.V. [7], Mazur O.V., Mironova G.V., Stashevsky R.V. [8], with increasing weight of planting tubers, their stem-forming ability, the number of stems and seed tubers in a bush, plant productivity increased. When the weight of planting tubers increased from 15-30 to 151-180 g, the number of stems of variety Gart increased 1.9 times, and that of variety Zov 2.4 times. As the number of stems in the bush increases, the number of branches decreases. The larger tubers make the plants grow taller. Thus, the height of the bush variety Garth, when planting tubers weighing 151-180 g was 84.7 cm and weighing 15-30 g - 63.1 cm, in the variety Zov - respectively 81.4 cm and 59.9 cm. The larger the mother tubers, the more seed tubers are formed in the bushes, with the average tuber weight decreasing.

Plant productivity increases with the weight of garden tubers, but as the weight of seed tubers and the number of stems in the bush increase, the productivity per stem decreases [1].

Potato yields are directly related to the weight of planted tubers; the plants were best developed from seed tubers, 80-100 g. Increasing the weight of planted tubers and planting density contributed to an overall increase in yield from 10.6-12.6 to 12.0-14.4 t/ha. However, the yield (minus seeds used for planting) was the highest in the variant of using small tubers weighing 30-50 g for planting, so along with the average seed fraction of tubers weighing 60-80 g, which is usually used in production, it is advisable to plant healthy. small tubers weighing 30-50 g [9].

Potato yields do not always depend on the weight of planted tubers: tubers weighing 25-49 g and 50-80 g hardly differ in terms of productivity. The highest yields were formed by tubers with mass of 15-24g and 50-80g with the calculated density of stems - 200 thousand stems per 1 ha, and for mass of 25-49g - 250 thousand stems per 1 ha and application of 60 t/ha of manure. $N_{90}P_{90}K_{90}$.. [10].

It is established, that irrespective of weight of blown up fractions of tubers and areas of feeding the yield of potatoes increased with increase of quantity of fertilizers. At joint introduction of manure and mineral fertilizers by norm the $N_{60}P_{60}K_{90}$ increase of a crop capacity of variety Svitanok Kyivskii has made 30,6 %, Lugovska - 37,3 %, and at norm $N_{90}P_{90}K_{120}$ - accordingly 44 and 47 % [1].

The weight of tubers, which was formed in the bush, on the variant without fertilizers was 314 g per bush, for the application of 50 t/ha of manure - increased by 21 %, at 50 t/ha of manure + $N_{45}P_{45}K_{45}$ - by 35 %, and at 50 t/ha of manure + $N_{60}P_{60}K_{60}$ - by 43 % [11].

The purpose of the research is to establish the dependence of formation of yield, seed productivity, number of stems, number of tubers under a bush, mass of tubers from one bush depending on fertilization and varietal features of potatoes.

Materials and Methods. Studies on the study of potato varieties were conducted in the farm "Olvia-S" village Sopyn Vinnytsia district of Vinnytsia region. The farm is located in the North - Eastern part of Vinnitsa region. The research was conducted during 2019-2021.

The hydrothermal regime has been contrasting over the years of study. The highest amount of precipitation during the growing season was 476.8 mm in 2019, which is 117.8 mm more than the mean annual data and 147.8 mm more than the amount of precipitation in 2020. The least amount of precipitation was recorded in the conditions of 2021 - 305 mm. As for the temperature regime, it was higher in all study years compared to the long-term average by 3.7; 1.3 and 1.2 °C, respectively.

The soil cover of the experimental plot is represented by deep low-humus medium-loam chernozem. The basic seed material of potato varieties was used for the research. The basic seed stock of potato varieties was used for the research. Three-factor field trial was carried out according to the following scheme: Factor A – varieties: Laperla – early variety, Granada – mid-early variety, Memphis – mid-ripening variety. Factor B – nutritional background and method of application of mineral fertilizers. Semi-rotted manure (40 t/ha) was applied under the predecessor (winter wheat). Potassium magnesia (K28Mg8S15) and simple superphosphate (P30) were applied under the main tillage of potatoes.

During planting, there was applied Nitroammophos (N15P15K15) into rows (locally) or pre-planting cultivation (scattered). Factor C – 1. the size of tubers by the largest transverse diameter, mm: < 28 mm, mass of seed tubers: from 25 to 50 g – 2-2.15 t/ ha; 2. 28-60 mm or from 51 to 80 g – 3.6-3.75 t/ha; 3. >60 mm or mass of seed tubers from 81 to 100 g – 5.4-5.55 t/ha.

Phenological observations: phases of germination, budding, flowering and destruction of tops were visually observed (according to the method of examination of plants of potato varieties and groups of vegetables, melons, spices [13].

Germination capacity of tubers, onset of phenological phases, total yield, crop structure were determined. All records and observations were conducted in accordance with the recommendations for research on potato growing [14].

