УДК 632.51

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

О ПУТЯХ ПОВЫШЕНИЯ КОНКУРЕНТОСПОСОБНОСТИ ЛЕКАРСТВЕННЫХ РАСТЕНИЙ НА ПРИМЕРЕ МЯТЫ ПОЛЕВОЙ В УСЛОВИЯХ ЧЕЧЕНСКОЙ РЕСПУБЛИКИ

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Цель исследования – поиск экологически безопасных путей повышения конкурентоспособности полевых культур, используя биологические возможности возделываемой культуры в условиях лесостепной зоны Чеченской Республики. Исследования проводятся в 2022–2023 годах в лесостепной зоне Чеченской Республики, в Гудермесском районе. В качестве объекта исследований выбран сорт мяты полевой Розовская Аромат. Изучена возможность предпосевной обработки семян различными концентрациями природного регулятора роста Гумат+7. Потери урожая при увеличении количества сорняков на 1 м2 до 320 штук составили 7,70 т/га или более 60% по сравнению с контролем (чистый от сорняков посев). При сокращении количества сорных компонентов ценоза мяты помимо увеличения количества вредных объектов происходит сокращение урожая и ухудшение его качества. На фоне 320 штук сорных растений на 1 м^2 потери урожая более 60%. Значительно сокращаются потери урожая на фоне предпосевной обработки семян 0,01% раствором Гумат+7. Дальнейшее увеличение концентрации Гумат+7 (0,02%) оказывает угнетающее воздействие на культурные растения. Посев семенами, обработанными 0,01% раствором Гумата + 7, характеризовался меньшей продолжительностью критического периода вредоносности – 23 суток. 26 суток составляет продолжительность критического периода

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4.1.1. General agriculture and plant growing (biological sciences, agricultural sciences)

ON WAYS TO INCREASE THE COMPETITIVENESS OF MEDICINAL PLANTS USING THE EXAMPLE OF FIELD MINT IN THE CONDITIONS OF THE CHECHEN REPUBLIC

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The objective of the study is to find environmentally friendly ways to increase the competitiveness of field crops using the biological potential of the cultivated crop in the forest-steppe zone of the Chechen Republic. The studies are conducted in 2022–2023 in the forest-steppe zone of the Chechen Republic, in the Gudermes district. The Rozovskaya Aromat variety of field mint was chosen as the object of the study. The possibility of pre-sowing seed treatment with various concentrations of the natural growth regulator Humate+7 was studied. Crop losses with an increase in the number of weeds per 1 m2 to 320 pieces amounted to 7.70 t/ha, or more than 60% compared to the control (weed-free sowing). With a decrease in the number of weed components of the mint cenosis, in addition to an increase in the number of harmful objects, there is a decrease in the yield and a deterioration in its quality. Against the background of 320 weeds per 1 m2, yield losses are more than 60%. Crop losses are significantly reduced against the background of pre-sowing seed treatment with a 0.01% solution of Humate+7. A further increase in the concentration of Humate+7 (0.02%) has a depressing effect on crop plants. Sowing with seeds treated with a 0.01% solution of Humate+7 was characterized by a shorter critical period of harmfulness – 23 days. The critical period of harmfulness of weeds is 26 days when sowing with seeds treated with a 0.02% solution of Humate+7

вредоносности сорняков при посеве семенами, обработанными 0,02% раствором Гумата + 7

Ключевые слова: МЯТА ПОЛЕВАЯ, ЗАСОРЕННОСТЬ, РЕГУЛЯТОР РОСТА, СОРНЫЕ РАСТЕНИЯ, СНИЖЕНИЕ

Keywords: MINT, WEED INFECTION, GROWTH REGULATOR, WEEDS, REDUCTION

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Introduction. Field mint (Metha arvensis) is a common perennial medicinal plant that is becoming increasingly popular. Raw materials are widely used in Its green mass is widely used in the food, perfume and pharmaceutical industries [1, 3, 5].

The main reason for the decrease in the production of green mass is the high infestation of crops. It is extremely important to ensure the absence of harmful objects in mint crops, since the use of chemical plant protection products in its crops should be minimized. Weeds are especially dangerous, since in addition to direct damage, they are reservoirs of pests and pathogens [4, 6, 8]. According to environmental monitoring, the Chechen Republic is one of the ecologically safe regions of the Russian Federation - this explains its attractiveness for the cultivation of medicinal plants.

Based on the above, the relevance of the research topic is beyond doubt.

The aim of the study is to find environmentally friendly ways to increase the competitiveness of field crops, using the biological capabilities of the cultivated crop in the conditions of the forest-steppe zone of the Chechen Republic.

Research methods. To achieve the set goal, two model field experiments were laid down for the first time in the Chechen Republic in the mint agrocenosis, where a given weed infestation of the crop took place - the number of weeds increased in geometric progression; the second experiment - the duration of the crop care techniques was changed. The basis is the Methodological Guidelines for the Study of Economic Thresholds and Critical Periods of Harmfulness of Field Crops.

Research is being conducted in 2022-2023, in the forest-steppe zone of the Chechen Republic, Gudermes district. The Rozovskaya Aroma variety of field mint was selected as the object of the study. The possibility of pre-sowing seed treatment with various concentrations of the natural growth regulator Humate+7.

Results of the study. The first stage of the study was to determine the species composition of the weed component as an independent harmful object and as a reservoir of pests and diseases of the crop [7, 10].

In accordance with the Atlas of Weeds (Amaeva, 2024), the floristic composition of the weed component was determined. During the survey of the mint cenosis, weeds representing 13 families were discovered: Ambrosia artemisiafolium*(L.),Eshinochloa crus-galli (L.),Amaranthus retroflexus (L.), Convolvulus arvensis* ***(L.),****Avena fatua (L.), Setaria viridis (L.), Elytrigia repens (L.),Ambrosiatrifida (L.),Abutilon theophrasti (Medicus),Conyza Canadensis (L.), Chenopodium album (L.), Cynodon dactylon (L.), Papaver rhoeas (L.), Asclepias syriaca (L.),Phleum pratense (L.),*and others (Fig. 1) [2, 4, 9].

Figure 1. Occurrence of weeds during the process of laying out field experiments to determine critical periods of weed harmfulness in mint crops (2022-2023).

As can be seen from Figure 1, late spring weeds predominate, which is explained primarily by the period of plant growth.

The biomass of the weed component is the main indicator of the intensity of photosynthesis and growth processes in them. The biomass of the weed component is the main indicator of the intensity of photosynthesis and growth processes in them. Therefore, one of the tasks was to determine the relationship between the number and air-dry mass of weeds per 1 m^2, as well as the effect of pre-sowing treatment of mint seeds with the growth regulator Guma + 7 on this indicator (Table 1).

Table 1. Relationship between the number and air-dry mass of weeds per 1 m^2 of field mint sowing (2022-2023)

Weeds in the cenosis, pcs/m^2	A mass of weeds,			Weight of 1 weed plant					
				G			from min. clogged,%		
	1	2	3	1	2	3	1	2	3
5	343.5	307.2	270,5	68,7	61.4	54.1	-	-	-
10	515,0	453,0	389,0	51.5	45.3	38.9	74.9	73.8	72.0
20	844.6	744,0	630,0	42.2	37.2	31.5	61.5	60.7	58.3
40	1472.4	1220,5	1008,0	36.8	30.5	25.2	53.6	49.6	46.7
80	2267.2	1960,0	1640,0	28.3	24.5	20.5	41.2	39.9	38.0
160	3371.2	2460.7	2048,0	21.0	15.4	12.8	30.7	25.0	23.7
320	4512,0	3720,5	3200,0	14.1	11.6	10.0	20.5	19.0	18.6

Note: 1 – without Humate+7; 2 – Humate+7 (0.01%); 3 – Humate+7 (0.02%)

Against the background of the maximum density of weeds per 1 m^2 – 320 pieces, their air-dry mass was 4512.00 g/m^2. At the same time, the minimum density (5 pieces/m2) was 343.5 g/m^2. Thus, in comparison with the minimum infestation, the indicator increased more than 13 times.

The use of a growth regulator, a derivative of humic substances of natural origin, Humate+7 (0.01%), at the stage of preparing seeds for sowing made it possible to reduce the mass of weeds with minimal contamination to 307.2 g/m^2 and against the background of maximum infestation, the biomass increased by 12 times - to 3720.5 g/m^2, which indicates an increase in the competitiveness of

the crop. A further increase in the concentration of the growth regulator to 0.02% contributed to an insignificant reduction in the biomass of the weed component - it increased by 11.8 times with maximum infestation.

