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SYSTEM OF PROTECTION OF WINTER WHEAT SOWING FROM SEGETAL AND RUDERAL VEGETATION

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Abstract. *The paper examines the question of comparing the effectiveness of the use of autumn and spring application of herbicides in the cultivation of winter wheat. The work confirms the research of scientists on the issue of applying herbicides in the autumn period, which affects their effectiveness, since the dependence on temperature and conditions decreases, and the moisture reserve in the soil affects the effectiveness of pesticides. During the research, it was established that in the autumn after sowing winter wheat, favorable conditions for the development of seedlings and segetal vegetation are created, the effectiveness of early spring feeding of winter wheat with nitrogen fertilizers decreases, since most of them are used by weeds, due to which they become more resistant to herbicides. Research has established that the use of herbicides in the fall helps to increase the yield of wheat by 30 % compared to the early spring application, which indicates the perspective of the application of drugs in the fall. The use of herbicides to protect winter wheat crops from weeds in different periods affected the number of productive stalks, so in the experimental variants their number increased by 22 pieces/m² compared to the control, which determined the increase in productivity and yield increase, so in the variants with the use of Prima Forte resulted in an increase in yield of 9.1 t/ha, while the option with a mixture of herbicides Logran 75 WG+Pik – 8.6 t/ha. Greater effectiveness of chemical protection is noted for the autumn application of herbicides, however, we recommend combining the protection system, since the weather conditions of the research years can contribute to the effectiveness of spring herbicide protection. We recommend taking into account the agro-climatic conditions of the year when growing crops in order to adjust the protection system against segetal and ruderal vegetation.*

Key words: *weeding, winter wheat, herbicides, productivity, segetal weeds, ruderal weeds.*

Introduction.

The phytosanitary condition of winter wheat crops affects the yield and leads to its decrease by 50%. At the early stages of wheat organogenesis, precisely in the tillering phase, plants are sensitive to the content of nutrients, humidity and lighting [2]. The task of winter wheat cultivation technology is the formation of the root system, which is affected by the phytosanitary condition of the field, namely the degree of weeding of the crops. In fields weeded after harvesting the predecessor, neglecting autumn herbicide protection promotes increased competition of wheat plants with segetal vegetation before entering winter, which negatively affects the disclosure of the genetic potential of the variety [5]. Autumn application of herbicides has a positive effect on the rational consumption of nitrogen fertilizers by crops, and excessive weeding leads to nitrogen losses, because weeds restore their vegetation faster, thereby consuming nitrogen fertilizers faster. Autumn herbicide protection



reduces the loss of macronutrients in the winter wheat fertilization system, and the cost of fertilizers exceeds the cost of using herbicides [3].

Autumn weeding affects the reduction of the coefficient of productive tillering, the accumulation of sugars in the tillering node decreases, a shorter spike with fewer spikes is laid, a weak root system is formed, which significantly increases the risk of freezing. In the fall, winter wheat crops are mostly covered by Papaver rhoeas, Viola arvensis, Galium aparine, Thlaspi arvense, Descurainia Sophia L, Cirsium arvense, Elymus repens and other types of segetal vegetation. In the autumn period, perennial, winter and hibernating weeds form a rosette of leaves, a well-developed root system, which enables them to successfully overwinter [1].

During the early spring recovery of vegetation, winter wheat plants on weedy areas in the period from the end of tillering to the beginning of emergence into the tube will have a negative effect on the establishment of reproductive organs, which will subsequently reduce the yield. Therefore, herbicide protection in autumn will help prevent grain losses [6]. Therefore, autumn treatment of winter wheat crops with herbicides is not inferior in effectiveness to spring treatment. Studies on the comparative evaluation of the effectiveness of autumn and spring application of herbicides confirm the higher expediency of their application in the autumn period [2].

Scientists have noted that the application of herbicides in the autumn period affects their effectiveness, as the dependence on temperature and conditions decreases, and the amount of moisture in the soil affects the effectiveness of the drugs. While in the spring period, unfavorable weather conditions affect the timeliness of applying herbicides in the necessary phase of the development of weeds and the culture itself. Deviation from the introduction phase causes a decrease in the effectiveness of the drugs [7].

Main text. Weather conditions in 2022 were characterized by a significant amount of precipitation, which provided productive moisture to the main agricultural crops, including winter wheat. However, increased soil moisture caused the growth of segetal vegetation in crops. Research on the effectiveness of herbicide protection of winter wheat crops in autumn and spring led to the search for drugs for protection and determination of their effectiveness.