Results and Discussion. Yield and yield structure of potatoes depending on fertilizer, fraction of seed tubers and variety features are shown in (Table 1). At increase of fraction of seed tubers the number of tubers in variety Laperla has increased from 6,1 to 6,5 pieces, and weight of an average tuber from 58,7 to 60,2 g, yield from 19,5 to 21,4 t/ha at the control variant (without fertilizer). At application of 40 t/ha of the semi-digested manure under the precursor - winter wheat, calamagnesia $K_{56}Mg_{16}S_{30}$ and simple superphosphate (P_{30}) under main potato cultivation (background) and increase of seed tubers the number of tubers per bush has increased from 6.9 to 7.3 units, and the mass of the average tuber from 63.5 to 66.3 g. Increase in yield structure, was noted on the variant, where on the background of phosphorus-potassium fertilizer and the action of semi-digested manure was made into rows (locally) Nitroammophoska $N_{30}P_{30}K_{30}$, the number of stems 7.1 to 7.6 pieces, and the weight of the average tuber from 70.4 to 72.2 g and yield from 27.2 to 29.9 t / ha. The highest increase in yield structure and yield was observed on the experiment variant, where with increasing fraction of seed tubers on the background of phosphorus-potassium fertilizer and the action of semi-digested manure was the introduction into rows (locally) Nitroammophoska ($N_{45}P_{45}K_{45}$). The number of tubers under the bush from 7.5 to 8.1 pieces, the average weight of tubers from 72.7 to 73.5 g.

On the variant of experiment, where on the background of phosphorus-potassium fertilizer and action of semiprepared manure was carried out scattering under pre-sowing cultivation of Nitroammophoska ($N_{60}P_{60}K_{60}$) the number of stalks of previous two variants of experience. This indicates a more efficient use of fertilizer by the plants when applied locally compared to the scattered application method. The best among the varieties studied were the indicators of yield structure and yield in the variety Granada, which was noted in all variants of the experiment. Thus, in the control variant the number of tubers under a bush has varied from 6,5 to 7,0 pieces, and the average mass of tubers from one bush from 71,5 to 72,9 g, and yield from 25.3 to 27,7 t / ha. On the background of the action of semi-distilled manure made under the predecessor and the phosphorous-potassium fertilizer increased the number of tubers under the bush from 7.8 to 8.3 pieces and the average mass of

tubers from 74.6 to 75.8 g, and yield from 31.6 to 34.3 t / ha. The higher values of the yield structure and yield at the variant experience, where on the background

Table 1

Yield structure of potatoes depending on the fertilization, fraction of planting tubers and varietal characteristics

Fertilization (factor C)	Fraction of seed tubers, mm (factor B)	Yield, t/ha	Yield structure	
			The number of tubers under the bush, pcs.	The mass of tuber per bush, g
1	2	3	4	5
Laperla				
Without fertilizers (c)	1	19.5	6.1	58.7
	2	20.5	6.3	59.4
	3	21.4	6.5	60.2
40 t/ha of semi-rotted manure under predecessor + $K_{56}Mg_{16}S_{30}$ +P_{30} (background)	1	23.8	6.9	63.5
	2	25.0	7.1	64.8
	3	26.4	7.3	66.3
Background + $N_{30}P_{30}K_{30}$ (locally)	1	27.2	7.1	70.4
	2	28.3	7.3	71.3
	3	29.9	7.6	72.2
Background + $N_{45}P_{45}K_{45}$ (locally)	1	29.7	7.5	72.7
	2	31.1	7.8	73.1
	3	32.5	8.1	73.5
Background + $N_{60}P_{60}K_{60}$ (scattered)	1	28.0	7.2	71.6
	2	29.6	7.5	72.4
	3	31.1	7.8	73.2
Granada				
Without fertilizers (c)	1	25.3	6.5	71.5
	2	26.3	6.7	72.1
	3	27.7	7.0	72.9
40 t/ha of semi-rotted manure under predecessor + $K_{56}Mg_{16}S_{30}$ +P_{30} (background)	1	31.6	7.8	74.6
	2	32.6	8.0	75.1
	3	34.3	8.3	75.8
Background + $N_{30}P_{30}K_{30}$ (locally)	1	36.3	8.6	77.4
	2	37.6	8.8	78.2
	3	39.2	9.1	79.0
Background + $N_{45}P_{45}K_{45}$ (locally)	1	38.3	9.0	78.1
	2	39.6	9.2	78.9
	3	41.1	9.5	79.5
Background + $N_{60}P_{60}K_{60}$ (scattered)	1	37.3	8.8	77,8
	2	38.5	9.0	78.6
	3	40.1	9.3	79.1

continuation of the Table 1

1	2	3	4	5
Memphis				
Without fertilizers (c)	1	21.3	6.2	62.9
	2	22.1	6.4	63.3
	3	23.3	6.7	64.0
40 t/ha of semi-rotted manure under predecessor + $K_{56}Mg_{16}S_{30}+P_{30}$ (background)	1	30.0	8.1	68.2
	2	30.9	8.2	69.4
	3	32.6	8.5	70.2
Background + $N_{30}P_{30}K_{30}$ (locally)	1	31.4	8.2	70.4
	2	32.9	8.5	71.3
	3	34.5	8,8	71.9
Background + $N_{45}P_{45}K_{45}$ (locally)	1	33.2	8.5	71.7
	2	35.2	8.9	72.5
	3	36.7	9.2	73.4
Background + $N_{60}P_{60}K_{60}$ (scattered)	1	32.9	8.5	71.2
	2	34.0	8.7	71.9
	3	35.6	9.0	72.6

Source:own research results

of the action of semi-decomposed manure made under the predecessor and the phosphate-potassium fertilizer was made into rows (locally) of Nitroammophoska $N_{30}P_{30}K_{30}$. Number of tubers from 8.6 to 9.1 pieces and the average weight of tubers from 77.4 to 79.0 g, as well as the level of yield from 36.3 to 39.2 t / ha with increased fraction of seed tubers . The highest rates of yield structure and yield were noted on the experiment variant, where on the background of the action of semi-prepared manure introduced under the predecessor and phosphorus-potassium fertilizer were introduced into rows (locally) of Nitroammophoska ($N_{45}P_{45}K_{45}$).

