

Conference Paper

Application of Organomineral Fertilizers to Winter Wheat in the Rostov Region

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Abstract

Modern crop cultivation technologies are based on various methods of seed and plant treatment using environmentally friendly drugs that stimulate growth and the development of the plants, and increase their productivity and stress resistance. It has been established that the use of organic fertilizers positively affects the vital signs, yield and grain quality of cereal plants. When cultivating winter wheat on the southern chernozem of the Kamensky district (in the Rostov region), the organic fertilizers Router (0.5 or 0.25 l / ton) and Leyli (0.25 l / ton) were used for seed treatment, and Soft Guard (0.2 l / ha) and Humiful Pro (0.2 l / ha) were used in spring tillering and in the flag leaf phase against the background of mineral nitrogen fertilizers in a dose of N32P32K32; the frozen-thawed soil was fertilized with ammonium nitrate in a dose of N40 and foliar fertilization was conducted with carbamide in the heading phase using a dose of N20. This increased the average grain yield by 64.2-64.8% compared with the control variant and by 31.4-32.4% compared with the use of mineral fertilizers. The maximum yield gain was achieved by using the soft-root organic fertilizers Soft Guard (0.2 l / ha) and Gumiful Pro (0.2 l / ha) against the background of mineral fertilizers and seed treatments with Router (0.5 l / ton).

Keywords: winter wheat, southern chernozem, organic fertilizers

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1. Introduction

Maximum gross yields of high quality are the main goal of agricultural producers. One of the ways to achieve it is the use of environmentally friendly biological products. They are used in modern technologies for the production of crop production [1;2;3].

Winter wheat is the main food crop in the North Caucasus [4; 5]. In Rostov Region, winter wheat areas exceed more than 50% of the sown area of the region. But the crop yield does not exceed 40 kg / ha [6]. Currently, one has to make greater efforts for grain production, since crop productivity can be increased using a balanced agricultural technology, based on the rational use of fertilizers [7; 8].

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Fertilizers are one of the most effective means for increasing the yield and quality of agricultural products. Their effectiveness depends on predecessors, soil fertility, weather conditions, biological characteristics of the crop, variety and many other factors [9].

The intensive farming system, application of highly concentrated ballast-free nitrogen-phosphorus-potassium fertilizers decreased the content of trace elements in soils and created a need for the widespread use of micronutrients, i.e. fertilizers, whose active substance are trace elements [10; 11].

To preserve and increase crop yields, it is necessary to use drugs to stimulate plant growth preparations and increase their immunity to adverse environmental conditions [12; 13].

Proper leaf nutrition can improve crop productivity. For a more effective implementation of this technology, a thorough study of new types of fertilizers is required [14].

2. Methods and Equipment

The selection of optimal organomineral fertilizers for foliar treatment is an important task of agrochemical research.

Therefore, the research aim is to study the effectiveness of new organic fertilizers used for winter wheat.

Field experiments were carried out in 2017-2019 in Kamensky district of Rostov region. The repetition of the experiment was fourfold. The agricultural method was generally accepted for the zone. The experiments and observations were carried out according to the methods of experiments with fertilizers [15; 16; 17]. The predecessor of winter wheat was corn. A variety of winter wheat Doneko was grown. The soil is southern chernozem [18].

Scheme of experience:

1. Control (without fertilizers);
2. N32P32K32 (application during sowing) + N40 (spring nitrogen application) + N20 (foliar urea application);
3. Router (0.5 l / ton), (seed treatment) + N32P32K32 (application during sowing) + N40 (nitrogen fertilizing in spring) + N20 (foliar fertilization with carbamide during heading);

4. Router (0.5 l / ton) + Leili 2000 (0.25 l / ton), (seed treatment) + N32P32K32 (application during sowing) + N40 (nitrogen fertilizing in spring) + N20 (foliar urea fertilization during heading);
5. Router (0.5 l / ton) + Leili 2000 (0.25 l / ton), (seed treatment) + N32P32K32 (application during sowing) + N40 (nitrogen fertilization in spring) + Soft Guard (0.2 l / ha) + Gumiful Pro (0.2 l / ha), (spring tillering) + Alga 2000 (0.5 l / ha) (in the phase of the flag leaf) + N20 (foliar fertilization with during heading);
6. Router (0.5 l / ton) + Leili 2000 (0.25 l / ton), (seed treatment) + N32P32K32 (application during sowing) + N40 (nitrogen fertilizing in spring) + Siamino Pro (0.5 l / ha) + Gumiful Pro (0.2 l / ha) + Double Vin MKP (2 kg / ha), (in the phase of the flag leaf) + N20 (foliar urea fertilizing during heading).
7. The objects of research were fertilizers company Biokefarm (Switzerland).
8. Router: A liquid biostimulant for the development of a root system.
9. Composition: Seaweed extract - 100 g / l, organic matter - 50 g / l, organic carbon - 70 g / l, phosphorus - 15 g / l, potassium - 30 g / l, polysaccharides - 85 g / l, steroids - 10 g / l, protein - 100 g / l, amino acids - 50 g / l, vitamin complex - 2 g / l.
10. Double Vin 18-18-18: Composition: seaweed extract - 0.5%; S - 6%; B - 0.04%; Mo - 0.01%; Mg - 3% (EDTA); Fe - 0.12% (EDTA); Mn - 0.08% (EDTA); Zn - 0.05% (EDTA); Cu - 0.03% (EDTA); alginic acid - 9%.
11. Soft Guard: water-soluble microcrystals with microorganisms. Composition: oligosaccharide molecules + potassium (chitosan 30 g / l, nitrogen 20 g / l, potassium 20 g / l, organic matter 40 g / l).
12. Gumiful: organic fertilizer to improve soil properties and the development of beneficial soil microorganisms. Composition: humic acids - 80%; fulvic acids - 10%; K2O - 8%.