The weight of one weed plant with minimum infestation in the variant without pre-sowing seed treatment is 68,0 g, against the background of maximum infestation it decreases by 4,8 times and is 14,1 g. Against the background of pre-sowing seed treatment with a solution of Humate+7 at a concentration of 0,01% with minimum infestation – 61,4 g and 11.6 g, or 5,3 times, respectively. 54,1 g is the weight of one specimen with minimum infestation against the background of pre-sowing treatment with a solution of Humate+7 at a concentration of 0,02%. At 320 pcs/m^2 – 10,0 g, that is, 5.4 times less.

All of the above points to intraspecific competition between the components of the weed cenosis. At the same time, increasing the concentration of the growth regulator used for pre-sowing seed treatment ensures an increase in the competitiveness of the crop without having a positive effect on the growth of the weed component of the cenosis.

It is important to evaluate the intensity of growth processes in cultivated plants. One of the main indicators is the intensity of photosynthesis, as a process underlying the production of sustainable yields. The intensity of photosynthesis is indirectly determined by the amount of pigments determined by the photometric method (Fig. 2) [1, 8].

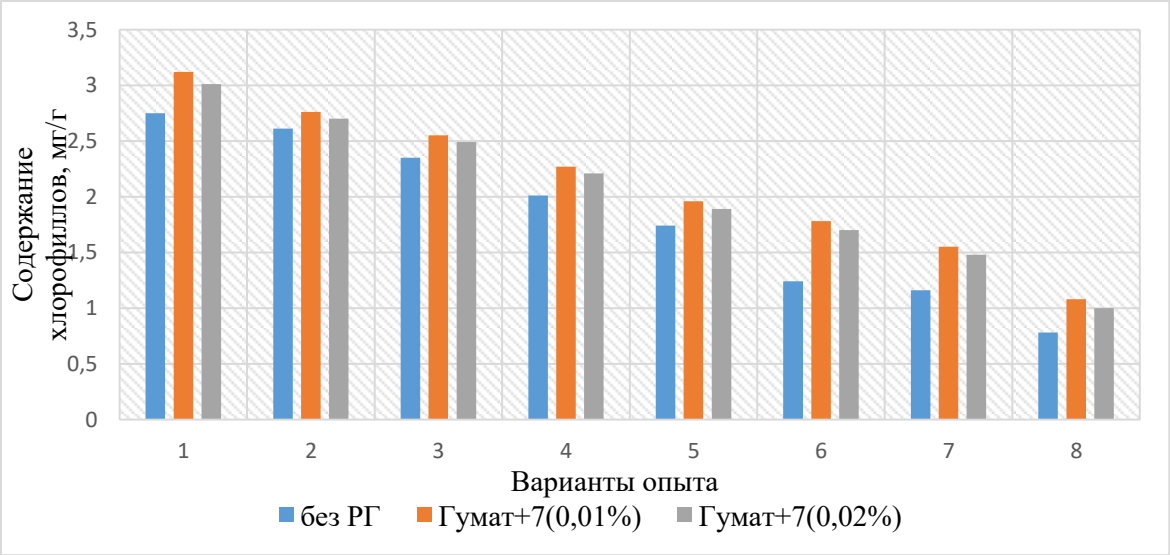


Figure 2. Chlorophyll level, mg/g in mint leaves (Rozovskaya Aroma variety) (2022-2023)

Based on Figure 2, it can be concluded that against the background of an increase in the number of weeds per 1 m2, the content of pigments in the leaves of the cultivated plant decreases, which indicates a decrease in the intensity of photosynthesis and speaks of interspecific competition. After pre-sowing treatment of seeds with a solution of Humate + 7 at a concentration of 0.01%, the content of pigments increased, and therefore the intensity of photosynthesis increased, and an inverse correlation was noted. With a further increase in the concentration of Humate + 7 to 0.02%, the content of pigments was not noted, in addition, one can speak of some depressing effect of the increased concentration of the growth regulator on the cultivated plant.

During the establishment of the species composition of the weed component, it was noted that the retroflex amaranth grew in all variants of the experiment. It is for this reason that this weed was chosen to determine the content of pigments (Fig. 3).

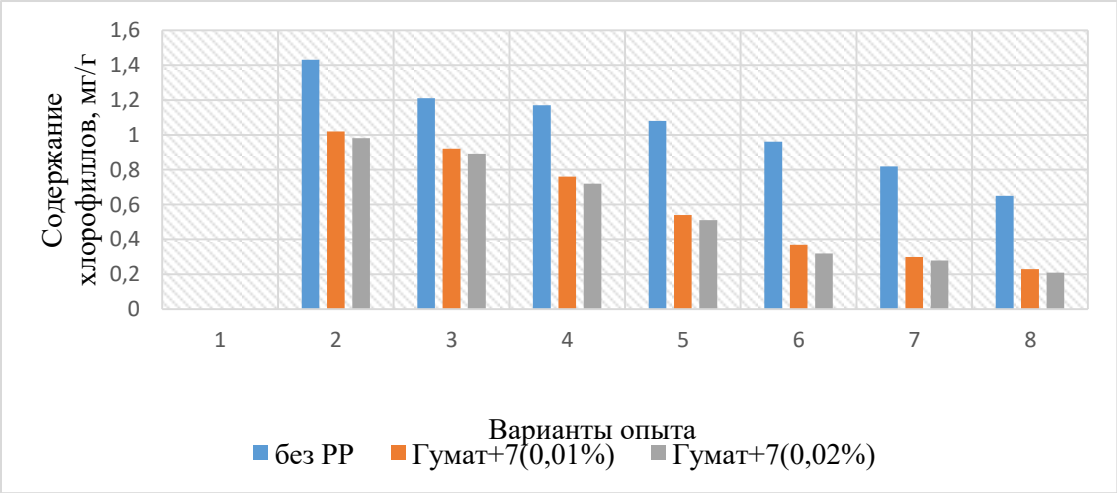


Figure 3. Pigment levels in Amaranthus retroflexus leaves (2022-2023)

As can be seen from the diagram, with an increase in the number of weeds per 1 m2, the intensity of photosynthesis and the content of pigments in the leaves decreased inversely proportional to the number. For example, in the variant with the minimum number of weeds in the leaves of the studied weed, the chlorophyll content was 1.43 mg / g, and with an increase in the number of weeds to 320 pcs / m2, this figure decreased by 2.2 times and was 0.65 mg / g. In the variant where mint seeds were treated before sowing with the preparation Humate + 7 at a concentration of 0.01%, the chlorophyll content in the weed leaves significantly decreased, indicating a marked increase in the competitiveness of the cultivated plant. An increase in the concentration of Humate + 7 to 0.02% ensured a further decrease in the pigment content in the leaves of the weed.

All of the above can be considered as a basis for the conclusion about intraspecific and interspecific competition in sowing. At the same time, the use of Humate+7 in a concentration of 0.01% ensured an increase in the competitiveness of mint plants, and a further increase in the concentration had a depressing effect on mint plants, which is confirmed by a decrease in the content of pigments in its leaves.

Crop losses with an increase in the number of weeds per 1 m2 to 320 pieces amounted to 7.70 t/ha or more than 60% compared to the control (sowing clean from weeds). Thus, the yield decreased by 2.5 times. Crop losses in the variants where the seeds were treated with a 0.01% solution of Humate+7 before sowing: 1.09-7.30 t/ha or 7.45-49.83%. With an increase in the concentration of Humate+7 to 0.02%, a decrease in yield was noted, which is a consequence of its inhibitory effect (Table 2).

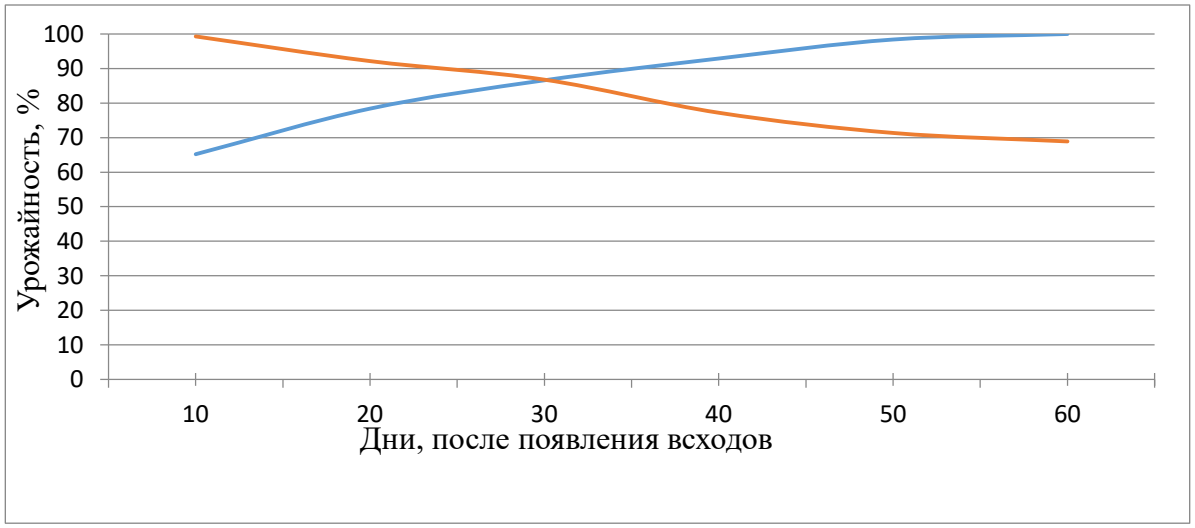
Table 2. – Relationship between the number of weeds per 1 m2 and mint yield (Rozovskaya Aroma variety) (2022-2023)

Number of weeds in the cenosis, pcs/m^2	Yield, t/ha			Crop losses					
				t/ha			%		
	1	2	3	1	2	3	1	2	3
0	12.80	14.65	13.77	-	-	-	-	-	-
5	11.25	13.56	12.47	1.55	1.09	1.30	12.11	7.45	9.44
10	10.40	12.90	12.10	2.40	1.75	1.67	18.75	11.94	12.70
20	9,10	11.47	10.86	3.70	3.18	2.91	28.90	21.70	23.09
40	8.00	10.09	9.65	4.80	4.60	4.12	37.50	31,12	33.40
80	7.10	9.35	8.29	5.70	5.30	5.48	44.53	36.17	39.79
160	6.23	8.41	7.56	6.57	6.24	6.21	51.32	42.59	45.10
320	5.10	7.35	6.65	7.70	7.30	7.12	60.15	49.83	51.70

Note: 1 – without Humate+7; 2 – Humate+7 (0.01%); 3 – Humate+7 (0.02%)

At the final stage of the work, the critical period of harmfulness is the time interval after which the joint growth of weeds and crops will not cause damage to the latter (Fig. 4).

1.



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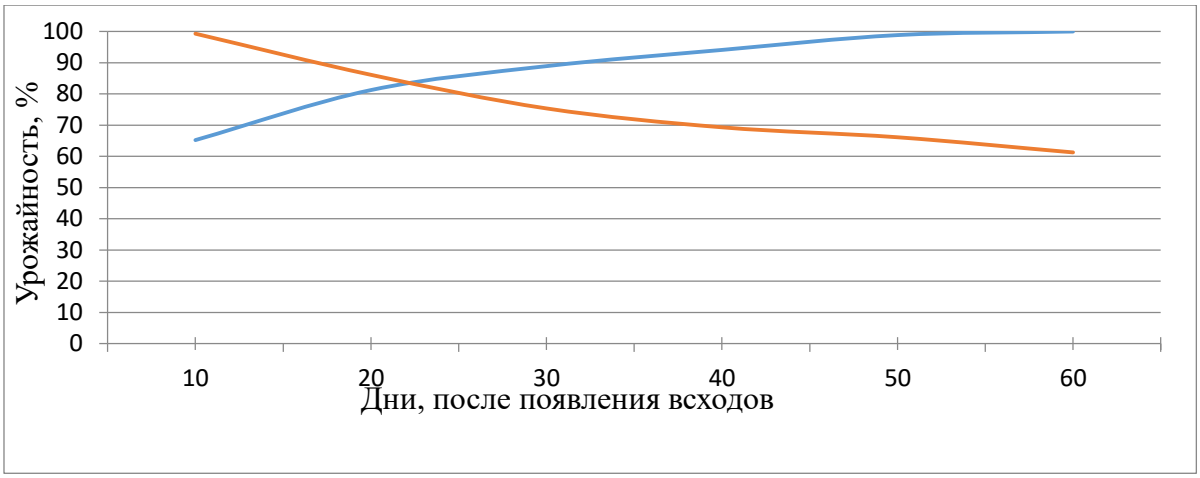

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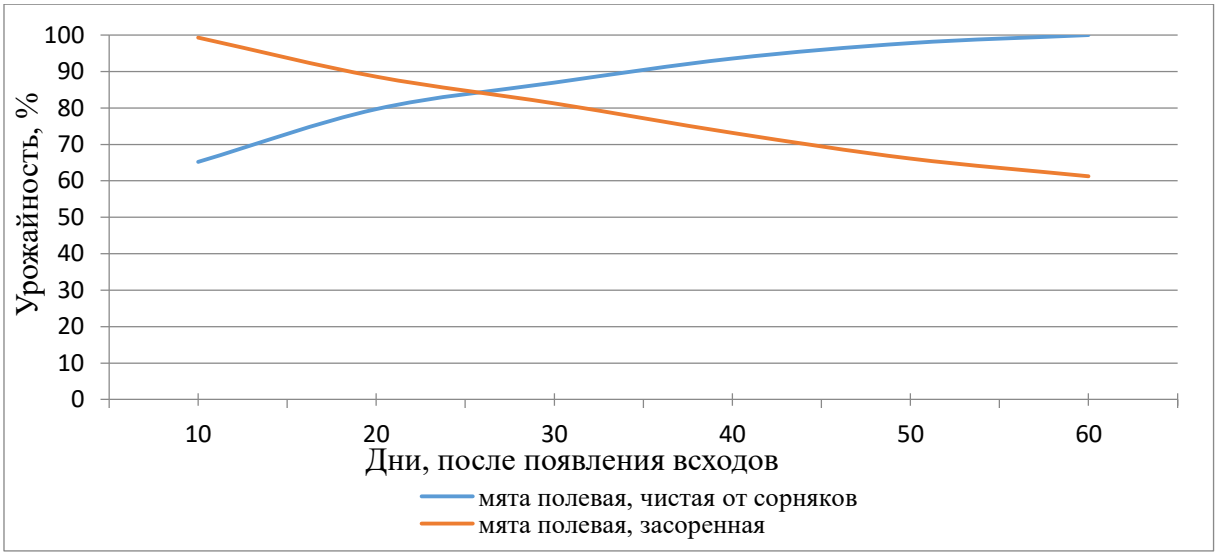

Figure 4. – Critical period of weed harmfulness of mint crops (Rozovskaya Aroma variety) (2022-2023) (1. – sowing seeds without treatment; 2. – seeds

treated with 0.01% solution of Humate+7; 3. – seeds treated with 0.02% solution of Humate+7

In the sowing carried out with seeds without treatment, the critical period of weed harmfulness was 30 days from the moment of emergence. Sowing produced by seeds treated with 0.01% solution of Humate + 7 was characterized by a shorter duration of the critical period of harmfulness - 23 days. 26 days is the duration of the critical period of weed harmfulness in sowing with seeds treated with 0.02% solution of Humate + 7. Thus, a pronounced inhibitory effect of an increased concentration of the growth regulator on the growth and development of mint plants is noted.

It can be concluded that the use of a solution of Humate + 7 at a concentration of 0.01% for pre-sowing seed treatment allows to reduce the duration of the critical period of weed harmfulness, and therefore reduce the level of spread of other harmful objects. This will ultimately ensure a reduction in the pesticide load, which is very important in the cultivation of medicinal plants.

Conclusion. When reducing the number of weed components of the mint cenosis, in addition to an increase in the number of harmful objects, there is a decrease in the yield and deterioration in its quality. Against the background of 320 weeds per 1 m2, yield losses can reach more than 60%. Crop losses are significantly reduced against the background of pre-sowing seed treatment with a 0.01% solution of Humate + 7. At the same time, a further increase in the concentration of Humate + 7 (0.02%) has a depressing effect on crop plants. Sowing with seeds treated with a 0.01% solution of Humate + 7 was characterized by a shorter critical period of harmfulness - 23 days. 26 days is the duration of the critical period of harmfulness of weeds when sowing with seeds treated with a 0.02% solution of Humate + 7

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