At the same time, the number of tubers under the bush from 9.0 to 9.5 pieces and the average weight of tubers from 78.1 to 79.5 g and yield from 38.3 to 41.1 t/ha. That is, the yield at this experiment variant for planting with >60 mm fraction of seed tubers was the highest and was 41.1 t/ha, which is 32.6% higher than on the control (without fertilization) and 1.5 t/ha more compared to the yield obtained with the same level and method of fertilization, but with a fraction of seed tubers 28-60 mm. However, indicating the yield increases from planting large tubers, we should mention the cost of planting materials. That is, the difference in planting material use between the best two potato varieties in the experiment, the Granada, was 1.85 t/ha. Consequently, the expenditure of planting material was greater than the yield increase we achieved. The similar regularity was received at early-ripening potato varieties Laperla and a mid-ripening Memphis where the yield was 32,5 and 36,7 t/ha that in comparison with the control (without fertilizer) on 34,2 and 36,5 % more, and the gain from fraction of seed tubers was 1,4 and 1,5 t/ha

at the first variant, and the difference in expenses of planting material between the best in experiment two variants was 1,8 t/ha. The variant of the experiment, where on the background of phosphorate-potassium fertilizer and action of the semi-digested manure, Nitroammophoska ($N_{60}P_{60}K_{60}$) was brought in scatter under pre-planting cultivation in the ladder fertilization provided in comparison with the previous variant 9 3 pieces and average weight of tubers from 77.8 to 79.1 g and yield from 37.3 to 40.1 t/ha with increased fraction of seed tubers . This indicates a lower efficiency of scattered fertilizer compared to local application, in which fertilizers are placed at a certain depth of soil with a better moisture supply, forming a zone with an increased concentration of nutrients, which are more fully used by plants during the growing season. The mid-maturing variety Memphis in all the variants of the experiment provided intermediate values for the elements of yield structure and yield levels between the best mid-early variety Granada and the early maturing variety Laperla. The results of our research indicated a high strength (Fig.1).

