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INFLUENCE OF THE FERTILIZER "ECO-SP + BRAND: A" ON THE YIELD AND STRUCTURE OF THE POTATO CROP IN THE CONDITIONS OF THE TAMBOV REGION

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Abstract: data on the use of fertilizers based on humic substances "ECO-SP+ brand: A" are presented. It is found that the maximum yield was obtained in the variant with the consumption of agrochemicals 2.0 l/ha and amounted to 53.7 t/ha, and the increase to the control was 12.8% (6.1 t/ha). The number and weight of tubers of the fraction more than 60 mm and 30-60 mm (relative to the control variant) increased.

Key words: potatoes, foliage application, fertilizers, yield, quality, marketability.

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Potatoes are one of the most important food crops and are cultivated in many countries around the world. Modern varieties of this crop have a high potential yield.

The use of fertilizers is an important component of the organization of a full-fledged mineral nutrition of agricultural crops. Fertilizers complement the traditional schemes of mineral nutrition with the use of basic fertilizers and allow obtaining the maximum effect at low costs - an increase in yield and an improvement in the quality characteristics of tubers.

Foliar application is the fastest way to eliminate nutrient deficiencies, as the penetration of nutrients through the leaf is much faster than through the root. Foliar application with special water-soluble fertilizers with trace elements provides plants with nutrients in an accessible form, despite the influence of adverse environmental factors - drought, heavy rains, temperature changes, high pH [2].

The aim was to determine the effectiveness of fertilizers based on humic substances of ECO-SP + brand: A on potatoes of the Sante variety in the conditions of the Tambov region.

Sante variety is a Mid-season Dutch table variety with high productivity. Suitable for mechanical harvesting and treatment. Has good and excellent taste. Suitable for frying. Requires a wide row spacing. Adapted for the climatic conditions of central and southern Russia. Ripening stage is 85-90 days. Starch content is 15-16%. The average weight of tubers (grams) is 90-120. The number of tubers on a bush is up to 20. Productivity is up to 570 kg/ha. Consumer qualities: good taste, ideal for cooking fried potatoes and French fries, the flesh does not darken when cut. Keeping quality (storageability) is 92%. The skin color is yellow, the flesh color is light yellow. Disease resistance: liable to late blight on the tops (tubers are resistant), susceptible to common scab [1].

The soil of the experimental plot is heavy clayloam medium-leached chernozem of medium thickness on loess loam. The soil contains 4-6% of humus, is highly saturated with footings (70-90%). The depth of the humus layer is on average 50-60 cm. The reaction of the upper soil layers is slightly acidic (pH=5.7). The structure of the soil is granular-pulverescent and lumpy-granular. The presence of pores in the upper layers reaches 65%. Field moisture capacity of the arable soil layer is about 30%. The content of easily hydrolyzable nitrogen is 186.7 mg/kg

according to Tyurin and Kononova, mobile phosphorus is 178.7 mg/kg of soil and exchangeable potassium is 171.0 mg/kg according to Chirikov in the modification of CRIAS.

Experimental design:

1. Control (no treatments)
2. EKO-SP + 1.0 l/ha;
3. EKO-SP + 1.5 l/ha;
4. EKO-SP + 2.0 l/ha;

Field plotting studies of the studied agrochemicals on the productivity and quality of potatoes were carried out in full accordance with the standard methods published in the following publications [3-5]

In general, the weather conditions during the growth of 2020 differed from the average long-term values.

Weather conditions in April 2020 did not differ significantly from the average long-term values.

Potatoes were planted on May 7, 2020. Planting rate of seeds 43000 pcs/ha. Harvesting was on September 1, 2020.

Spray application of plants - 1st in the phase of full seedlings, 2nd in the budding phase, the consumption of the spray material is 300 l/ha.

Table 1. Meteorological data on the day of treatment

Treatment date	May 25	June 16
Temperature	11,2 ⁰ C	21,8 ⁰ C
Atmosphere pressure	755 mm Hg	751 mm Hg
Air humidity	67 %	44 %
Wind speed	2 m/s	2 m/s
Wind direction	S	SE

One of the main indicators, reflecting the effectiveness of the studied agrochemical, is the productivity of potatoes. There is a clear tendency of an increase in the productivity and marketability of potatoes with an increase in the doses of the EKO-SP + agrochemical (Table 2).

