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ЭФФЕКТИВНОСТЬ ГЕРБИЦИДА БАЗИС В ПОСЕВАХ ГИБРИДОВ КУКУРУЗЫ РОССИЙСКОЙ СЕЛЕКЦИИ

EFFICIENCY OF HERBICIDE BASIC IN CROPS OF CORN HYBRIDS OF DIFFERENT MATURITY GROUPS

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Цель – изучение эффективности двухкомпонентного гербицида Базис в посевах гибридов кукурузы российской селекции разных групп спелости в условиях лесостепной зоны Чеченской Республики. В качестве объекта исследований были взяты два гибрида кукурузы отечественно селекции, разные по группам спелости, а именно среднеспелый Зерноградский 354 МВ и среднеранний Краснодарский 291 АМВ с целью выбора оптимального для возделывания в условиях зоны. В ходе обследования и определения флористического состава сорного компонента ценоза вариантов опыта зафиксирован сложный тип засоренности Базис, СТС 10-15 г/га: гибель 86,71-90,11%, 84,76-91,78% снижение массы. Базис, СТС в дозе 20 г/га обеспечил уничтожение 100% сорных растений в посевах двух гибридов кукурузы. С учетом тенденции к росту численности сорнополевого компонента и расширения его видового состава возникла необходимость использования повышенных доз гербицидов. Наибольшая прибавка урожая отмечалась при использовании: Титуса, СТС (50 г/га): 5,20 т/га (Краснодарский 291 АМВ) и 4,99 т/га (Зерноградский 354 МВ), что составило 113,28 и 112,13% от контроля без гербицидов и прополок; Базис, СТС (20 г/га): 3,92 т/га и 5,10 т/га (85,40% и 114,60%) соответственно. Базис, СТС в дозе 25 г/га оказал некоторое угнетающее воздействие на растения кукурузы, что выразилось в снижении прибавки урожая. в целях минимизации пестицидной нагрузки на агроценоз, достоверного снижения засоренности посевов изучаемых гибридов кукурузы оптимально применение Базиса, СТС в дозе 20 г/га в условиях лесостепной зоны Чеченской Республики

The objective is to study the efficiency of the herbicide Basis in the crops of corn hybrids of different maturity groups in the conditions of the forest-steppe zone of the Chechen Republic. As an object of research, two corn hybrids of domestic selection, different in maturity groups, namely mid-season Zernogradsky 354 MV and mid-early Krasnodarsky 291 AMV were taken in order to select the optimal one for cultivation in the conditions of the zone. During the survey and determination of the floristic composition of the weed component of the cenosis of the experimental options, a complex type of weed infestation Basis, STS 10-15 g / ha was recorded: mortality 86.71-90.11%, 84.76-91.78% weight loss. Basis, STS at a dose of 20 g / ha ensured the destruction of 100% of weeds in the crops of two corn hybrids. Taking into account the tendency to an increase in the number of weed components and the expansion of its species composition, it became necessary to use increased doses of herbicides. The greatest yield increase was observed with the use of: Titus, STS (50 g/ha): 5.20 t/ha (Krasnodar 291 AMV) and 4.99 t/ha (Zernograd 354 MV), which amounted to 113.28 and 112.13% of the control without herbicides and weeding; Basis, STS (20 g/ha): 3.92 t/ha and 5.10 t/ha (85.40% and 114.60%), respectively. Basis, STS at a dose of 25 g/ha had some depressing effect on corn plants, which was reflected in a decrease in yield increase. Based on the studies conducted, in order to reliably reduce the infestation of crops of the studied corn hybrids, in order to minimize the pesticide load on the agroecosystem, it is optimal to use Basis, STS at a dose of 20 g/ha in the conditions of the forest-steppe zone of the Chechen Republic

Ключевые слова: ГИБРИДЫ КУКУРУЗЫ,
ЗАСОРЕННОСТЬ, ГЕРБИЦИДЫ, СОРНЫЕ
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Introduction

Today, corn is the main crop in the Russian Federation. Taking into account the biological characteristics of the crop, the main part of the sown areas is concentrated in the southern regions of Russia [1, 4, 9].