Among the factors that ensure high yields of winter wheat grain, measures aimed at creating an optimal phytosanitary condition in the agro cenosis are important, since the level of potential and actual crop losses due to damage from weeds determine the protection system as an element of agricultural production optimization [6].

In the fall, after sowing winter wheat, favorable conditions are created for the development of seedlings and segetal vegetation. Compared to the seedlings of winter wheat, weeds actively grow and develop during the autumn period and enter the winter season having accumulated powerful biomass. In addition, the effectiveness of early spring fertilizing with winter nitrogen fertilizers decreases, since most of them are used by weeds, due to which they become more resistant to herbicides [3, 7].

A critical period for weed control in fall is the seedling phase, when weeds compete with wheat for nutrients.



Conducted field research shows that in a warm and humid autumn, favorable conditions for the germination of weeds are created, accordingly, there is a need for treatment with herbicides.

Evaluation of the effectiveness of autumn and spring application of herbicides unequivocally confirms the feasibility of applying herbicides in autumn [5].

The optimal conditions for the use of herbicides are: high-quality soil cultivation, the optimal amount of productive moisture, and on soils with a heavy granulometric composition, drugs are used with the maximum consumption rate, and weeds are sprayed in sunny weather.

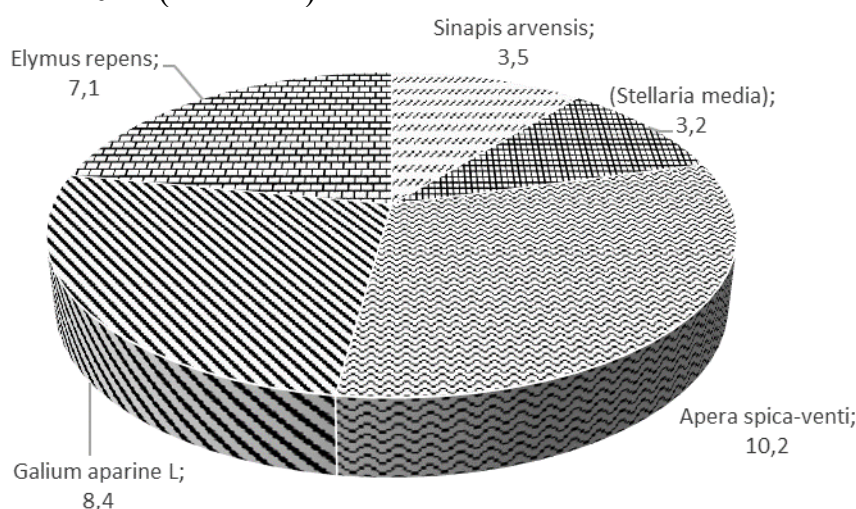
As indicated in the studies, the use of herbicides in the fall helps to increase the yield of wheat by 30% compared to the early spring application, which indicates the perspective of the application of drugs in the fall.

Thus, overwintering and spring annual dicotyledonous weeds have an impact on winter wheat as competitors for water, nutrients, light, and affect crop productivity.

Studies on the effect of herbicides on the phytosanitary condition of crops and the yield of winter wheat were conducted on – typical low-humus chernozem; humus content – 3.09%; nitrate nitrogen – 13.2 mg/kg, mobile compounds of phosphorus and potassium, respectively, 145 and 115 mg/kg. Agrotechnical measures in the experiments meet the existing requirements for the zone for the further cultivation of winter wheat in 2022-2023. Fertilizer system N 120; P90; K90. The predecessor of winter wheat is soybean. The variety of winter wheat is Chiron: medium-ripening, the growing season is 260 days. Treatment with herbicides was carried out in the fall of 2022 in the phase of 3-4 true leaves of winter wheat and when the spring vegetation of wheat is restored in 2023 in the phase of the creation of the first internode.

The method of conducting research is field, repetition is three times, placement of variants and repetitions is sequential. The sown area of the plot is 150 m².

Before starting the experiment with herbicides, we monitored winter wheat crops for the degree of weeding by small and perennial weeds in the phase of 3-4 true leaves in the fall of 2022 (Picture 1).

