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4.1.1. Общее земледелие и растениеводство (биологические науки, сельскохозяйственные науки)

ПРОДУКТИВНОСТЬ ОЗИМОЙ ПШЕНИЦЫ, ВОЗДЕЛЫВАЕМОЙ ПО ПРЕДШЕСТВЕННИКУ КУКУРУЗА, В СТАЦИОНАРНОМ ОПЫТЕ НА ЧЕРНОЗЕМЕ ВЫЩЕЛОЧЕННОМ

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В работе представлены данные по изучению продуктивности озимой пшеницы сорта Безостая 100, возделываемой по предшественнику кукуруза, в стационарном опыте на черноземе выщелоченном. Место проведения исследований – опытное поле УОХ «Кубань» КубГАУ. Первое отделение Учхоз Кубань КубГАУ находится на второй террасе правого берега реки Кубани, в 5 км от города Краснодара. Объект исследований – влияние минимизации основной обработки почвы на продукционные показатели озимой пшеницы сорта Безостая 100. Максимальные количество продуктивных стеблей, масса зерна с колоса и биологическая урожайность озимой пшеницы были сформированы при проведении мелкой обработки почвы (дисковое лущение) на 10-12 см на фоне рекомендованной нормы минерального удобрения ($N_{60}P_{60}K_{60}+N_{30}$) – 563 шт./м^2, 1,64 и 923 г/м^2, соответственно. Такие показатели, как длина колоса, количество колосков в колосе, количество зерен в колосе и масса 1000 зерен являются относительно стабильными сортовыми признаками. Высокую урожайность озимой пшеницы можно получить при проведении мелкой обработки почвы (дисковое лущение) на 10-12 см – 7,40–8,89 т/га. Внесение рекомендованной нормы минерального удобрения ($N_{60}P_{60}K_{60}+N_{30}$) обеспечивает рост урожайности озимой пшеницы на 20,1 % При интенсивной ($N_{120}P_{120}K_{120}+N_{60}$) норме удобрения урожайность не растет, разница в урожайности в 0,21 т/га меньше $НСР_{05}$ (0,37 т/га) и потому не существенна. Изучаемые приемы основной обработки почвы оказывали влияние на качество урожая озимой пшеницы Внесение

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4.1.1. General agriculture and crop production (biological sciences, agricultural sciences)

PRODUCTIVITY OF WINTER WHEAT CULTIVATED AFTER CORN IN A STATIONARY EXPERIMENT ON LEACHED CHERNOZEM

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The article presents data on the study of productivity of winter wheat varieties called Bezostaya 100, cultivated after corn as a predecessor, in a stationary experiment on leached chernozem. The research location is the experimental field of the UOH "Kuban" of KubSAU. The first branch of the UOH Kuban KubSAU is located on the second terrace of the right bank of the Kuban River, 5 km from the city of Krasnodar. The object of the research is the effect of minimizing primary soil cultivation on the production indicators of winter wheat of the Bezostaya 100 variety. The maximum number of productive stems, grain weight per ear and biological yield of winter wheat were formed by shallow soil cultivation (disc stubble cultivation) at 10-12 cm against the background of the recommended rate of mineral fertilizer (N60P60K60+N30) – 563 pcs/m2, 1.64 and 923 g/m2, respectively. Such indicators as ear length, number of spikelets per ear, number of grains per ear and weight of 1000 grains are relatively stable varietal characteristics. High yield of winter wheat can be obtained by shallow soil cultivation (disc stubble cultivation) at 10-12 cm – 7.40–8.89 t/ha. The application of the recommended rate of mineral fertilizer (N60P60K60+N30) ensures an increase in the winter wheat yield by 20.1%. With the intensive (N120P120K120+N60) fertilizer rate, the yield does not increase; the yield difference of 0.21 t/ha is less than the HSR05 (0.37 t/ha) and therefore is not significant. The studied primary soil cultivation techniques influenced the quality of the winter wheat yield. The application of mineral fertilizers contributed to the improvement of such indicators as grain unit (by 11–12 g/l), protein content (by 0.37–63%) and gluten

минеральных удобрений способствовало улучшению таких показателей, как натура зерна (на 11–12 г/л), содержание протеина (на 0,37–63 %) и клейковины (на 0,90–2,84 %), а также стекловидности зерна (на 1,77–2,47 %)

(by 0.90–2.84%), as well as grain vitreousness (by 1.77–2.47%)