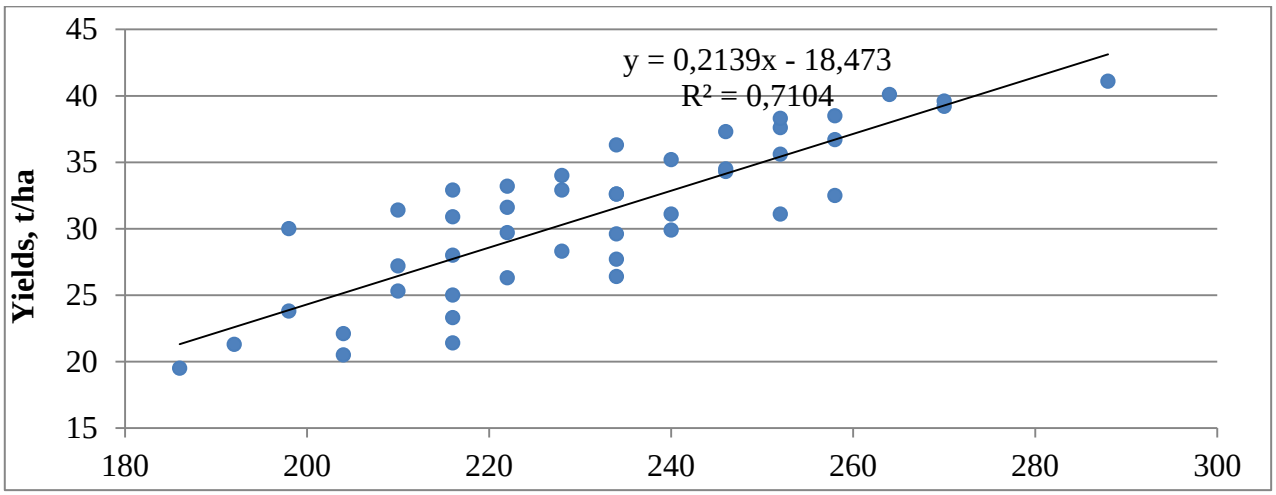


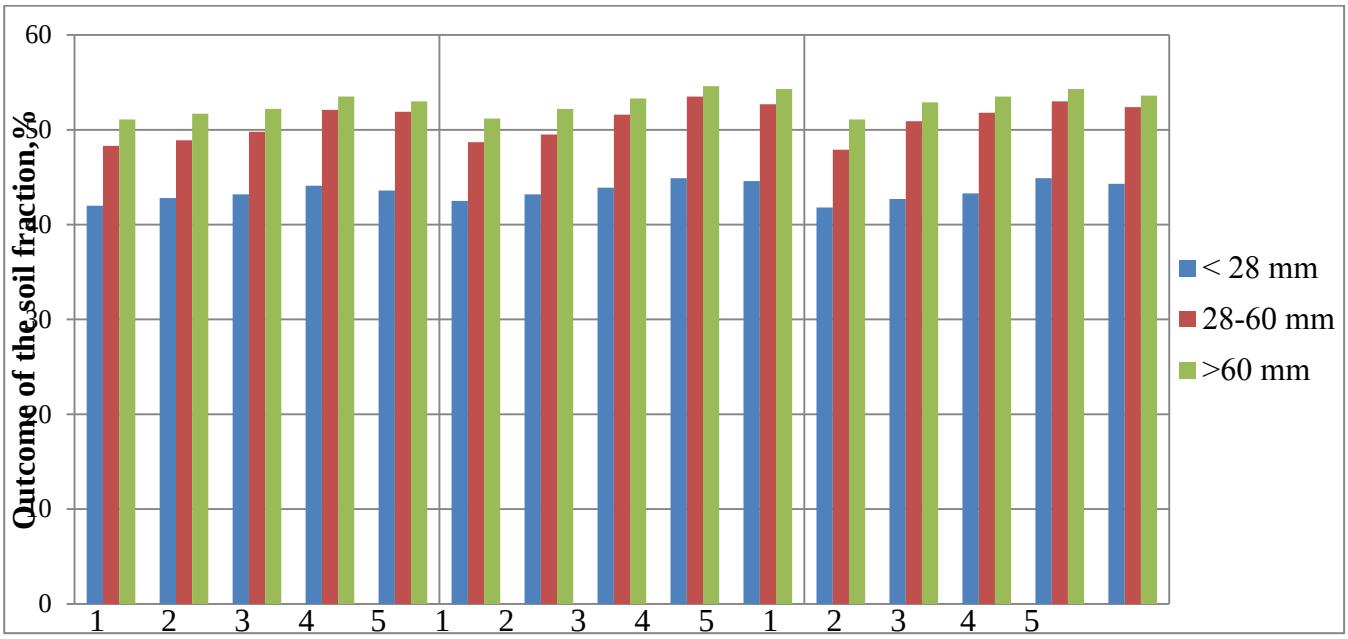
Fig. 1. Correlation dependence between stem number and yield

Source:own research results

Correlations between yield and number of stems; correlation coefficient (r=0.84) with a coefficient of determination of 71.0%. Thus, when the number of stems is increased, the yield increases significantly.

The results of the research indicate that by increasing the fraction of seed tubers from < 28 mm to >60 mm in the structure of the yield significantly increases the proportion of tuber size by the largest transverse diameter of 28-60 mm. Thus, on the control variant (without fertilizer) in the variety Laperla from 42 to 51.1% (Fig.2).

The highest rates yield of tubers Laperla, the size of which at the largest cross diameter of 28-60 mm were obtained on the experiment variant, where on the background of semi-distilled manure made under the predecessor and phosphate-potassium fertilizer introduced into rows (locally) Nitroammophoska ($N_{45}P_{45}K_{45}$). The tuber yield was 44.1 to 53.5%, which is higher than the control 2.1 and 2.4%. At intensification of potato growing the highest indicators, thanks to variety by .



1 – without fertilizers (control);2. – 40 t/ha of semi-rotted manure under predecessor + $K_{56}Mg_{16}S_{30}$ +P_{30} (background); 3 – Background + $N_{30}P_{30}K_{30}$ (locally); 4 – Background + $N_{45}P_{45}K_{45}$ (locally); 5 – Background + $N_{60}P_{60}K_{60}$ (scattered)

Fig. 2. Potato yield of the potato crop depending on fertilisation, bulb size and varietal characteristics

Source:own research results

features, the yield of tubers of Granada variety, the size of which on the greatest transverse diameter of 28-60 mm were received on the variant of experiment, where on the background of action of half-digested manure introduced under the predecessor andphosphorus-potassium fertilizer under potato. lines Nitroammophoska ($N_{45}P_{45}K_{45}$). At the same time, the proportion of tubers of this fraction varied depending on the fraction of seed tubers material from 44.9 to 54.6%. This compared to the control variant by 2.4 and 3.4% more.

Yield structure of potatoes yields as a function of fertiliser, fraction of seed tubers and varietal characteristics (Table 2).

The level of productivity of potato varieties varied depending on the studied factors, thus, when increasing the fraction of seed tubers, the number of seed tubers in the variety Laperla increased from 2.4 to 3.1 units, and the weight of a seed tuber from 57.6 to 59.4 g, the potato seed yield from 8.2 to 10.9 t/ha on the control variant (without fertilizer). For the application of 40 t/ha of semi-decomposed manure under the precursor - winter wheat, calamagnesia $K_{56}Mg_{16}S_{30}$ and simple superphosphate (P_{30}) under the main potato cultivation (background) and increased fraction of seed tubers the number of seed tubers per bush has increased from 2.8 to 3.7 and the weight of an average seed tuber from 60.2 to 62.4 g and the yield from 10.2 to 13.7 t/ha. Increase of yield structure was noted on the variant, where on a background of phosphorus-potassium fertilizer

and action of the semi-digested manure was made Nitroammophoska $N_{30}P_{30}K_{30}$ (locally), number of tubers under a bush increased from 3.1 to 3.9 pieces

Table 2

Yield structure of potatoes depending on the fertilization, fraction of planting tubers and varietal characteristics, %, 2019-2021

Fertilization (factor C)	Fraction of seed tubers, mm (factor B)	Yields, t/ha	Yield structure	
			The number of tubers under the bush, pcs.	The mass of tuber per bush, g
1	2	3	4	5
Laperla				
Without fertilizers (c)	1	8.2	2.4	57.6
	2	9.9	2.8	58.7
	3	10.9	3.1	59.4
40 t/ha of semi-rotted manure under predecessor + $K_{56}Mg_{16}S_{30}$ +P_{30} (background)	1	10.2	2.8	60.2
	2	12.2	3.3	61.6
	3	13.7	3.7	62.4
Background + $N_{30}P_{30}K_{30}$ (locally)	1	11.8	3.1	63.9
	2	14.1	3.6	65.1
	3	15.6	3.9	66.3
Background + $N_{45}P_{45}K_{45}$ (locally)	1	13.1	3.2	67.5
	2	16.2	3.9	68.8
	3	17.4	4.2	69.4
Background + $N_{60}P_{60}K_{60}$ (scattered)	1	12.2	3.0	67.2
	2	15.4	3.8	68.1
	3	16.5	4.0	68.9
Granada				
Without fertilizers (c)	1	10.7	2.6	70.2
	2	12.8	3,0	70.9
	3	14.2	3.3	71.6
40 t/ha of semi-rotted manure under predecessor + $K_{56}Mg_{16}S_{30}$ +P_{30} (background)	1	13.7	3.2	71.4
	2	16.2	3.7	71.9
	3	17.9	4.1	72.5
Background + $N_{30}P_{30}K_{30}$ (locally)	1	15.9	3.6	73.6
	2	19.4	4.3	74.3
	3	20.9	4.6	75.1
Background + $N_{45}P_{45}K_{45}$ (locally)	1	17.2	3.9	73.9
	2	21.2	4.7	74.6
	3	22.5	5.0	75.5
Background + $N_{60}P_{60}K_{60}$ (scattered)	1	16.6	3.8	73.7
	2	20.3	4.6	74.2
	3	21.8	4.8	75.1

continuation of the Table 2

1	2	3	4	5
Memphis				
Without fertilizers (c)	1	8.9	2.4	62.1
	2	10.6	2.8	62.5
	3	11.9	3.2	63.2
40 t/ha of semi-rotted manure under predecessor + $K_{56}Mg_{16}S_{30}$ +P_{30} (background)	1	12.8	3.3	64.8
	2	15.8	4.0	65.9
	3	17.2	4.3	66.7
Background + $N_{30}P_{30}K_{30}$ (locally)	1	13.6	3.5	65.6
	2	17.1	4.3	66.7
	3	18.5	4.6	67.5
Background + $N_{45}P_{45}K_{45}$ (locally)	1	14.9	3.7	66.9
	2	18.6	4.6	67.6
	3	19.9	4.9	68.4
Background + $N_{60}P_{60}K_{60}$ (scattered)	1	14.6	3.7	66.5
	2	17.8	4.4	67.3
	3	19.1	4.7	68.0

Source:own research results

and weight from 63,9 to 66,3 g, and yield of seed potatoes from 11.8 to 15.6 t/ha.

The highest increase in yield structure and yield was observed on the experiment variant, where with increasing fraction of seed tubers on the background of phosphorus-potassium fertilizer and the action of semi-digested manure was the introduction into(locally) Nitroammophoska ($N_{45}P_{45}K_{45}$). At the same time the number of tubers under the bush increased from 3.2 to 4.2 units, the average weight of a seed tuber from 67.5 to 69.4 g and seed yield from 13.1 to 17.4 t / ha. On the variant of the experiment, where on the background of phosphorus-potassium fertilizer and semi-digested manure the Nitroammophoska ($N_{60}P_{60}K_{60}$) was placed under pre-planting cultivation was used as a top dressing on sprouts two variants of the experiments. The highest yield of seed potatoes depending on the varietal characteristics, namely, the yield of seed potato was noted with intensification of its cultivation in the variety Granada, whose size by the largest transverse diameter of 28-60 mm was obtained in the variant of experiment, where on the background of the potassium fertilizer under potato, into rows (locally) Nitroammophoska ($N_{45}P_{45}K_{45}$). At the same time the number of tubers under a bush increased from 3.9 to 5.0, and the weight of an average seed tuber from 73.9 to 75.5 g, the yield of seed potatoes from 17.2 to 22.5 t/ha.

The highest yield of seed potatoes with fraction of seed tubers - >60 mm - 22.5 t/ha. In the variant of experience identical on a dose and a method of fertilizer, however with fraction of landing tubers - 28-60 mm the yield of 21,2 t/ha is received.

The results of our research indicated a high correlation strength between the number of stems and yield (r=0.93), with a coefficient of determination of 86%. During growth and development, each stem is an autonomous plant with its own root system, which forms stolons and forms tubers. That is, increase of number of stalks promotes increase of number of tubers and yield of potatoes, at optimum number of stalks per hectare.

