

directly incorporating the liquid manure ensure exceptionally low-emission and economic spreading of this resource.

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MICRONUTRIENTS IN RAPESEED CROPS

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Abstract: Trace elements are involved in almost all processes of plant life, despite the fact that they need very small amounts. The lack of trace elements in the soil does not lead to the death of plants, but is the cause of a decrease in the rate of their development. In the end, the plants do not realize their capabilities and give a low and low-quality crop. To solve this problem quickly, you can use foliar fertilizing with microfertilizers. The purpose of this study was to assess the impact of foliar fertilizing at different times with new types of complex microfertilizers on the productivity of spring rapeseed and the quality of its oilseeds. The experiments were carried out in the Lipetsk Region in Russia in 2019 and 2020 on Rif spring oilseed rape variety. The research results showed that processing foliar fertilization in the rosette stage with further feeding in the bud-formation phase were most effective. Because of

the provision with microelements, vegetative plants were able to synthesize a full complex of enzymes. Plantafol 20:20:20 and Plantafol 5:15:45 micronutrient fertilizers provided the maximum increase in the rapeseed yield with double-spray processing, yielding 2.05 and 1.94 t/ha, respectively, and exceeding the control crops by 0.64 and 0.53 t/ha, respectively.

Keywords: oilseed rape, micronutrient fertilizers, crop yield, oil content, biometric indicators.

Oilseeds are the most valuable agricultural crops in the world trade. Expansion of the range, of oilseeds grown types which allows for providing the population with a variety of very useful vegetable oils of local production [3].

Oilseed rape (canola) is an indispensable crop that is used in many different fields, including the edible oil production. This crop is one of the most popular oilseeds in Europe [2]. According to Food and Agricultural Organization, the annual worldwide rapeseed oil production ranges from 15 to 16 million tons, trailing only soybean and palm oil. The growing demand for rapeseed oil and favorable world market conditions contribute to the development of oilseed rape cultivation.

Nowadays, foliar feeding is actively used in cropping systems particular under adverse climatic conditions or severe minerals deficiency. Foliar feeding contributes to increased oil content in the seeds, improve oil quality and increase the crop yield of oilseeds [1].

The purpose of this study was to assess the impact of foliar fertilizing at different times with new types of complex microfertilizers on the productivity of spring rapeseed and the quality of its oilseeds in the conditions of the Central Black Earth zone of Russia. The effectiveness of foliar fertilizing with microfertilizers was evaluated by such indicators as an increase in the yield of spring rapeseed, an increase in the quality of oilseeds, an increase in the gross oil harvest per hectare and a reduction in the cost of finished products.

The effectiveness of foliar fertilizing with microfertilizers was evaluated by such indicators as increasing the yield of spring rapeseed, improving the quality of oilseeds, increasing the gross oil harvest per hectare and reducing the cost of finished products.

All micronutrient fertilizers studied in the experiment had a positive effect on crop yield. Micronutrient fertilization of rapeseed plants in the

rosette stage contributed to increased productivity by 13.5% on average for research options, increasing it by 20.7% in case of feeding in the bud-formation stage and by 32% in case of double-spray application compared to the control option. Double-spray fertilization with Plantafol 20:20:20 and Plantafol 5:15:45 provided the maximum increase in the yield, amounting to 2.05 and 1.94 t/ha, respectively, and exceeding the control option by 0.64 and 0.53 t/ha.

The application of micronutrient fertilizers had a positive effect on the oil content of rape seeds. This indicator ranged within 43.73-43.77%. The maximum gross oil yield was provided by double-spray fertilization. The largest amount of oil was collected when plants were treated with Plantafol 20:20:20 (0.77 t/ha), slightly less oil was obtained in the options of feeding with Life Force (0.71 t/ha) and Plantafol 5:15:45 (0.72 t/ha).

Evaluation of the economic efficiency of the use of foliar fertilizing with microfertilizers on rapeseed crops allowed us to establish that the use of all microfertilizers was cost-effective in relation to the control. It should be noted that the highest net income (\$430 / ha), the highest level of profitability (107,2 %) and the lowest cost of 1 ton of seeds (\$196/t.) were observed when using Plantafol 20:20:20 microfertilizer.

The use of Plantafol 20:20:20 microfertilizer on rapeseed crops contributed to a more significant net income than on other options. Compared to the control, the treatment of rapeseed plants with Plantafol 20:20:20 microfertilizer increased net income by 257 \$/ha, and provided a cost reduction of 87 \$/t. At the same time, the level of profitability in comparison with the control in this variant increased by almost 63.8 %.

Besides that the treatment of spring rapeseed plants with microfertilizers contributed to the reduction of the vegetation season. Single-staged fertilizations reduced its duration by 2-3 days, while double-spray fertilizations reduced its duration by 3-5 days, what is important in the technology of rapeseed cultivation.

Studies conducted in the experiment have established high productivity and economic efficiency in foliar treatment of spring rapeseed plants in the rosette phase and the subsequent budding phase with Plantafol 20:20:20 microfertilizer at a dose of 1 kg/ha in the Central Black Earth Region of Russia.

Further research is needed to determine the best combinations of the studied microfertilizers to assess their impact on the productivity of

spring rapeseed plants. There is also a need to identify changes that occur at different stages of plant development, using biochemical analyses.

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ОБОБЩЕННАЯ ОЦЕНКА ТЕХНОЛОГИЙ ПРОИЗВОДСТВА КАРТОФЕЛЯ

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Аннотация: В статье рассматриваются перспективные технологии производства картофеля.

Abstract: The article discusses promising potato production technologies.

Ключевые слова: картофель, ресурсосбережения, производство, показатели, снижение затрат, почва, производительность.

Keywords: potatoes, resource saving, production, performance, cost reduction, soil, productivity.

Введение

В настоящее время позитивные резервы интенсификации сельского хозяйства практически исчерпаны, вместе с тем нарастают негативные последствия применения интенсивных технологий: