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Phytosanitary state of agrocenoses and productivity of spring wheat in the Ryazan region

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Abstract. Pesticide treatment of grain crops with pesticides — fungicides, herbicides, and seed dressers — plays a key role in ensuring high harvest quality. The objective of the study was to evaluate the effectiveness of integrated plant protection applications to ensure the phytosanitary stability of spring wheat crops in the Ryazan region. The experiments were conducted in 2024–2025. The spring wheat protection scheme included: seed treatment with Sterling, WSC at 1.5 L/t and Graviet, SC at 1.5 L/t; treatment in the tillering stage with a tank mixture containing the systemic fungicide Rakurs, SC — 0.2 L/ha, the insecticide Borey Neo, SC (125+100+50 g/L) — 1.0 L/ha and the herbicides NordStream, WDG — 0.07 L/ha, Stingray, EC — 0.35 L/ha; treatment at the flag leaf stage with the fungicide Lantsea, CME at 0.8 L/ha. The research showed that the development of root rot in spring wheat crops did not exceed 2–3.5%, and the prevalence of the disease was 4–14.1%. The use of the fungicide Rakurs, SC reduced brown rust development by 12.3–13.4% and decreased its prevalence by 35–45.6%. The biological efficacy of the agent reached 48.3–58%. The use of the herbicides NordStream, WDG and Stingray, EC reduced weed infestation of the crops, providing a high level of efficacy against annual and perennial dicotyledonous weeds (95–97.4%) and grass weed species (97.5–97.6%). The results confirm the feasibility of the integrated use of plant protection products to maintain phytosanitary stability and increase the yield of spring wheat.

Key words: cereals, herbicides, fungicides, seed dressers, biological efficacy, weed infestation, productivity

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Introduction

Wheat is one of the most important agricultural crops in the world, accounting for approximately 20.5% of human calorie intake [1]. Russia remains one of the world's leading wheat producers, despite a slight decline in volumes after record years. In 2023, 92.8 million tons of wheat were harvested, and in 2024, 82.6 million tons, an 11% decrease but still among the largest in the country's history. The total grain harvest in 2024 amounted to 125.9 million tons, compared to 144.9 million tons the previous year. According to Rosstat's final data published in March 2026, the gross wheat harvest in Russia in 2025 amounted to 91.1 million tons. Thus, the actual harvest exceeded the initial forecast (84.5 million tons) by approximately 6.6 million tons, or about 8%.

The 2025 harvest was uneven: southern regions suffered from drought, while the Central and Volga Federal Districts showed growth thanks to favorable weather conditions[1].

The variety of chemicals used to protect grain crops from weeds, pests, and diseases necessitates their rational and scientifically sound selection, considering the specific phytosanitary conditions.

Weeds are one of the main challenges faced by farmers when growing grain, and their spread leads to decrease in productive potential of agricultural crops and increased costs.

At the same time, plant disease protection is a significant factor in increasing the yield of grain crops, particularly spring wheat [2–5]. Effective crop protection, including comprehensive measures to monitor phytosanitary conditions and the rational use of chemicals, is a critical condition for creating sustainable agroecosystems and realizing biological potential of plants [6–11]. Only a systematic approach to managing weeds, diseases, and pests will ensure phytosanitary stability and increase the long-term profitability of grain production [12–15].

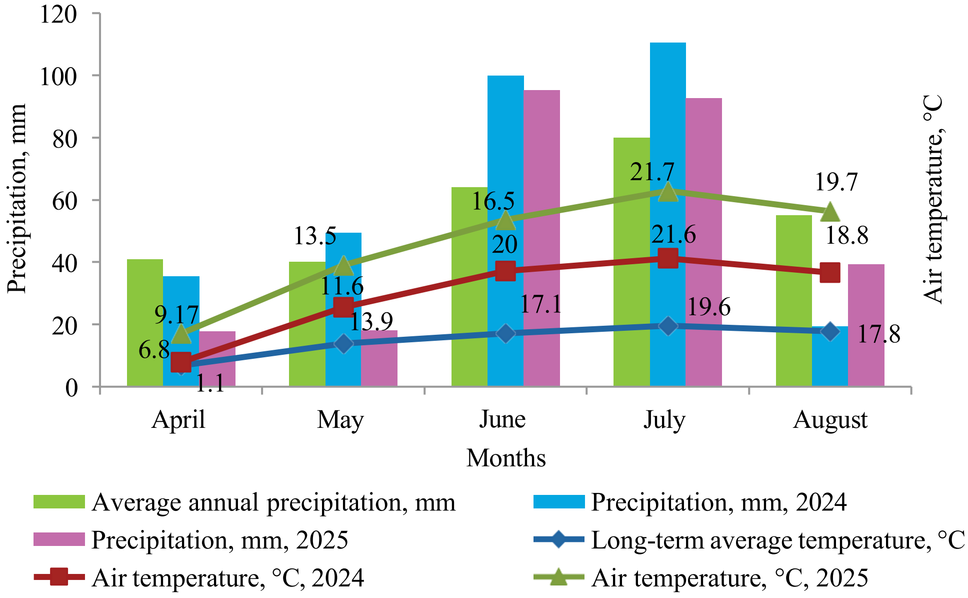
The objective of this study was to evaluate the effectiveness of the integrated use of plant protection products to ensure phytosanitary stability in spring wheat crops.

Materials and methods

The experiment was conducted on spring wheat crops in 2024 and 2025 in the Ryazan region on gray, heavy loamy forest soil with a humus content of 3.2–3.5%. Soil pH ranged from 5.1 to 5.4. Phosphorus (10.9–15.3 mg/100 g soil) and potassium (12.8–14.8 mg/100 g soil) contents were elevated.

Meteorological conditions during the study period deviated from long-term averages for temperature and humidity, both upward and downward, but were generally satisfactory for the growth and development of the cultivated crop (Fig.).

[1] StroyAgroPro. *Wheat yield in Russia in 2026: forecasts, figures and key factors.* Available from: https://stroyagropro.ru/article/prognoz-ceny-na-pshenicy-2026/?ysclid=mn1io2vg9n100751881 (Accessed 29th March 2026).



Weather conditions in 2024–2025

Source: Data from the Ryazan weather station.

Winter wheat served as the forecrop to spring wheat cv. Rima in the experiment.

The tillage system consisted of primary tillage (disking with MTZ 1221 + BDT-7 unit, followed by autumn plowing with MTZ 1221 + PLN 5–35) in the second and third decades of August, early spring harrowing with BZTS-1.0 tooth harrows, and pre-sowing cultivation with 1221 + KPE-3.8 unit, with application of mineral fertilizer Azofoska (N16: P16: K16) at a rate of 2.1 c/ha.

In accordance with the experimental design, spring wheat seeds treated with Sterling seed treatment agent, WSC (40 + 30 g/L) at a dose of 1.5 L/t and Graviet, SC (250 g/L) at a dose of 1.5 L/t were sown in the experimental plots. The consumption rate of the working solution was 8–10 L/t. During the growing season at the tillering stage, a tank mixture consisting of systemic fungicide Rakurs, SC (160 + 240 g/L) — 0.2 L/ha, the insecticide Borey Neo, SC (125 + 100 + 50 g/L) — 1.0 L/ha, and herbicides NordStream, WDG (350 + 200 + 80 g/kg) — 0.07 L/ha and Stingray, EC (45 + 11.5 g/L) — 0.35 L/ha was applied on the experimental variants of spring wheat crops (excluding the control) against disease pathogens, pests, and weeds. A second treatment of the spring wheat crops at the flag leaf stage was carried out with fungicide Lantsea, CME (125 + 100 g/L) at a dose of 0.8 L/ha. A JAR-MET-600–12 mounted sprayer was used for spraying over the growing plants. The working fluid consumption rate was 200 L/ha.

The experiments were established in accordance with the methodology of field research by B.A. Dospekhov[2]. The plot arrangement was randomized, with three repli-

[2] Dospekhov BA. *Metodika polevogo opyta: (s osnovami statisticheskoi obrabotki rezul'tatov issledovanii)* [Methodology of field experiment: (with the basics of statistical processing of research results)]. 5th ed. Moscow; 1985.

cations. The area of the experimental plots was 100 m², and the area of the recording plots was 50 m².

Disease development was monitored according to the Methodological Guidelines for Registration Trials of Fungicides in Agriculture, VIZR, 2009[3]; herbicide evaluation was conducted according to the Methodological Guidelines for Registration Trials of Herbicides in Agriculture, VIZR, 2013[4].

Results and discussion

Pre-sowing seed treatment with Sterling, WSC, and Graviet, SC, provided effective protection of spring wheat crops from root rot throughout the growing season. The use of seed treatments reduced disease development by 1.8 to 2 times compared to the control. Sterling, WSC, demonstrated the greatest effectiveness (Table 1).

Table 1

Average infection rate of spring wheat plants with root rot depending on pre-sowing treatment of seeds

Variant	Assessment date (growth stage)	Total assessed *N*	of which infected, scores						Disease incidence *P*	Sum of products of the number of diseased plant parts and their corresponding disease severity scores Σ (*a* × *b*)	Disease development
			0	1	2	3	4	Total *n*			
Sterling, WSC	Tillering	227	218	9	0	0	0	9	4.0	9	1.0
	Second node formatio	238	220	18	0	0	0	18	7.6	18	1.9
Graviet, SC	Tillering	222	210	12	0	0	0	12	5.4	12	1.4
	Second node formatio	218	194	24	0	0	0	24	11.0	24	2.8
Control (untreated)	Tillering	228	210	18	0	0	0	18	7.9	18	2.0
	Second node formatio	220	189	31	0	0	0	31	14.1	31	3.5

Source: compiled by A.A. Sokolov, D.V. Vinogradov, I.M. Lebedev.

[3] Metodicheskie ukazaniya po registratsionnym ispytaniyam gerbitsidov v sel'skom khozyaistve [Guidelines for registration tests of herbicides in agriculture]. Saint Petersburg; 2009. (In Russ.).
[4] Dolzhenko VI. (ed.) *Metodicheskie ukazaniya po registratsionnym ispytaniyam gerbitsidov v sel'skom khozyaistve* [Guidelines for registration tests of herbicides in agriculture]. Saint Petersburg; 2013. (In Russ.).

During the initial survey, the incidence of wheat root rot ranged from 1.0 to 2.0%, while the infection rate varied between 4.0 and 7.9%. A secondary survey revealed an increase in disease incidence to a range of 1.9–3.5% with an increase in the pathogen occurrence rate to values of 7.6–14.1%.

Analysis of the results revealed no statistically significant differences in the degree of spring wheat root rot infection depending on the seed treatments used. A slight increase in the level of plant infection was noted in variants using Graviet SC, amounting to 1.4% in the first assessment and 2.8% in the second recording, respectively.

Among foliar pathogens of spring wheat under the field experiment conditions, brown rust was recorded. Primary symptoms of the infectious process on spring wheat plants appeared at the stem elongation — heading stage. According to the first assessment data, the intensity of disease varied within the range of 5.7–6.3% with a disease prevalence of 21.7–23.6% (Table 2).

Table 2

Average infection rate of spring wheat plants with brown rust depending on treatment with Rakurs fungicide, SC

Variant	Assessment date (growth stage)	Total assessed *N*	Of which infected, scores						Disease incidence *P*	Sum of products of the number of diseased plant parts and their corresponding disease	Disease development
			0	1	2	3	4	Total *n*			
Sterling, WSC	Before treatment	360	282	74	4	0	0	78	21.7	82	5.7
	10 days after treatment	360	269	85	6	0	0	91	25.3	97	6.7
	20 days after treatment	360	247	102	8	3	0	113	31.4	127	8.8
	30 days after treatment	360	228	114	12	6	0	132	36.7	156	10.8
Graviet, SC	Before treatment	360	275	80	5	0	0	85	23.6	90	6.3
	10 days after treatment	360	269	83	7	1	0	91	25.3	100	6.9
	20 days after treatment	360	248	98	10	4	0	112	31.1	130	9.0
	30 days after treatment	360	237	110	10	3	0	123	34.2	139	9.7
Control (untreated)	Before treatment	360	275	79	6	0	0	85	23.6	91	6.3
	10 days after treatment	360	255	83	15	7	0	105	29.2	134	9.3
	20 days after treatment	360	204	120	24	12	0	156	43.3	204	14.2
	30 days after treatment	360	111	186	42	21	0	249	69.2	333	23.1

Source: compiled by A.A. Sokolov, D.V. Vinogradov, I.M.