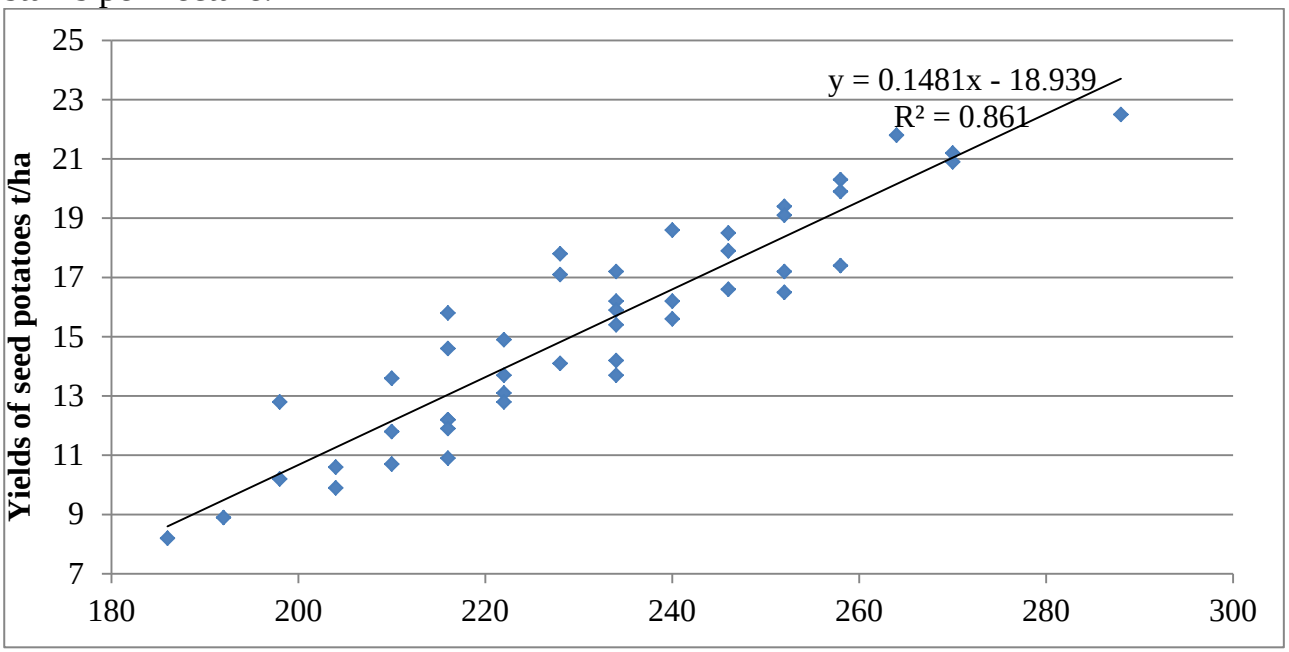


Fig. 3. Correlation dependence between number of stems and yield

Source:own research results

An important indicator of potato seed production is the multiplication factor, which varied with fertiliser, fraction of seed tubers and cultivar characteristics (Table 3). The multiplication factor varied according to the fraction of seed tubers on the control variant from 5.5 to 5.8 pieces, depending on the fraction of planted tubers. The multiplication factor by weight was significantly higher for seed potatoes with a fraction of seed tubers of < 28 mm and was 9.8 units. At seed of tubers with a fraction of 28-60 mm it was at the level of 5.7 pieces, almost equal to the quantitative multiplication factor for the same fraction of planted tubers - 28-60 mm. Only at planting of potatoes with a fraction of seed tubers >60 mm the multiplication factor by weight was lower and was 4.0 compared to the quantitative multiplication factor of 5.8.

The highest rates of multiplication factor were noted in the variant of experiment, where with increasing fraction of seed tubers on the background of phosphorus-potassium fertilizer and semi-digested manure action, into rows (locally) Nitroammophoska ($N_{45}P_{45}K_{45}$). At the same time, the quantitative multiplication factor increased from 6.8 to 7.4 tubers per bush.

Table 3

Breeding rate of seed potatoes as a function of fertiliser, planting tuber weight and varietal characteristics, 2019-2021

Fertilization (factor C)	Fraction of seed tubers, mm (factor B)	Breeding rate	
		by the mass	by the amount
1	2	3	4
Laperla			
Without fertilizers (c)	1	9.8	5.5
	2	5.7	5.6
	3	4.0	5.8
40 t/ha of semi-rotted manure under predecessor + $K_{56}Mg_{16}S_{30}$ +P_{30} (background)	1	11.9	6.3
	2	6.9	6.5
	3	4.9	6.6
Background + $N_{30}P_{30}K_{30}$ (locally)	1	13.6	6.5
	2	7.9	6.7
	3	5.5	6.9
Background + $N_{45}P_{45}K_{45}$ (locally)	1	14.9	6.8
	2	8.6	7.2
	3	6.0	7.4
Background + $N_{60}P_{60}K_{60}$ (scattered)	1	14.0	6.6
	2	8.2	6.7
	3	5.8	7.2
Granada			
Without fertilizers (c)	1	11.8	5.8
	2	7.1	6.1
	3	5.0	6.3
40 t/ha of semi-rotted manure under predecessor + $K_{56}Mg_{16}S_{30}$ +P_{30} (background)	1	14.7	7.2
	2	8.8	7.4
	3	6.2	7.6
Background + $N_{30}P_{30}K_{30}$ (locally)	1	16.9	8.0
	2	10.2	8.2
	3	7.1	8.4
Background + $N_{45}P_{45}K_{45}$ (locally)	1	17.8	8.3
	2	10.7	8.5
	3	7.4	8.7
Background + $N_{60}P_{60}K_{60}$ (scattered)	1	17.3	8.2
	2	10,4	8.4
	3	7.2	8.6