3. Results

In 2018, the grain yield in the control variant (without fertilizers) amounted to 2.32 t / ha - Table 1.

The use of the nitrogen fertilizer N32P32K32, fertilization of the frozen soil with ammonium nitrate in a dose of N₄₀, and foliar fertilization with carbamide during heading in a dose of N₂₀ (farming fertilizer system) increased the yield of winter wheat grain by

TABLE 1: The yield of winter wheat grain, t / ha.

2018 год	Productivity, t / ha		Gain	
	2019 год	Average for 2018-2019	t/ha	%
control (without fertilizers)				
2.32	2.62	2.47	-	-
N ₃₂ P ₃₂ K ₃₂ (during sowing) + N ₄₀ (in spring) + N ₂₀ (heading)				
3.06	3.43	3.25	0.78	31.4
Router (0.5 l / ton) (seed treatment)				
3.27	4.01	3.64	1.17	47.4
Router (0.25 l / t) + Leili 2000 (0.25 l / t) (seed treatment)				
3.26	3.91	3.59	1.12	45.1
Router (0.5 l / ton) (seed treatment) + Gumiful Pro (0.1 l / ha) + Double Vin MKR (2 kg / ha), (spring tillering and flag leaf)				
3.53	4.33	3.3	1.46	59.1
Router (0.25 l / t) + Leili 2000 (0.25 l / t) Gumiful Pro (0.1 l / ha) + Double Vin MKR (2 kg / ha), (spring tillering and flag leaf)				
3.53	4.20	3.87	1.40	56.5
Router (0.5 l / ton) + Soft Guard (0.2 l / ha) + Gumiful Pro (0.2 l / ha), (spring tillering) + Soft Guard (0.2 l / ha) + Gumiful Pro (0.2 l / ha) (flag sheet)				
3.62	4.49	4.06	1.59	64.2
Router (0.25 l / t) + Leili 2000 (0.25 l / t) + Soft Guard (0.2 l / ha) + Gumiful Pro (0.2 l / ha), (spring tillering and flag leaf)				
3.57	4.57	4.07	1.60	64.8
HCP ₀₅				
0.11	0.21	-	-	-

0.74 t / ha or 31.9% in comparison with the control variant. The treatment of winter wheat seeds with Router (0.5 l / ton) contributed to an increase in the grain yield by 0.21 t / ha.

The maximum grain yield gain was achieved by the use of soft-root organic fertilizers Soft Guard (0.2 l / ha) and Gumiful Pro (0.2 l / ha) against the background of mineral fertilizers and seed treatments with Router (0.5 l / ton).

The grain yield of winter wheat in the control variant (without the use of fertilizers) was 2.62 t / ha. The use of a sowing mineral fertilizer in a dose of N32P32K32, fertilization of the frozen soil with ammonium nitrate in a dose of N40, and foliar fertilization with carbamide during heading in a dose of N20 (farming fertilizer system) increased the yield of winter wheat in comparison with the control variant by 0.81 t / ha or 30.9%.

Treatment of winter wheat seeds with Router (0.5 l/ton) contributed to an increase in the grain yield by 0.58 t / ha or 22.0%.

Reducing the dose of Router to 0.25 l / ton and adding organic fertilizers Leyli 2000 (0.25 l / ton) did not increase the effect against the background of the fertilizer system.

The use of organic mineral fertilizers twice during the growing season of winter wheat against the background of the fertilizer system contributed to an increase in the yield compared to the options involving seed treatment before sowing by 60.3-65.3%.

The maximum yield gain was achieved by using Soft Guard (0.2 l / ha) and Gumiful Pro (0.2 l / ha) against the background of mineral fertilizers and seed treatments with Router (0.5 l / ton).

For 2018-2019, in the control option, the grain yield was 2.47 t / ha. Over 2 years, the yield grain was obtained under the influence of Soft Guard (0.2 l / ha) and Gumiful Pro (0.2 l / ha) against the background of mineral fertilizers and seed treatment with Router (0.5 l / ton).

4. Discussion

An important aspect of the use of any preparations (including growth regulators) is compliance with the application technology. The use of growth regulators in compliance with these requirements contributes to the development of additional lateral shoots, which increases density of the productive stalk, and can lead to an increase in the yield. The most effective way of cultivating winter wheat was the use of organomineral fertilizers twice during the growing season of winter wheat.

5. Conclusion

The application of organic fertilizers for seed treatment twice during the growing season of winter wheat increased the grain yield compared by 1.59-1.60 t/ha or 64.2-64.8% compared with an option without fertilizers, and by 31.4-32.4% compared with the system of mineral fertilizers.

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Conflict of Interest

The authors have no conflict of interest to declare.

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