Ключевые слова: ПШЕНИЦА ОЗИМАЯ, БЕЗОСТАЯ 100, СТРУКТУРА, УРОЖАЙНОСТЬ, КАЧЕСТВО

Keywords: WINTER WHEAT, USTLELESS 100, STRUCTURE, YIELD, QUALITY

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Introduction

Winter wheat in Kuban is grown using intensive technology. Intensive technology includes high-quality primary tillage, providing plants with balanced nutrition taking into account the content of basic elements in the soil, sowing should be carried out at the optimal time, and correct fertilization during the growing season of winter wheat. At the same time, it is necessary to take into account the prevailing conditions in each specific field. In 2022, 15 million 100 thousand tons of grain were harvested in the Krasnodar Territory. There are 20 thousand tons more cereals and legumes, and 100 thousand tons more wheat compared to 2021. The average grain yield in 2022 is 65 c/ha higher than last year's 61.8 c/ha. The winter wheat yield in 2022 is 67.4 c/ha, which is 3.7 c/ha higher than the wheat yield in 2021 (63.7 c/ha). Under 2022 conditions, winter crops occupied an area of 1.9 million hectares. The new harvest mainly consists of food grain: almost 90% of the 3rd and 4th class. The record gross wheat harvest is 10.7 million tons [1-5].

Gross grain harvests are negatively affected by large variability in yield. The issues of obtaining high yields of quality winter wheat grain arise annually. Due to the wide use of mineral fertilizers, new problems constantly arise. Biochemical processes that occur in crop plants during the growing season depend on the cultivated variety, the climatic conditions that develop in a given year and the geographical location and amount of precipitation, as well as the availability of mineral nutrition. Scientific publications reflect the role played by mineral nutrition elements at different stages of organogenesis and their

influence on the formation of the grain yield and its quality. Nitrogen plays a primary role in the mineral nutrition of wheat. This element is usually at a minimum in the conditions of the Krasnodar Territory. And in winter wheat plants its content reaches 0.5 - 0.6% of the total dry matter. This element is present in all amino acids and proteins, chlorophyll, biologically active compounds, many important enzymes, and promotes the synthesis of organic matter [10].

In all cases, the application of fertilizers during the cultivation of winter wheat increases the grain yield and gluten content. This ultimately has a positive effect on the income from a unit of sown area. The use of mineral fertilizers on wheat affects the growth and development of crop plants, its yield and the quality of grain varieties, regardless of the maturity group. But mineral fertilizers do not affect the timing of emergence, but an increased background of mineral nutrition extends the duration of crop vegetation from 2 to 5 days, depending on the early maturity of the variety. The use of mineral fertilizers contributes to an increase in not only the height of winter wheat plants by 2–4 cm, but also their mass per unit area. [6–9, 11].

All this requires further study and improvement of individual techniques, which form the technologies. Improvement of soil cultivation techniques, fertilization of grain crops, where the reserves for obtaining high yields are mainly hidden, are becoming relevant. Therefore, the purpose of our research was to study the production indicators of winter wheat of the Bezostaya 100 variety, cultivated after the predecessor corn, in a stationary experiment on leached chernozem.

Material and object of research

The experimental field where we conducted research in 2024 is located at the Kuban UOH of KubGAU. The first branch of the Kuban UOH of KubGAU is located on the second terrace of the right bank of the Kuban River, 5 km from the city of Krasnodar. The first branch of the Kuban UOH of KubGAU is a

multifunctional complex consisting of production facilities for the production of crop and livestock products, and is also an advanced farm for the transfer of experience in innovative techniques and technologies. The experimental field is located here. Leached chernozem is most widespread on the territory of the farm.

The experiment studied the production indicators of winter wheat of the Bezostaya 100 variety, cultivated after corn as a predecessor, in a stationary experiment on leached chernozem.

Research results

Elements of the crop structure of field crops allow us to determine the yield size at the early stages of plant development. These elements include: the number of productive stems, the length of the ear, the number of grains in the ear, the weight of grain from 1 ear, the weight of 1000 grains. Thanks to this, we can calculate the biological yield.

The necessary elements of the structure, depending on the soil cultivation and the rate of applied fertilizers are recorded in Table 1. Studying the table on the structure of the crop for soil cultivation with disk stubble cultivation, the number of productive stems in the control was 538 pcs/m2, but when applying the recommended fertilizer rate, this number increased to 563 pcs/m2 and did not change with the intensive fertilizer rate.