The use of fungicide Rakurs, SC on spring wheat significantly reduced disease development and prevented further spread of the infection to the upper leaves of plants. Compared to the control, disease intensity decreased by 12.3–13.4%, and prevalence decreased by 35.0–45.6%. At the early stages of the study, the lowest plant infection was observed in the plot where seeds were treated with the seed dresser Sterling, WSC. Subsequently, as observations progressed, the best disease reduction results were recorded with pre-sowing seed treatment with Graviet, SC.

A biological efficacy assessment of fungicide Rakurs, SC on wheat crops revealed that 10 days after treatment, brown rust development was reduced by 20.4% with the seed dresser Sterling, WSC, and by 25.8% with Graviet, SC. On the thirtieth day, the efficiency of the Rakurs fungicide application increased to 48.3% (Sterling, WSC) and 58.0% (Graviet, SC) (Table 3).

Table 3

Biological efficacy of fungicide Rakurs, SC in protecting spring wheat from brown rust

Variant	Average disease development per plant, %				Reduction in disease development adjusted for control after treatment by assessment days, %		
	Before treatment	After treatment by assessment days					
		10	20	30	10	20	30
Sterling, WSC	5.7	6.7	8.8	10.8	20.4	31.5	48.3
Graviet, SC	6.3	6.9	9.0	9.7	25.8	36.6	58.0
Control (untreated)	6.3	9.3	14.2	23.1	–	–	–

Source: compiled by A.A. Sokolov, D.V. Vinogradov, I.M.

During subsequent observations of brown rust development on wheat crops, a further increase in the severity of plant damage was noted in the control plot. By the end of the experiment, the disease development index reached 30.5%, with a prevalence of 75.3% (Table 4). Application of fungicide Lantsea, CME, significantly slowed further spread of the disease. This helped maintain healthy flag leaves and extend functioning period of foliage.

The application of the fungicide Lantsea, CME during the spring wheat growing season provided biological efficacy of 54.5 and 53.4% for the pre-sowing treatment variants Sterling, WSC and Graviet, SC, respectively (Table 5).

The phytosanitary condition of the crops was characterized by a moderate level of weed infestation. The weed species composition included both annual and perennial species (Table 6).

During the spring wheat growing season, the number of weed plants varied depending on the species. For annual dicotyledonous weeds, this indicator ranged from 19.3

to 86.4 plants/m²; for perennial dicotyledonous weeds, from 2.1 to 4.5 plants/m²; and for grass species, it was in the range of 12.6–82.9 plants/m². The use of the herbicides NordStream, WDG and Stingray significantly reduced weed infestation of the crops and confirmed their high biological efficacy (Table 7).

Table 4

Average infection rate of spring wheat plants with brown rust depending on treatment with the fungicide Lantsea, CME

Variant	Assessment date (growth stage)	Total asses-sed *N*	Of which infected, scores						Disease incidence *P*	Sum of products of the number of diseased plant parts and their corresponding disease severity scores Σ (*a* × *b*)	Disease develop-ment
			0	1	2	3	4	Total *n*			
Sterling, WSC	Before treatment	360	247	102	8	3	0	113	31.4	127	8.8
	10 days after treatment	360	228	114	12	6	0	132	36.7	156	10.8
	20 days after treatment	360	234	113	9	4	0	126	35.0	143	9.9
	30 days after treatment	360	244	110	4	2	0	116	32.2	124	8.6
Graviet, SC	Before treatment	360	248	98	10	4	0	112	31.1	130	9.0
	10 days after treatment	360	237	110	10	3	0	123	34.2	139	9.7
	20 days after treatment	360	235	115	6	4	0	125	34.7	139	9.7
	30 days after treatment	360	240	113	4	3	0	120	33.3	130	9.0
Control (untre-ated)	Before treatment	360	204	120	24	12	0	156	43.3	204	14.2
	10 days after treatment	360	111	186	42	21	0	249	69.2	333	23.1
	20 days after treatment	360	42	218	61	39	0	318	88.3	457	31.7
	30 days after treatment	360	89	145	84	42	0	271	75.3	439	30.5

