ЗЕМЛЕРОБСТВО І РОСЛИННИЦТВО

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INFLUENCE OF MACRO- AND MICROELEMENTS ON THE GROWTH DYNAMICS OF POTATO CROPS ON THE 60TH DAY AFTER PLANTING

Studies of the influence of growth regulators and microfertilizers with L-a-amino acids on potato yield were conducted in the crop rotation of the sector of potato study of the Institute of Agriculture of the Carpathian region of NAAS in the Western Forest-Steppe zone on gray forestal soils.

The studies were conducted at different plant nutrition areas (70×20 cm; 70×25 cm; 70×30 cm) and different groups of potato ripeness, namely the middle-early variety Aria and the medium-ripe variety Hurman.

To increase the aboveground vegetative mass of plants with the formation of the maximum daily increase in yield of potato tubers is important for increasing the productivity of potatoes. In the process of growth and development, each stem becomes an independent plant with its own root system, which forms stolons and forms tubers.

When studying the dynamics of the potato crops development on the 60th day after planting, it is important to increase the productivity of potato plants and the growth of vegetative mass. The application of drugs, such as hros korenerist 1 l/ha, ecoline bor premium 1 l/ha and hros amino mahnii 1.5 l/ha, showed an effect on increasing the number of stems in the bush, plant height and leaf area surface. Increase in potato yield depends on the increase in vegetative mass of plants.

As a result of observations it was found that on the 60th day after planting potatoes, the variety Aria on a feeding area of 70×30 cm with the recommended dose of fertilizer $N_{90}P_{90}K_{120}$ and treatment with microfertilizers observed the largest number of stems (3.3), plant height (74 cm) and leaf surface area (38.6 thousand m^2/ha). In the Hurman variety, the largest increase in vegetative mass was observed at a feeding area of 70×20 cm with the application of the recommended dose of $N_{90}P_{90}K_{120}$ fertilizers and micronutrient treatment: the number of stems was 4.5, plant height 76.2 cm and leaf surface area 41.7 thousand m^2/ha.

Therefore, in the process of observing the growth dynamics of potato plants, it was found that the use of the recommended dose of $N_{90}P_{90}K_{120}$ and

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microfertilizers containing L-a-amino acids causes increases in the vegetative mass on different feeding areas and different maturity groups of potatoes.

Key words: potatoes, variety, fertilizers, microfertilizers, vegetative mass.

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Вплив макро- та мікроелементів на динаміку росту посівів картоплі на 60-й день після садіння

Дослідження впливу регуляторів росту та мікродобрив з L-a-амінокислотами на динаміку росту картоплі проводили в сівозміні сектору картоплярства Інституту сільського господарства Карпатського регіону НААН у зоні Західного Лісостепу на сірих лісових ґрунтах.

Дослідження здійснювали за різних площ живлення (70×20;70×25; 70×30 см) та різних груп стиглості картоплі, а саме: середньораннього сорту Арія та середньостиглого сорту Гурман.

Важливим для підвищення продуктивності картоплі є наростання надземної вегетативної маси рослин із формуванням максимального добового приросту врожайності бульб. У процесі росту й розвитку кожне стебло стає самостійною рослиною з власною кореневою системою, яка утворює столони й формує бульби.

Під час проведення дослідження динаміки розвитку посівів картоплі на 60-й день після садіння виявлено підвищення продуктивності та приросту вегетативної маси картоплі.

За внесення препаратів, таких як «Грос коренеріст», 1 л/га, «Еколайн бор преміум», 1,0 л/га, та «Грос аміно магній», 1,5 л/га, було помічено збільшення кількості стебел у кущі, висоти рослин та площі листкової поверхні, оскільки приріст урожаю картоплі залежить від наростання вегетативної маси рослин.

У результаті спостережень було встановлено, що на 60-й день після садіння картоплі в сорту Арія на площі живлення 70×30 см із внесенням рекомендованої дози добрив $N_{90}P_{90}K_{120}$ та обробкою мікродобривами була найбільша кількість стебел (3,3 шт.), висота рослин (74 см) та площа листкової поверхні (38,6 тис. м^2/га). У сорту Гурман найбільший приріст вегетативної маси спостерігали на площі живлення 70×20 см із внесенням рекомендованої дози добрив $N_{90}P_{90}K_{120}$ та обробкою мікродобривами: кількість стебел становила 4,5 шт., висота рослин – 76,2 см та площа листкової поверхні – 41,7 тис. м^2/га.