Table 1 – Structure of the grain yield of winter wheat variety “Bezostaya 100”

Option		Number of productive stems, pcs/m2	Ear length, cm	Number of spikelets in an ear, pcs.		M1000	Number of grains in an ear, pcs.	Grain weight from 1 ear, g	Biological yield, g/m2
soil cultivation	fertilizer rate			total	incl. productive				
Disc peeling	B0 (k)	538	10	17	14	35.5	40.0	1.42	764
	B1	563	10	17	14	40.5	40.5	1.64	923
	B2	536	10	17	14	36.4	40.4	1.47	790
Plowing	B0	382	10	17	14	44.5	41.8	1.86	712
	B1	388	10	17	14	51.3	42.4	2.18	846
	B2	398	10	17	14	46.7	42.0	1.96	781

B0 – used
B1 – N60P60K60+N30
B2 – N120P120K120+N60

The studied winter wheat cultivation techniques had no effect on such indicators as ear length, number of ears and grains in an ear.

Among the indicators of the crop structure, it is necessary to pay attention to the grain weight per ear, where 1.42 g was in the variant without fertilizers, 1.64 g with the introduction of the recommended fertilizer rate (N60P60K60+N30)and 1.47 g with the introduction of an intensive fertilizer rate (N120P120K120+N60). Deducing the biological yield from the studied data, it is clear that the control was the lowest with a figure of 764 g/cm2, then there is an increase to 923 g/cm2 and to 790 g/cm2 for the variants with one and the other fertilizer.

When using plowing, the initial indicators for productive stems were lower than with disc stubble cultivation and were 382 pcs/m2. The applied fertilizers did not affect this factor, since they were 388 pcs/m2 for the second option and 398 pcs/m2 for the third option.

The studied winter wheat cultivation techniques had no effect on such indicators as ear length, number of ears and grains in an ear.

The grain weight per ear increased by 0.44 g in the variant without fertilizers, by 0.76 g in the variants with the recommended rate of mineral fertilizer, and by 0.54 g for the intensive rate of mineral fertilizer.

And moving on to biological yield, it is worth noting that without fertilizers the yield was lower by 52 g/cm2 and became 712 g/cm2. In further variants there was a growth trend and biological yield was higher by 82 g/cm2, becoming 846 g/cm2, and higher by 17 g/cm2, i.e. 781 g/m2.

From the listed and noted data, it can be concluded that both soil cultivation and fertilizers change the indicators of the winter wheat yield structure. The maximum number of productive stems, grain weight per ear and biological yield of winter wheat were formed during shallow soil cultivation against the background of the recommended rate of mineral fertilizer (N60P60K60+N30) - 563 pcs./m2, 1.64 and 923 g/m2, respectively. Such

indicators as ear length, number of spikelets in an ear, number of grains in an ear and weight of 1000 grains are relatively stable varietal characteristics.

Yield is the gross harvest of agricultural crops per unit area. This is the indicator that the economy and its further implementation strive for. However, this indicator is influenced by many factors, biotic or abiotic, as well as anthropogenic under the influence of human activity.

The yield data are in Table 2.

Table 2 – Grain yield of winter wheat depending on primary soil cultivation and mineral fertilizer rate, t/ha

Option		Productivity	Deviation from control		By factor	
soil cultivation	fertilizers		t/ha	%	A	IN
Disc peeling at 10-12 cm	b/fertilizer (k)	7.40	-	-	7.97	7.12
	N60P60K60+N30	8.89	+1.49	+20.1		8.42
	N120P120K120+N60	7.61	+0.21	+2.8		7.56
Plowing to 20-22 cm	b/fertilizers	6.84	-0.56	-7.6	7.43	-
	N60P60K60+N30	7.95	0.55	+7.4		-
	N120P120K120+N60	7.51	0.11	+1.5		-
HSR05 for options		0.37	-		-	-
Factor A		-	-		0.28	-
Factor B		-	-		-	0.31

When studying the yield table of winter wheat on the control variant with disk stubble cultivation, the yield was 7.40 t/ha. The recommended fertilizer rate

had a positive effect on the yield, since there is an increase of 1.49 t/ha (or 20.1%) and it becomes 8.89 t/ha in relation to the control.

But with the largest amount of fertilizer, the yield will not increase; the difference in yield of 0.21 t/ha is less than the HSR05 (0.37 t/ha) and therefore is not significant.

With the use of plowing at 20-22 cm, the variant without fertilizers did not reveal any increase in yield; even a decrease in yield by 0.56 t/ha (or 7.6%) was noted.

Compared to the control, plowing with the recommended fertilizer rate significantly increased the yield by 0.55 t/ha (or 7.4%) and reached 7.95 t/ha. Just like in the previous variant, the intensive rate showed a similar result - the difference in yield of 0.11 t/ha is less than the HSR05 (0.37 t/ha) and therefore is not significant.

The smallest significant difference for the variants was 0.37 t/ha, while the NSR05 for factor A was within 0.28, and for factor B – 0.31 t/ha.

Drawing a conclusion for this agricultural year, the highest yield was recorded with the application of the recommended rate of mineral fertilizer against the background of disc stubble cultivation to a depth of 10-12 cm and amounted to 8.89 t/ha.

In the technology of cultivation of winter wheat of the Bezostaya 100 variety, the main soil cultivation has the largest specific weight – 68.2%. In second place are mineral fertilizers, the share of which is 29.7%.

Based on the analysis, it can be concluded that high yields of winter wheat can be obtained by shallow primary tillage at 10-12 cm – 7.40–8.89 t/ha. Application of only the recommended rate of mineral fertilizer (N60P60K60+N30) ensures an increase in winter wheat yields by 20.1%.

Grain quality is a series of features and various properties such as biological, physiological, physical and chemical. And depending on the purpose, they can be used for seed, food or feed purposes.

The set of data on various indicators of winter wheat grain quality is shown in Table 3.

Table 3 – Grain quality of winter wheat variety “Bezostaya 100”

Option		Grain nature, g/l	Protein, %	Gluten		Glassy appearance, %
soil cultivation	fertilizer rate			%	IDK	
Disc peeling	without fertilizers (k)	807	11:30	17.33	70.77	48.53
	N60P60K60+N30	815	11.50	17.97	72,00	50.47
	N120P120K120+N60	819	11.67	18.23	72.50	51,00
Plowing	without fertilizers	822	12.20	19.33	69.83	49.33
	N60P60K60+N30	829	12.67	20,20	72.37	50.03
	N120P120K120+N60	833	12.83	20.60	72.67	51.10

To determine the grain quality, it is necessary to refer to Table 10, where it is evident that with disc peeling, the grain nature was 807 g/l under control, with the addition of fertilizers and an increase in their rate, the data increased to 815 g/l and to 819 g/l. As for the percentage content of protein, its amount did not exceed 12% and in each variant, it was as follows: 11.30% without fertilizers, 11.50% with the recommended rate and 11.67% with an intensive (double) rate. Fertilizers had a positive effect on gluten, since without them, the IPC was 70.77, and the percentage was 17.33, but with the introduction of fertilizers already with them, the IPC increased to 72.00 and 72.50 and to 17.97 and 18.23% with the recommended and intensive rates, respectively.

When analyzing the vitreousness, it is noticeable that fertilizers contributed to an increase from 48.53% in the variant without fertilizers to

50.47% in the variant with the recommended fertilizer rate and to 51.00% at the double fertilizer rate.

Plowing had a positive effect on the grain quality and in particular on the grain unit indicator, because on a non-fertilized background its data were 822 g / l, and with fertilizers there is an increase of 7 g / l and 11 g / l for both options with fertilizers. Protein was within 12.20% on the control option, 12.67% on the option with the recommended rate, and at the intensive rate was 12.83%. When examining gluten, it was noted that the maximum figures were present in the option where there was an intensive background of fertilizers, and corresponded to 72.67%. Further, the best percentage of vitreousness was at the intensive rate - 51.10%, the recommended rate showed a figure of 50.03%, and the option without fertilizers - 49.33%.

In conclusion, it is worth noting that the studied methods of primary soil cultivation influenced the quality of the winter wheat crop. The application of mineral fertilizers contributed to the improvement of such indicators as grain unit (by 11–12 g/l), protein content (by 0.37–63%) and gluten (by 0.90–2.84%), as well as grain vitreousness (by 1.77–2.47%).

Conclusion

The maximum number of productive stems, grain weight per ear and biological yield of winter wheat were formed by shallow soil cultivation (disc stubble cultivation) at 10-12 cm against the background of the recommended rate of mineral fertilizer (N60P60K60+N30) – 563 pcs/m2, 1.64 and 923 g/m2, respectively. Such indicators as ear length, number of spikelets per ear, number of grains per ear and weight of 1000 grains are relatively stable varietal characteristics. High yield of winter wheat can be obtained by shallow soil cultivation (disc stubble cultivation) at 10-12 cm – 7.40–8.89 t/ha. The application of the recommended rate of mineral fertilizer (N60P60K60+N30) ensures an increase in the winter wheat yield by 20.1%. With the intensive

(N120P120K120+N60) fertilizer rate, the yield does not increase; the yield difference of 0.21 t/ha is less than the HSR05 (0.37 t/ha) and therefore is not significant. The studied primary soil cultivation techniques influenced the quality of the winter wheat yield. The application of mineral fertilizers contributed to the improvement of such indicators as grain unit (by 11–12 g/l), protein content (by 0.37–63%) and gluten (by 0.90–2.84%), as well as grain vitreousness (by 1.77–2.47%).

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