Source: compiled by A.A. Sokolov, D.V. Vinogradov, I.M.

Table 5

Biological efficacy of fungicide Lantsea, CME in protecting spring wheat from brown rust

Variant	Average disease development per plant, %				Reduction in disease development adjusted for control after treatment by assessment days, %		
	Before treatment	After treatment by assessment days					
		10	20	30	10	20	30
Sterling, WSC	8.8	10.8	9.9	8.6	24.6	49.6	54.5
Graviet, SC	9.0	9.7	9.7	9.0	33.8	51.7	53.4
Control (untreated)	14.2	23.1	31.7	30.5	–	–	–

Source: compiled by A.A. Sokolov, D.V. Vinogradov, I.M.

Table 6

Effect of herbicide NordStream, WDG on total weed infestation of spring wheat crops by annual and perennial dicotyledonous weeds

Variant	Assessment dates	Number of weeds		Weed mass	
		plants/m²	Reduction, % control	g/m²	Reduction, % to control
Sterling, WSC	Before treatment	18.6 1.9	–	–	–
	10 days after treatment	10.9 1.4	71.9 51.6	68 23	44.7 56.6
	20 days after treatment	4.8 1.2	90.9 58.6	61 32	77.2 75.0
	30 days after treatment	3.6 0.6	94.6 81.6	36 40	88.7 79.5
	40 days after treatment	2.5 0.2	97.0 95.1	32 42	91.9 87.1
Graviet, SC	Before treatment	17.9 2.1	–	–	–
	10 days after treatment	10.8 1.2	71.0 62.5	70 25	43.1 52.8
	20 days after treatment	5.0 1.1	90.1 65.6	60 33	77.5 74.2
	30 days after treatment	2.9 0.8	95.5 77.8	38 40	88.1 79.5
	40 days after treatment	2.1 0.2	97.4 95.6	34 43	91.4 86.8
Control (untreated)	Before treatment	19.3 2.1	–	–	–
	10 days after treatment	40.2 3.2	–	123 53	–
	20 days after treatment	54.7 3.2	–	267 128	–
	30 days after treatment	69.2 3.6	–	318 195	–
	40 days after treatment	86.4 4.5	–	395 326	–

Note: Numerator — annual weeds; Denominator — perennial weeds.

Source: compiled by A.A. Sokolov, D.V. Vinogradov, I.M.

Table 7

Effect of herbicide Stingray, EC on total infestation of spring wheat crops by annual grass weeds

Variant	Assessment dates	Number of weeds		Weed mass	
		plants/m²	Reduction, % to control	g/m²	Reduction, % to control
Sterling, WSC	Before treatment	12.6	–	–	–
	10 days after treatment	9.8	75.1	56	55.6
	20 days after treatment	7.5	87.6	61	77.0
	30 days after treatment	2.7	96.3	55	80.1
	40 days after treatment	2.0	97.6	34	89.5
Graviet, SC	Before treatment	12.8	–	–	–
	10 days after treatment	10.1	74.7	58	54.0
	20 days after treatment	6.8	88.9	59	77.7
	30 days after treatment	2.9	96.1	52	81.2
	40 days after treatment	2.1	97.5	32	90.1
Control (untreated)	Before treatment	12.4	–	–	–
	10 days after treatment	38.7	–	126	–
	20 days after treatment	59.6	–	265	–
	30 days after treatment	72.3	–	276	–
	40 days after treatment	82.9	–	324	–

Source: compiled by A.A. Sokolov, D.V. Vinogradov, I.M.