Отже, в процесі спостережень за динамікою росту рослин картоплі було встановлено, що застосування рекомендованої дози $N_{90}P_{90}K_{120}$ та використання мікродобрив із вмістом L-a-амінокислот зумовлює збільшення вегетативної маси на різних площах живлення та за різних груп стиглості картоплі.

Ключові слова: картопля, сорт, удобрення, мікродобрива, вегетативна маса.

Introduction. Of all the crops grown in Ukraine, potatoes are one of the most demanding to nutrients and respond positively to fertilizers.

An important requirement for the growth and development of potato plants is nutritional conditions. Many scientists – O. M. Bunchak [7], A. A. Bondarchuk [13], M. Ya. Molotsky, Yu. V. Fedoruk, K. V. Zhytetsky [21] note that the need of plants in the appropriate number and ratio nutrients are due to potato plants and its biological properties. They also emphasize that potatoes are more demanding on nutrients than other crops. This is explained by the fact that it is an extremely very productive plant.

To obtain a high yield, it is necessary to ensure a sufficient level of nutrition throughout the growing season [16, 23, 26]. For normal growth and development, as well as high productivity, potato plants need mineral nutrients: nitrogen, phosphorus, potassium, calcium, magnesium, iron, sulfur, boron, manganese and others. However, potatoes need nitrogen, phosphorus and potassium the most.

It is believed that 50% of the increase in yield belongs to fertilizers [1]. Effective use of fertilizers in growing potatoes has always been relevant [16, 19].

With the cultivation technology potatoes accumulate high yields of biological mass, which requires a large number of nutrients.

Depending on the variety and agro-climatic conditions, 10.0 tons of tubers and 8.0 tons of potato greens absorb 40–60 kg of nitrogen, 10–18 phosphorus, 60–100 potassium, 20–40 sulfur, 10–25 magnesium, 20–50 calcium. The higher the yield, the greater the removal of nutrients from the soil. The main source of soil replenishment with nutrients and a necessary condition for obtaining high yields of quality tubers in all soil – climatic zones is the introduction of basic nutrients in the form of fertilizers.

For potatoes, the period of maximum use of plant nutrients falls on the beginning of tuber formation, ie the period of maximum mineralization of organic fertilizers. Therefore, it is very important to provide the required amount of nutrients in the soil in the first 10–15 days after emergence. Various deficiency or excess of them negatively affects the growth and development of plants. If it is not possible to apply the full amount of mineral fertilizers locally, it is necessary to allocate 15–20 kg of nitrogen, phosphorus and potassium from the main fertilizer for row fertilization. The rest of the fertilizer is applied during the preparation of the soil for planting. High yield increments with the application of complete mineral fertilizers are observed on all types of soils [3].

Today potatoes are the main food, fodder and industrial crop. Modern economic conditions in the agricultural sector encourage the search

for technologies based on the mobilization of cheap local mineral and organic resources. Promising in this aspect is the involvement in the biological cycle of secondary crop products of green manures and production on their basis of a new generation of organomineral bioactive fertilizers, which, applied in doses an order of magnitude lower than the recommended doses of traditional organic fertilizers, are not inferior or even exceed efficiency.

Compared to other crops, potatoes are more demanding of nutrients, so they require a significant amount of fertilizer. The solution to this problem is the use of new modern organo-mineral fertilizers, which contain not only the basic nutrients, but also a whole arsenal of trace elements (copper, molybdenum, manganese, zinc, boron, selenium, silicium, etc.). Their use is most effective in optimal doses because they regulate different metabolic processes.

Under such conditions, the use of fertilizers should meet the needs of plants in macro-and micronutrients at all stages of their organogenesis. Current plant growth stimulants on the Ukrainian market are available in the form of chemical compounds and humic preparations isolated from natural substances of organic origin. The positive effect of foliar fertilization on yield and quality of potato tubers is proven by numerous experimental studies in different soil and climatic conditions.

One of the ways to increase the efficiency of mineral fertilizers by reducing their rates is the use of growth stimulants. Synthetic drugs increase yields, resistance of plants to adverse weather conditions, to damage by pests and diseases, etc. [20].

As already mentioned, a very important factor in yield and quality of potatoes is the meteorological conditions of the growing season [28, 29]. They also affect the effectiveness of mineral fertilizers. However, the relationship between rainfall and potato yields is zonal. It was found that in the Steppe there is a close connection between them, in the Forest-Steppe it decreases and is almost not felt in Polissia, where an important limiting factor is cloudiness, which reduces the inflow of solar radiation by 5–6 times. The degree of provision of the potato plant with solar insolation affects its mineral nutrition. In sunny summer there is a need to increase potassium nutrition, and in cloudy – calcium.