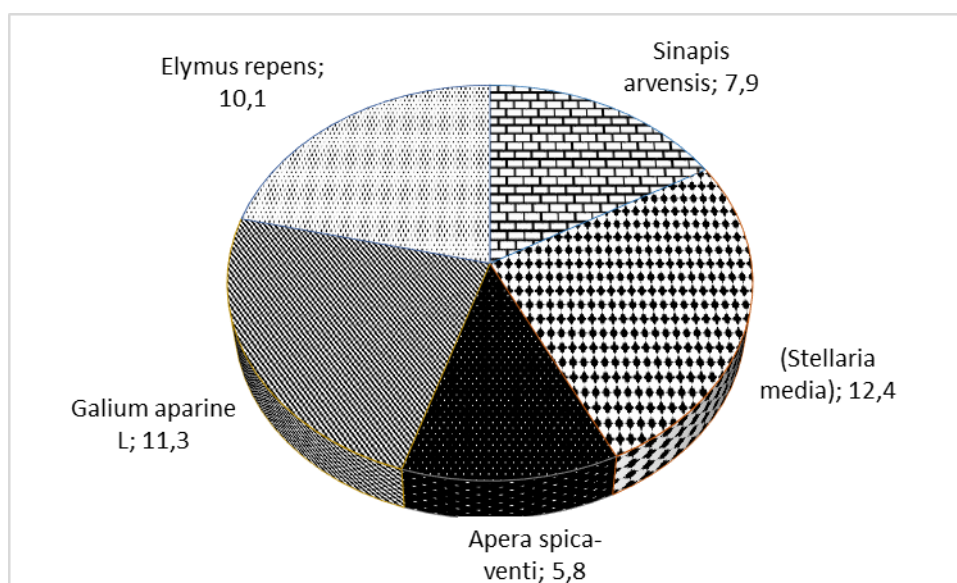


Picture 1 – «The number of weeds in winter wheat crops before applying the herbicide in the fall (phase 3-4 true leaves), pcs/m²» [development of the author]



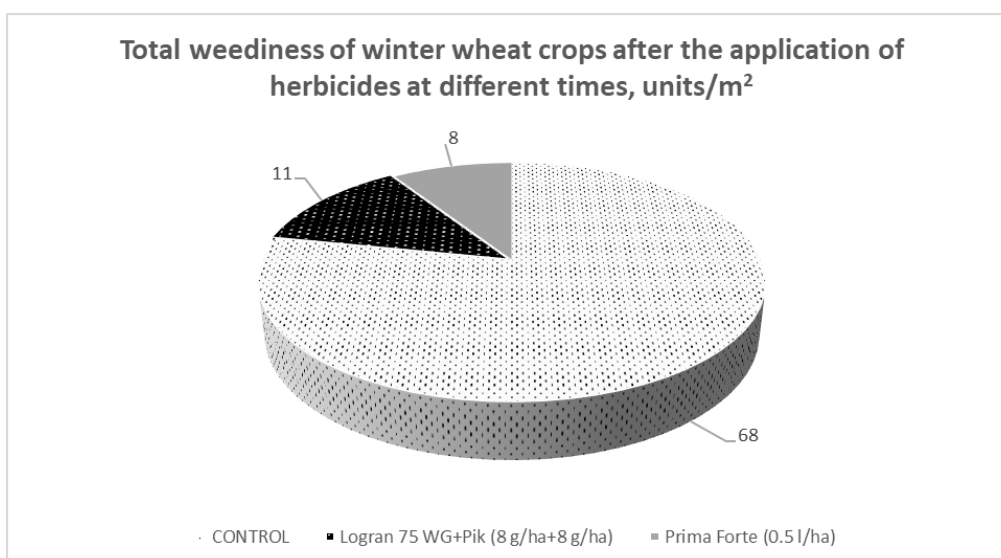
Our research has established that before the introduction of the herbicide mixture Logran 75 WG+Pik, the weediness of wheat was 32.4 units/m². The most numerous were *Apera spica-venti* – 10,2 units/m², *Galium aparine* L – 8,4 units/m² i *Elymus repens* – 7,1 units/m². Most of the weeds were in the phase of 2–3 true leaves, *Galium aparine* L – in the phase of 2–3 rings.

Before the treatment with Prima Forte herbicide in the spring of 2023, we monitored the plot of option 2, with the sowing of winter wheat, for the degree of contamination by small and perennial weeds in the phase of emergence into the tube, at the appearance of the first internode (Picture 2).