The use of herbicides ensured high biological efficiency: infestation by annual dicotyledonous weeds decreased by 97.0–97.4%, by perennial weeds — by 95.1–95.6%, and by grass weeds — up to 97.6%.

The studied spring wheat protection system against harmful organisms (disease pathogens, pests, weeds) using the pesticides Sterling, WSC (30 g/L difenoconazole + 40 g/L prothioconazole); Graviet, SC (paclobutrazol, 250 g/L); Lantsea, CME (125 g/L prothioconazole + 100 g/L picoxystrobin); Rakurs, SC (160+240 g/L); Stingray, EC (45 g/L pinoxaden + 11.5 g/L cloquintocet-mexyl) is an effective agricultural practice that provides a significant increase in spring wheat yield compared to the control (Table 8).

Table 8

Spring wheat yield in experiment, c/ha

Variant	Yield, c/ha	Yield increase	
		c/ha	% to control
Sterling, WSC	42.6	+7.5	+21.4
Graviet, SC	41.5	+6.4	+18.2
Control (untreated)	35.1	–	–
LSD $_{05}$, c/ha — 3.10			

Source: compiled by A.A. Sokolov, D.V. Vinogradov, I.M.

The maximum yield in the experiment — 42.6 c/ha — was obtained in the variant with the application of Sterling, WSC against the background of the studied plant protection system.

Conclusion

The use of a comprehensive range of modern plant protection products significantly improved the phytosanitary condition and yield of spring wheat. Yield increased by 6.4–7.5 c/ha (18.2–21.4% of the control) due to pre-sowing treatment with Sterling, WSC, and Graviet, SC. Subsequent treatments with the fungicides Lantsea, CME (53–55%) and Rakurs, SC (48–58%) effectively inhibited the development of brown rust, while herbicides NordStream, VDG, and Stingray, EC destroyed up to 97.6% of weeds.

References

1. Singh J, Chhabra B, Raza A, Yang SH, Sandhu KS. Important wheat diseases in the US and their management in the 21st century. *Frontiers in Plant Science*. 2023;13:1010191. doi: 10.3389/fpls.2022.1010191

2. Doronin VG, Ledovsky EN. Systems for protecting spring wheat from weeds and diseases in the south of Western Siberia. *Bulletin of Altai State Agricultural University*. 2011;(4):9–13. (In Russ.). EDN: NDXMHB

3. Lebedev IM, Zubkova TV, Vinogradov DV. Efficiency of organomineral fertilizer application in spring wheat growing technology. *Bulletin of KSAU*. 2025;(3):23–33. (In Russ.). doi: 10.36718/1819-4036-2025-3-23-33 EDN: JMJXBD

4. Vinogradov DV, Sokolov AA, Lebedev IM, Krylov VA, Zubkova TV. Effect of liquid copper-containing micro-fertilizers on the productivity of spring wheat. *Zemledelie*. 2025;(4):13–16. (In Russ.). doi: 10.24412/0044-3913-2025-4-13-16 EDN: WKKVYD

5. Vinogradov DV, Sokolov AA, Lebedev IM, Krylov VA, Zubkova TV. Efficiency of liquid compound micro-fertilizers in the spring wheat crops in the South of Non-Chernozem region. *Plant Protection and Quarantine*. 2025;(10):17–18. (In Russ.). doi: 10.47528/1026-8634_2025_10_17 EDN: IDQSGK

6. Krasnozhon SM. The effectiveness of measures for controlling the phytosanitary condition of spring wheat. *APK Rossii*. 2019;26(2):157–162. (In Russ.). EDN: PMGGQG

7. Gulidova VA. *Optimization of the phytosanitary state of winter wheat crops*.Yelets; 2020. (In Russ.). EDN: PBCKXW

8. Gulidova VA. Foliar top dressing of winter wheat plants with Macrohans microfertilizer in the conditions of the forest-steppe of the Central Chernozem region. *Agropromyshlennye tekhnologii tsentral'noi Rossii*. 2020;(4):38–46. (In Russ.). doi: 10.24888/2541-7835-2020-18-38-46 EDN: LZZCBW