Table 2. The productivity of potatoes of the Sante variety, depending on the doses of the EKO-SP + agrochemical

Variant	Gross yield, t/ha	Yield increase		Marketability, %
		t/ha	%	
Control	47.6	-	-	92
EKO-SP + 1.0 l/ha	49.8	2.2	4.6	92
EKO-SP + 1.5 l/ha	52.3	4.7	9.9	93
EKO-SP + 2.0 l/ha	53.7	6.1	12.8	93
LSD _{0.5}	1.3			

So in the control variant, the productivity was 47,6 t/ha. When applying the EKO-SP + agrochemical, the increase in productivity (relative to control) ranged from 4.6% to 12.8%.

The maximum productivity of 53.7 t/ha was obtained in the variant of the experiment with an agrochemical consumption of 2.0 l/ha, which amounted to an increase of 6.1 t/ha to the control. The lowest productivity indicator in the experiment was showed by the agrochemical consumption of 1.0 l/ha - 49.8 t/ha.

Analysis of the indicator of marketability of potatoes showed 92-93% in all variants of the experiment. The application of the EKO-SP + agrochemical (regardless of the consumption of the agrochemical) had a positive effect on the structure of the harvest, contributing to the accumulation of tubers with a fraction of more than 60 mm and a fraction of 30-60 mm (Table 3).

Table 3: The effect of the agrochemical EKO-SP + on the structure of the harvest of potatoes of the

Sante variety

Variant	Tuber weight (kg) from 1 m ²				Fraction composition by weight, %			
	total	> 60 mm	30-60 mm	< 30 mm	total	> 60 mm	30-60 mm	< 30 mm
Control	4.76	3.05	1.07	0.64	100	64.1	22.5	13.4
EKO-SP + 1,0 l/ha	4.98	3.3	1.29	0.39	100	66.3	25.9	7.8
EKO-SP + 1,5 l/ha	5.23	3.35	1.42	0.46	100	64.1	27.1	8.8
EKO-SP + 2,0 l/ha	5.37	3.5	1.67	0.20	100	65.2	31.1	3.7

It was also noted that with an increase in the dose of agrochemical consumption per hectare, there is a decrease in tubers of fraction less than 30 mm from 7.8% to 3.7% (with values of 13.4% in the control).

According to the results of the study of the tops, it is also clearly noticeable that with the application of an agrochemical and with an increase in its rate, the weight of the tops increases: the increase in relation to the control was 144 g (35%), 210 g (51%) and 260 g (63%), respectively (Table 4).

Table 4. The effect of the agrochemical EKO-SP + on the growth of potato vine of the Sante variety

Variant	Tops weight from 1 bush, g	Increase to control	
		g	%
Control	410	-	-
EKO-SP + 1.0 l/ha	554	144	35
EKO-SP + 1.5 l/ha	620	210	51
EKO-SP + 2.0 l/ha	670	260	63

From the data in Table 5 it can be seen that the application of the EKO-SP + agrochemical gives an increase in the number of tubers in all variants of the experiment in comparison with the control: there is an increase in the fraction of more than 60 mm and a fraction of 30-60 mm. The average weight of tubers with fractions of more than 60 mm and 30-60 mm was observed in the variant of the experiment with an agrochemical consumption of 2.0 l/ha and amounted to 143 g and 93 g, respectively.

Table 5. Number and weight of tubers per 1 bush

Variant	Number of tubers, pcs/bush				Average tuber weight, > 60 mm, g	Average tuber weight, 30-60 mm, g
	total	> 60 mm	30-60 mm	< 30 mm		
Control	9	4	2	3	125	83
EKO-SP + 1,0 l/ha	11	6	3	2	137	89
EKO-SP + 1,5 l/ha	14	8	5	1	140	93
EKO-SP + 2,0 l/ha	17	11	5	1	143	93

Conclusions

Thus, the application of the EKO-SP + agrochemical during the growth of 2020 had a positive effect on the growth and development of potato plants of the Sante variety.

The maximum productivity was obtained in the variant with an agrochemical consumption of 2.0 l/ha and amounted to 53.7 t/ha. The increase to the control was 12.8% (6.1 t/ha). The number and weight of tubers of the fraction more than 60 mm and 30-60 mm (relative to the control variant) increased.

The use of this product in the conditions of crop production will be economically feasible and cost-effective. The low cost of an agrochemical and a tangible increase in qualitative and an increase in quantitative indicators of productivity, in particular when used on potatoes, when using EKO-SP + fertilizers, based on humic substances, brand: A, in the technology of cultivation of agricultural crops, will be economically profitable for agricultural producers.

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