Picture 2 – «The number of weeds in winter wheat crops before herbicide application in the spring (emergence phase), units/m²» [development of the author]

Our research has established that before the introduction of the Prima Forte herbicide mixture, the weediness of wheat was 47.5 units/m². The most numerous were *Capsella bursa-pastoris* L – 12.4 pcs/m², *Cirsium arvense* L – 11.3 pcs/m² and *Elymus repens* – 10.1 pcs/m².



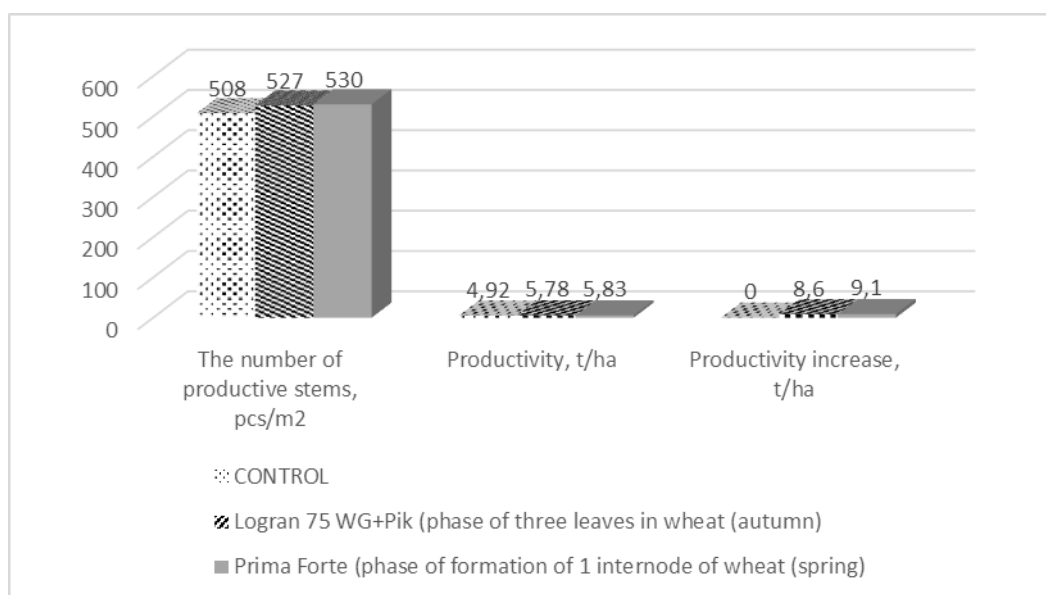
Picture 3 – «General weediness of winter wheat crops after the application of herbicides in different periods» [development of the author]



The contamination of winter wheat before harvesting with autumn and spring application of herbicides is presented in Picture 3.

The monitoring of weediness of winter wheat sowing in experimental plots before harvesting showed that it was more effective to apply Prima Forte herbicide in the phase of emergence into the tube, where the number of weeds per 1 m² was 8 pcs., when spraying the sowing with a mixture of Logran 75 WG+Pik amount of weeds was 11 pcs/m² while the control had 68 pcs/m² of weeds.

The productivity of winter wheat in the experiment with the use of herbicides in different periods is presented in Picture 4.



Picture 4 – «Productivity of winter wheat with the use of herbicides in different periods» [development of the author]

The use of herbicides to protect winter wheat crops from weeds at different times affected the number of productive stalks, so in the experimental variants their number increased within the range of 19...22 pieces/m² compared to the control, which determined the increase in yield and yield increase, so the variants with the use of Prima Forte received a yield increase of 9.1 t/ha, while the variant with the herbicide mixture Logran 75 WG+Pik – 8.6 t/ha.

The conducted studies showed that the system of protection of winter wheat crops from weeds in the phase of emergence into the tube with the herbicide Prima Forte was more effective in comparison with the autumn protection with the mixture of herbicides Logran 75 WG+Pik.

Summary and conclusions. Therefore, our research on the effect of herbicides on the degree of weeding of winter wheat crops, which were applied at different times, shows that the weather conditions of the year have a significant effect on the phytotoxicity of the preparations in the experiments. According to the studies of scientists, the greater effectiveness of herbicide protection is noted for the autumn application of drugs, however, in our studies, a better effect of spring application of herbicides was found, which was influenced by the weather conditions of 2022-2023 years, the predecessor, the crop fertilization system.

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