9. Shkurkina AS. The formation of a winter rye crop with the use of non-root fertilizing fertilizers in the Central Non-Black Earth region. *Agropromyshlennye tekhnologii tsentral'noi Rossii*. 2024;(4):99–107. (In Russ.). doi: 10.24888/2541-7835-2024-34-4-99-107 EDN: QRCVCW

10. Chernopyatov SS. The role of technological elements in increasing the yield of winter triticale in the conditions of the Central Non-Black Earth Region. *Daghestan GAU Proceedings*. 2024;(3):70–74. (In Russ.). doi: 10.52671/26867591_2024_3_70 EDN: XEEGKJ

11. Dedova EM. Influence of the combined use of forecrops, herbicides and tillage on the yield of winter wheat. *Daghestan GAU Proceedings*. 2024:(3):11–16. (In Russ.). doi: 10.52671/26867591_ 2024_3_11 EDN: LYEWMH

12. Dedova EM, Fedoskin VV, Bakulina GN. Organizational and economic substantiation of measures to improve the efficiency of grain production. *Youth and the XXI century — 2022: conference proceedings*. Kursk; 2022. p.110–115. (In Russ.). EDN: IAWXPC

13. Fedoskin VV, Bakulina GN, Polyakov MV, Martynushkin AB, Dedova EM. Factor analysis of profit and profitability of grain production. *Innovations in agriculture and ecology: conference proceedings.* Ryazan; 2023. p.417–421. (In Russ.). EDN: LGSSHD

14. Fedotova MY, Kryuchkov MM, Byshov NV, Kostin YV, Ushakov RN. Influence of co-use of mineral, organo-mineral microbiological fertilizers and growth regulator on oats yield. *Bioscience Biotechnology Research Communications*. 2019;12(S5):299–307. EDN: WJHDUP

15. Stenichkina MY, Baranovsky AV. Use of biopreparations in oat agrocenosis. *Ecological state of the natural environment and scientific and practical aspects of modern agricultural technologies: conference proceedings.* Ryazan; 2020. p.460–465. (In Russ.).

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Фитосанитарное состояние агроценозов и урожайность яровой пшеницы в условиях Рязанской области

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Аннотация. Обработка зерновых культур пестицидами — фунгицидами, гербицидами и протравителями — играет ключевую роль в обеспечении высокого качества урожая. Цель исследования заключалась в оценке эффективности комплексного применения средств защиты растений для обеспечения фитосанитарной стабильности посевов яровой пшеницы в условиях Рязанской области. Представлены результаты, полученные в 2024–2025 гг. Схема защиты яровой пшеницы включала: протравление семян препаратами Стерлинг, ВСК в дозе 1,5 л/т и Гравиэт, СК в дозе 1,5 л/т; обработка в фазу кущения баковой смесью с системным фунгицидом Ракурс, СК — 0,2 л/га, инсектицидом Борей Нео, СК (125+100+50 г/л) — 1,0 л/га и гербицидами НордСтрим, ВДГ — 0,07 л/га, Стингрей, КЭ — 0,35 л/га; обработка в фазу флагового листа культуры фунгицидом Ланцея, КМЭ в дозе 0,8 л/га. Установлено, что развитие корневых гнилей на посевах яровой пшеницы не превышало 2…3,5 %, а распространенность болезни составляла 4…14,1 %. Применение фунгицида Ракурс, СК обеспечило снижение развития бурой ржавчины на 12,3…13,4 % и уменьшение распространенности на 35…45,6 %. Биологическая эффективность препарата достигала 48,3…58 %. Использование гербицидов НордСтрим, ВДГ и Стингрей, КЭ позволило снизить засоренность посевов, обеспечив высокий уровень эффективности против однолетних и многолетних двудольных сорняков (95…97,4 %) и злаковых видов (97,5…97,6 %). Результаты подтверждают целесообразность комплексного применения средств защиты растений для поддержания фитосанитарной стабильности и повышения урожайности яровой пшеницы.

Ключевые слова: зерновые, гербициды, фунгициды, протравители, биологическая эффективность, засоренность, продуктивность

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