Mineral fertilizers affect a number of plant parameters. These are photosynthetic activity and leaf area; height and bushiness [2], yield and its quality [10, 11, 23, 24, 25, 31]; nitrate content in tubers and degeneration, etc.

The normal life cycle of potato plants consists of a number of periods, which are characterized by changes in physiological functions and organ-forming processes. At the same time there are changes in phenological phases, ie morphological and physiological changes in plant organs that have formed [3].

In their research, scientists [12] found that the density of potato plants should correspond to its biological characteristics to create a potential opportunity to increase yields due to a well-developed leaf surface and root system. The density of agrophytocenosis depends on soil fertility, tuber size and variety [13]. The economic yield of potato tubers largely depends on the biometric indicators of plants and plantations: plant height, leaf area and quatity of stems in the bush and in the area.

It is known that the height of plants largely depends on varietal characteristics and predecessor. With constant cultivation of potatoes there was a decrease in plant height, compared with options where it was grown in short-rotation crop rotation. Thus, in permanent plantations, the height of plants of the variety Borodianska rozheva averaged 45 cm, which is 4% less than in the variety Yavir (47 cm).

When placing potatoes in crop rotation, the height of plants was, respectively, by varieties: Borodianska rozheva – 49 cm, Yavir – 52 cm, and its growth is 9 and 11% plus, compared with permanent cultivation. The difference in varieties under these conditions was greater and amounted to 6%.

With increasing nutrition, there was a tendency to increase the height of plants of both varieties, both in constant cultivation and in crop rotation. If in the control variant, where fertilizers were not applied, the height of plants averaged 42 cm, then when applying 40 t/ha of manure this figure increased by 21%, with the use of mineral fertilizers in the norm $N_{45}P_{45}K_{45}$ with the manure background – by 35%.

The size of the potato yield is significantly influenced by the leaf surface area of plants per hectare. The efficiency of the formation of the leaf surface area of plants varies depending on the varietal characteristics and growing conditions [3].

At the Department of Agrochemistry and Plant Quality of NUBiP, research was conducted on the effect of fertilizers on the photosynthetic activity of table potatoes of medium-ripe variety Saturn. The formation of the leaf surface was influenced by both applied fertilizers and meteorological conditions. The maximum leaf surface area was in a variant with 1.5 doses of mineral fertilizers given in two steps ($N_{60}P_{70}K_{100}$ + $N_{60}P_{50}K_{80}$ at planting) – 45.2 thousand m^2/ha [2].

Various agro-technological methods significantly affect the value of potato yield. It is known that plant density is the most important element of the crop structure and it must be established depending on the size of the seed material, the properties of the variety and soil fertility [22].

Depending on the density of plantings, the yield of potatoes increases or decreases significantly [2].

In other studies studying the effect of feeding area on yield when growing potatoes on peat-swamp soils, the highest yield of seed tubers was obtained at feeding area 70×20 – 25 and 90×15 – 20 cm, which is 9–20% more than the control of 70×35 cm (40 thousand/ha) – 27.6 t/ha.

Potato yield is closely related to the area of nutrition, which in turn depends on biological characteristics, soil fertility, variety, size of planting tubers, planting density and soil cultivation [4, 6].

Studies of the Institute of Potato NAAS over the years have shown that using a row spacing of 75 cm it is necessary to plant 67 or 54 thousand tubers per 1 ha according to the scheme 75×20 – 25 cm [17].

According to T. V. Klymenko [15] in connection with the shortage of organic and mineral fertilizers in the cultivation of potatoes, it is recommended to use straw in combination with green manure, which will provide environmentally friendly products, manure and moderate rates of mineral fertilizers, which increases the active leaf surface of plants, carbohydrate synthesis and obtaining a high yield of potato tubers.

It was believed that the main crops widely used for food purposes are cereals and vegetables. However, the advent of potatoes changed the structure of agriculture. Potatoes are a valuable crop and are used in many areas of human activity. It is an indispensable food product, widely used for feeding animals and as a raw material for various potato products, starch, alcohol. In addition, it is a good precursor for different crops.

It is known that the optimal lighting conditions for photosynthesis of plant are in the case if the total leaf surface is approximately 3–4 times or more exceeds the soil area and is not less than 35–40 thousand m^2/ha

The main organ of photosynthesis of plants are green leaves, so the main attention when growing potatoes should be paid to the formation of the optimal leaf surface area [1].

In areas of traditional potato growing, it has been established that the optimal leaf area is 40–45 thousand m^2/ha. Further increase in it not only did not increase the productivity of plantations, but on the contrary, led to smaller yields due to the stronger suppression of such crops by soil and air drought. Numerous studies have shown that the leaf surface area of potato plants largely depends on agronomic measures. It is known that crop yields are

formed in the process of photosynthesis, when green plants form organic matter from carbon monoxide, water and minerals. In this case, solar energy is converted into energy from plant biomass. The efficiency of this process and ultimately the level of yield depend on the functioning of the leaf surface of the crop as a photosynthetic system. The productivity of photosynthesis, in turn, depends on environmental factors, technology of cultivation, other factors and is determined by two main components: the total area of assimilation surface of plants and net productivity of photosynthesis [27].

Materials and methods. In 2018–2020, field research was conducted on the experimental field of the Institute of Agriculture of the Carpathian Region on gray forestal soils. The subject of research – the productivity of potatoes depending on the influence of agro-technological factors. The object of study – potatoes medium-early variety Aria and medium-ripe Hurman and five options for mineral fertilizers and micronutrients: 1) control without fertilizers (70×30 cm); 2) Recommended dose of fertilizer $N_{90}P_{90}K_{120}$ (70× 30 cm); 3) Recommended dose of fertilizers $N_{90}P_{90}K_{120}$ + microfertilizers (70×20 cm); 4) Recommended dose of fertilizer $N_{90}P_{90}K_{120}$ + microfertilizers (70×25 cm); 5) The recommended dose of fertilizers $N_{90}P_{90}K_{120}$ + microfertilizers (70×30 cm).

The objective of the study was to determine the effect of the recommended dose of fertilizers and microfertilizers with L-a-amino acids on potato yield.

In all variants except the first and the second, foliar fertilization was carried out with microfertilizers gros korenerist 1 l/ha, ecoline bor premium 1.0 l/ha and gross amino magnesium 1.5 l/ha.

Results and discussion. It is important to increase the productivity of potatoes and increase of aboveground vegetative mass with the formation of the maximum daily growth of tubers. The yield of potatoes is significantly affected by the number of stems in the bush. In the process of growth and development each stem becomes an independent plant with its own root system, which forms stolons and forms tubers. There is a direct relationship between the number of stems in the bush and the number of tubers, so the growth of the first indicator always leads to the growth of the second. (Table 1)

Thus, for three years of our research, the largest number of formed stems in the bush of medium-early and medium-ripe varieties Aria and Hurman on day 60 after planting potatoes in 2018 on feeding areas 70×20 cm and 70×25 cm with the recommended dose of fertilizer $N_{90}P_{90}K_{120}$ and microfertilizer treatment was 3.5–4.5 pcs. In 2019, the largest number of stems in the Aria variety was on the feeding area of 70×30 cm after the

application of the recommended dose of fertilizers and treatment with microfertilizers – 3.2 pcs. In the Hurman variety, the largest number of stems was on the feeding area of 70×20 cm with the introduction of the recommended dose of fertilizers and treatment with microfertilizers – 6 pcs.

In 2020, the largest number of stems was in the variety Aria on a feeding area of 70×30 cm with the recommended dose of fertilizers and microfertilizers – 3.3 pcs, and in the Hurman variety the largest number of stems was observed on the area of 70×20 cm with the recommended dose of fertilizers and microfertilizers – 4.5 pcs.

Thus, on average over 3 years of research, the largest number of stems was in the variety Aria – 3.3 pieces on a feeding area of 70×30 cm with the introduction of the recommended dose of fertilizer $N_{90}P_{90}K_{120}$ and treatment with microfertilizers.