continuation of the Table 3

Memphis			
1	2	3	4
Without fertilizers (c)	1	10.1	5.5
	2	6.0	5.8
	3	4.2	6.2
40 t/ha of semi-rotted manure under predecessor + $K_{56}Mg_{16}S_{30}$ +P_{30} (background)	1	14.3	7.4
	2	8.4	7.6
	3	5.9	7.9
Background + $N_{30}P_{30}K_{30}$ (locally)	1	14.9	7.6
	2	8.9	7.8
	3	6.3	8.1
Background + $N_{45}P_{45}K_{45}$ (locally)	1	15.8	7.8
	2	9.5	8.2
	3	6.7	8.5
Background + $N_{60}P_{60}K_{60}$ (scattered)	1	15.7	7.9
	2	9.2	8.0
	3	6.5	8.3

Source:own research results

Multiplication factor by weight was the highest for planting potatoes with a fraction of seed tubers < 28 mm, and amounted to 14.9 pcs. It was slightly higher compared to the quantitative multiplication factor for planting with fraction of seed tubers 28-60 mm and amounted to 8.6 and for the quantitative value 7.2. Only at planting with a fraction of seed tubers of >60 mm, the quantitative value was lower at 7.4 and the mass value higher at 6.0.

The highest rates, both in quantitative and mass values were observed for intensification of its cultivation in the variety Granada, on the experiment variant, where on the background of semi-distilled manure introduced under the precursor and phosphorus-potassium fertilizer under potatoes, introduced into rows (locally) Nitroamophoska ($N_{45}P_{45}K_{45}$). At the same time the multiplication factor by the quantitative value varied from 8.3 to 8.7 units, and by the mass value varied from 7.4 for seed tubers of the largest fraction to 17.8 units, for planting tubers of the smallest fraction. And only at planting by fraction of seed tubers of 28-60 mm, multiplication coefficients by both quantitative and mass values were maximally close to each other and amounted to 8,5 and 10,7 pieces. This indicates an optimum ratio of seed reproduction just at planting by fraction of seed tubers of 28-60 mm.

Correlation dependence between potato crop yield and multiplication factor (Fig. 4). As a result of our research we established high strength of direct correlation between potato yield and quantitative seed multiplication factor (r=0.97) with

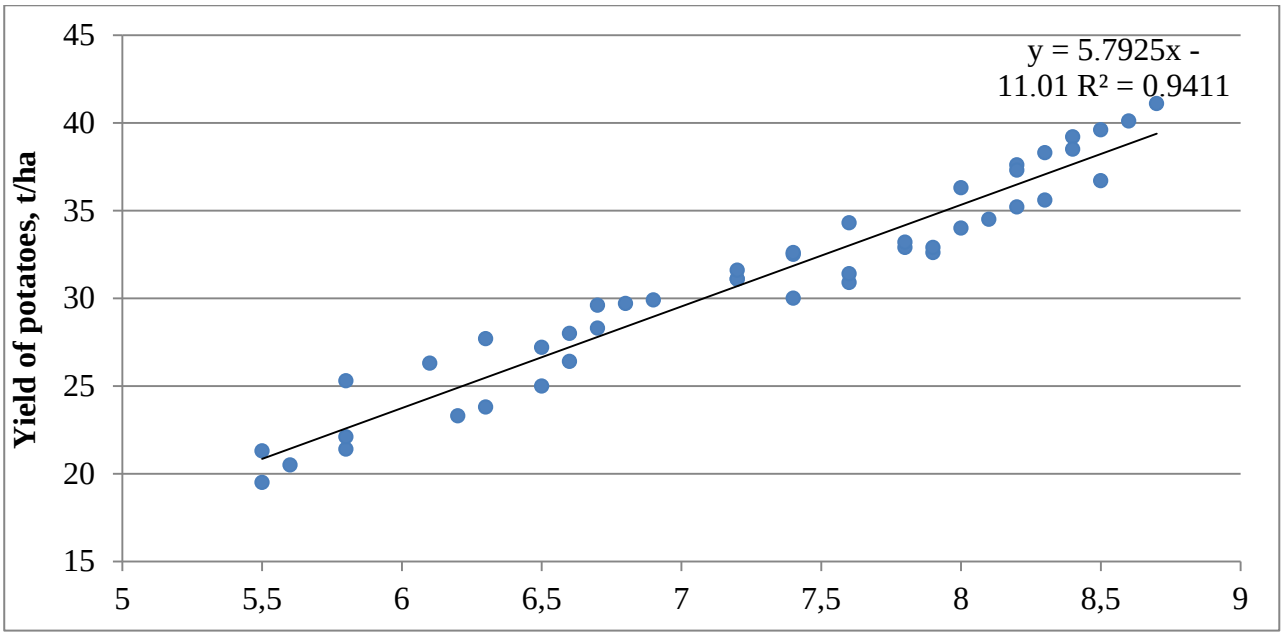


Fig. 4. Correlation dependence between potato yield and quantitative seed multiplication factor

Source:own research results

determination coefficient of 94%. That is, when the quantitative seed multiplication factor increases, potato yields significantly increase.

Conclusions and prospects for further research. To obtain higher indicators by the stem number, the number of tubers under the bush, mass of tubers per bush and the level of seed potato yield, it is recommended to apply mineral fertilizers there was applied Nitroammophos (N45P45K45) into rows (locally) on the background of the effect of rotted manure and phosphorus-potassium fertilizer for Laperla, Granada and Memphis potato varieties.

For the rational use of the seed stock of potatoes, Laperla, Granada and Memphis varieties of different maturity groups should be planted using seed tubers with the fraction of 28-60 mm, as the cost of planting stock was higher than the yield gains when seed large tubers with the fraction of >60 mm. In addition, the yield structure (excluding seed stock) was maximum when seed tubers with the fraction of 28-60 mm.

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АНОТАЦІЯ

ВРОЖАЙНІСТЬ ТА НАСІННЄВА ПРОДУКТИВНІСТЬ СОРТІВ КАРТОПЛІ ЗАЛЕЖНО ВІД ЕЛЕМЕНТІВ ТЕХНОЛОГІЇ ВИРОЩУВАННЯ

Наведено результати досліджень, спрямовані на вивчення впливу доз і способів внесення добрив та фракції садивного матеріалу на формування врожайності, насіннєвої продуктивності та структури врожаю бульб картоплі в умовах Вінницької області.

У результаті проведених нами досліджень впродовж 2019-2021 року встановлено, що урожайність та вихід насіннєвої картоплі змінюється залежно від дози і способу внесення добрив, фракції садивних бульб та сортових особливостей. Найвищі показники структури врожаю та урожайності отримано на варіанті досліду, де на фоні дії напівперепрілого гною внесеного під попередник та фосфорно-калійного удобрення під основний обробіток картоплі внесено локально Нітроамофоску ($N_{45}P_{45}K_{45}$) середньораннього сорту картоплі Гранада. При цьому кількість бульб під кущем збільшилася від 9,0 до 9,5 шт. та середньої маси бульб від 78,1 до 79,5 г, урожайність від 38,3 до 41,1 т/га, за збільшення фракції садивних бульб. За інтенсифікації вирощування картоплі найвищі показники, завдяки сортовим особливостям, виходу бульб сорту Гранада, розмір яких за найбільшим поперечним діаметром 28-60 мм отримано на варіанті досліду, де на фоні дії напівперепрілого гною внесеного під попередник та фосфорно-калійного удобрення під картоплю, внесено локально Нітроамофоску ($N_{45}P_{45}K_{45}$). При цьому частка бульб цієї фракції змінювалася залежно від фракції садивного матеріалу від 44,9 до 54,6%,

У середньому за три роки найвищий врожай бульб сорту Гранада одержали на варіанті досліду, де на фоні дії напівперепрілого гною та фосфорно-калійного удобрення внесено локально Нітроамофоску ($N_{45}P_{45}K_{45}$) із фракцією садивних бульб >60 мм – 41,1 т/га, що на 32,6% вище ніж на контролі (без удобрення) та 1,5 т/га більше порівняно із урожайністю, яку отримали із такою самою дозою та способом удобрення, проте із фракцією садивних бульб 28-60 мм. Однак, вказуючи на прирости врожаю від садіння великими бульбами необхідно згадати про витрати садивного матеріалу. Тобто різниця у витраті садивного матеріалу між кращими у досліді двома варіантами на сорті картоплі Гранада становили 1,85 т/га. Отже, витрати садивного матеріалу були більшими, ніж ми одержали приросту врожаю. Аналогічна закономірність була отримана у ранньостиглого сорту картоплі Лаперла так і середньостиглого сорту Мемфіс.

Важливим показником насіннєвої продуктивності картоплі є коефіцієнт розмноження, який змінювався у залежності від удобрення, фракції садивних бульб та сортових особливостей. Найвищі показники коефіцієнту розмноження як за кількісним так масовим значенням відмічено у сорту Гранада, на варіанті досліду, де на фоні дії напівперепрілого гною внесеного під попередник та фосфорно-калійного удобрення під картоплю, внесено локально Нітроамофоску ($N_{45}P_{45}K_{45}$). При цьому коефіцієнт розмноження за кількісним значенням змінювався від 8,3 до 8,7 шт., а за масовим значенням змінювався від 7,4 за висаджування бульб найбільшою фракцією до 17,8 шт., за висаджування бульб найдрібнішою фракцією. Доведено, що лише за висаджування картоплі фракцією садивних бульб 28-60 мм коефіцієнти розмноження, як за кількісним так

і масовим значенням були максимально наближеними один до одного і склали 8,5 та 10,7 шт. Це вказує на оптимальне співвідношення відтворення насіннєвого матеріалу саме за висаджування фракцією садивних бульб цієї фракції.

Ключові слова: *картопля, насіння, дози, способи удобрення, фракція садивних бульб, урожайність, структура врожаю.*

Табл. 3. Рис. 4. Літ. 14.

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