1. The number of stems of potato plants on the 60th day after planting

Options	Years of research	Number of stems, pcs	
		Aria	Hurman
Control without fertilizers	2018	3	5
	2019	2.5	5
	2020	2.8	5
	Average for years	2.8	5
Recommended dose $N_{90}P_{90}K_{120}$	2018	2	3
	2019	3.5	5
	2020	2.8	4
	Average	2.8	4
Recommended dose $N_{90}P_{90}K_{120}$ + microfertilizers (70×20)	2018	3.5	3
	2019	2.5	6
	2020	3	4.5
	Average	3	4.5
Recommended dose $N_{90}P_{90}K_{120}$ + microfertilizers (70×25)	2018	3	4.5
	2019	3	3
	2020	3	3.8
	Average	3	3.8
Recommended dose $N_{90}P_{90}K_{120}$ + microfertilizers (70×30)	2018	3	5
	2019	3.5	3.5
	2020	3.3	4.3
	Average	3.3	4.3

In the Hurman variety at a feeding area of 70×20 cm with the application of the recommended dose of fertilizer $N_{90}P_{90}K_{120}$ and treatment with microfertilizers, the number of stems was 4.5 pcs.

We also conducted research to determine the growth rates of potato plants in height (Table 2).

2. The height of potato plants on the 60th day after planting

Options	Years of research	Plant height, cm	
		Aria	Hurman
Control without fertilizers	2018	74	57.5
	2019	50	72.5
	2020	62	65
	Average for years	62	65
Recommended dose $N_{90}P_{90}K_{120}$	2018	60	70
	2019	55	73.5
	2020	58	71.8
	Average	58	71.8
Recommended dose $N_{90}P_{90}K_{120}$ + microfertilizers (70×20)	2018	85	85
	2019	63.7	67.5
	2020	74.4	76.2
	Average	74.4	76.2
Recommended dose $N_{90}P_{90}K_{120}$ + microfertilizers (70×25)	2018	57.5	72.5
	2019	62.5	75
	2020	60	73.8
	Average	60	73.8
Recommended dose $N_{90}P_{90}K_{120}$ + microfertilizers (70×30)	2018	82.5	70.5
	2019	65	72.5
	2020	73.8	71.5
	Average	73.8	71.5

Thus, the highest plant height of the studied varieties of potatoes of medium-early and medium-ripe varieties Aria and Hurman in height in 2018 was on the options with the recommended dose of fertilizer $N_{90}P_{90}K_{120}$ and micronutrient treatment with a feeding area of 70×20 cm – 85 cm.

In 2019, the highest plant height was observed in the Aria variety with a feeding area of 70×30 cm with the recommended dose of $N_{90}P_{90}K_{120}$ and microfertilizer treatment – 65 cm, and in the Hurman variety the highest

plant height was observed at a feeding area of 70×25 cm with the recommended dose of $N_{90}P_{90}K_{120}$ and microfertilizer treatment – 75 cm.

In 2020, the highest plant height at 60 days after planting potatoes was observed in the Aria variety with a feeding area of 70×30 cm with the recommended dose of fertilizer $N_{90}P_{90}K_{120}$ and microfertilizer treatment – 73.8 cm, in the Hurman variety the highest plant height was 70×20 cm with application of the recommended dose of $N_{90}P_{90}K_{120}$ and treatment with microfertilizers – 76.2 cm.

It should be noted that the average indicators for 2018–2020 studies showed that the highest plant height was observed in both medium-early cultivar Aria and medium-ripe cultivar Hurman on a feeding area of 70×20 cm with the recommended dose of fertilizer $N_{90}P_{90}K_{120}$ and microfertilizer treatment – 74.4–76.2 cm.

Potato yield is also significantly affected by the leaf surface area ofplants per hectare. The formation of the leaf surface area of potato plants varies depending on varietal characteristics and growing conditions.

On the 60th day after planting potatoes, the area of the potato leaf surface was determined. According to the data (Table 3), the leaf surface area on the control options without fertilizers with a feeding area of 70×30 cm in 2018 in the middle-early variety Aria was 16.0 thousand m^2/ha, and in the medium-ripe variety Hurman – 11.0 thousand. m^2/ha.

The leaf surface area in 2019 on the variant of control without fertilizers in the variety Aria was 11.1 thousand m^2/ha, and in the variety Hurman – 31.6 thousand m^2/ha.

In 2020, the leaf surface area on the control option without fertilizers in the variety Aria 13.6 thousand m^2/ha, and in the variety Hurman – 21.6 thousand m^2/ha.

Thus, in the control variant without fertilizers, the average value of the leaf surface area for 2018–2020 in the variety Aria 13.6 thousand m^2/ha, and in the variety Hurman – 21.6 thousand m^2/ha.

In the variant with the application of the recommended dose of fertilizer $N_{90}P_{90}K_{120}$, the leaf surface area in 2018 for the middle-early variety Aria was 18.0 thousand m^2/ha, in the medium-ripe variety Hurman – 15.5 thousand m^2/ha. In 2019, the leaf surface area of the Aria variety was 29.6 thousand m^2/ha, and of the Hurman variety 36.0 thousand m^2/ha.

In 2020, the leaf surface area on the variant with the application of the recommended dose of fertilizer $N_{90}P_{90}K_{120}$ in the variety Aria was 23.8 thousand m^2/ha, in the variety Hurman – 25.8 thousand m^2/ha. On average, over the years of the study, the leaf surface area in the variant with the application of the recommended dose of fertilizers was

23.8 thousand m^2/ha in the Aria variety and 25.8 thousand m^2/ha in the Hurman variety.

3. Potato leaf surface area for 60 days after planting

Options	Years of research	Leaf surface area, thousand m^2/ha	
		Aria	Hurman
Control without fertilizers	2018	16.0	11.5
	2019	11.1	31.6
	2020	13.6	21.6
	Average for years	13.6	21.6
Recommended dose $N_{90}P_{90}K_{120}$	2018	18.0	15.5
	2019	29.6	36.0
	2020	23.8	25.8
	Average	23.8	25.8
Recommended dose $N_{90}P_{90}K_{120}$ + microfertilizers (70×20)	2018	21.5	38.0
	2019	47.1	45.3
	2020	34.3	41.7
	Average	34.3	41.7
Recommended dose $N_{90}P_{90}K_{120}$ + microfertilizers (70×25)	2018	18.5	21.0
	2019	35.9	38.4
	2020	27.2	29.7
	Average	27.2	29.7
Recommended dose $N_{90}P_{90}K_{120}$ + microfertilizers (70×30)	2018	22.0	26.5
	2019	55.1	33.1
	2020	38.6	29.8
	Average	38.6	29.8

The leaf surface area on the variants with the application of the recommended dose of fertilizer $N_{90}P_{90}K_{120}$ and treatment with microfertilizers of the Aria variety for 2018 was 70×20 cm – 21.5 thousand m^2/ha, 70×25 cm – 49.9 thousand m^2/ha, 70×30 cm – 22.0 thousand m^2/ha. For the Hurman variety, the feeding area is 70×20 cm – 38.0 thousand m^2/ha, 70×25 cm – 21.0 thousand m^2/ha, 70×30 cm – 26.5 thousand m^2/ha.

When conducting research in 2019 on the variant with the introduction of the recommended dose of fertilizer $N_{90}P_{90}K_{120}$ and treatment with microfertilizers in the variety Aria, the leaf surface area was 70×20 cm

– 47.1 thousand m^2/ha, 70×25 cm – 35.9 thousand m^2/ha, 70×30 cm – 55.1 thousand m^2/ha. In the Hurman variety on the feeding area of 70×20 cm – 45.3 thousand m^2/ha, 70×25 cm – 38.4 thousand m^2/ha, 70×30 cm – 33.1 thousand m^2/ha.

In 2020, the leaf surface area of the Aria variety was 70×20 cm – 34.3 thousand m^2/ha, 70×25 cm – 27.2 thousand m^2/ha, 70×30 cm – 38.6 thousand m^2/ha. In the Hurman variety on the feeding area of 70×20 cm – 41.7 thousand m^2/ha, 70×25 cm – 29.7 thousand m^2/ha, 70×30 cm – 29.8 thousand m^2/ha.

According to the results of 2018–2020 research, the average value of the leaf surface area in the middle-early variety Aria on variants with the recommended dose of $N_{90}P_{90}K_{120}$ and micronutrient treatment is 70×20 cm – 34.3 thousand m^2/ha, 70×25 cm – 27.2 thousand m^2/ha, 70×30 cm – 38.6 thousand m^2/ha. The medium-ripe Hurman variety has a feeding area of 70×20 cm – 41.7 thousand m^2/ha, 70×25 cm – 29.7 thousand m^2/ha, 70×30 cm – 29.8 thousand m^2/ha.

Conclusions. In the course of observations it was found that the use of the recommended dose of fertilizers and the use of microfertilizers with L-a-amino acids affects the increase in stem numbers, plant height and leaf surface area in different areas and with different groups of potato ripeness. During the research period, when applying the recommended dose of fertilizer $N_{90}P_{90}K_{120}$ with the addition of microfertilizers on the studied varieties Aria and Hurman, changes in the increase of leaf surface area were observed in the experiment variants with a feeding area of 70×25 and 70×30 cm.

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