Research by Russian and foreign scientists into the biological characteristics of the crop has proven the high competitiveness of corn in relation to weeds, and the possibility of their joint growth has been confirmed. At the same time, the fact of crop losses and a decrease in its quality against the background of severe weed infestation of crops has been proven, which is associated with the current situation in the agricultural sector of Russia, when a significant wedge of arable land is leased by agricultural producers. And corn crops are no exception. The weed component of the agrocenosis is distinguished by lesser demands on growing conditions, while significantly greater consumption of water and nutrients per unit of mass [2, 5, 8].

All of the above confirms the need for continuous improvement of the set of measures to protect crops from harmful objects, which include the weed component.

Based on the results of research by Russian and foreign scientists, the following conclusion was made: given the complex type of weed infestation in most areas, the most effective is the use of two-component herbicides or their tank mixtures in order to destroy the entire spectrum of weed vegetation and reduce the pesticide load on the agroecosystem.

Target– study of the effectiveness of Basis in crops of corn hybrids of different maturity groups in the conditions of the forest-steppe zone of the Chechen Republic.

Materials and research methods.

The experiment was carried out in accordance with the Guidelines for conducting experiments with herbicides (1985) in the period 2016-2019 [7].

The object of the research was two domestically bred corn hybrids with different maturity groups, namely the mid-season Zernogradsky 354 MV and the mid-early Krasnodarsky 291 AMV, with the aim of selecting the optimal hybrid for cultivation in the conditions of the zone.

The experiment studied the effectiveness of Basis, STS, which is a mixture of two active substances: 500 g/kg rimsulfuron + 250 g/kg thifensulfuron-methyl [3, 6].

Results and discussions.

During the examination and determination of the floristic composition of the weed component of the cenosis of the experimental variants, a complex type of weed infestation was recorded (Table 1).

Table 1 – Weed occurrence in the experiment (before herbicide treatment) (2016-2019)

Weeds	Experience options							
	1	2	3	4	5	6	7	8
Mid-early hybrid Krasnodar 291 AMV								
<i>Echinochloa crus-galli (L.)</i>	+	-	+	+	-	-	-	+
<i>Amaranthus retroflexus (L.)</i>	+	-	+	+	-	-	-	+
<i>Ambrosia artemisifolia (L.)</i>	+	-	+	-	-	-	-	+
<i>Setaria viridis (L.)</i>	+	-	+	-	-	-	+	+
<i>Chenopodium album (L.)</i>	-	-	+	+	-	-	+	+
<i>Galinsoga parviflora (Cov.)</i>	+	-	+	-	-	-	-	+
<i>Abutilon theophrastii (Medik.)</i>	+	-	-	-	-	-	-	+
<i>Stellaria media (L.)</i>	+	-	-	-	-	-	-	+
<i>Sonchus arvensis (L.)</i>	+	-	+	+	-	-	-	-
<i>Convolvulus arvensis (L.)</i>	+	-	-	+	-	-	-	+
<i>Cirsium arvense (L.)</i>	+	-	+	+	-	-	-	+
<i>Sorghum halepense (L.)</i>	+	-	+	-	-	-	-	-

<i>Melandrium dioicum</i> (Mill.)	+	-	-	-	-	-	-	+
<i>Galium aparine</i> (L.)	+	-	+	-	-	-	-	-
<i>Cynodon dactylon</i> (L.)	+	-	-	-	-	-	+	-
<i>Asclepius syriaca</i> (L.)	+	-	-	-	-	-	-	+
Mid-season hybrid Zernogradsky 354 MV								
<i>Echinochloa crus-galli</i> (L.)	+	-	+	+	-	-	-	+
<i>Amaranthus retroflexus</i> (L.)	+	-	-	+	-	-	-	+
<i>Ambrosia artemisifolia</i> (L.)	+	-	+	+	-	-	-	+
<i>Setaria viridis</i> (L.)	+	-	+	-	-	-	-	+
<i>Chenopodium album</i> (L.)	+	-	-	+	-	-	-	+
<i>Galinsoga parviflora</i> (Cov.)	+	-	-	-	-	-	-	+
<i>Abutilon theophrastii</i> Medik.)	+	-	+	+	-	-	-	-
<i>Stellaria media</i> (L.)	+	-	+	-	-	-	-	+
<i>Sonchus arvensis</i> (L.)	+	-	+	+	-	-	+	+
<i>Convolvulus arvensis</i> (L.)	+	-	-	-	-	-	+	+
<i>Cirsium arvense</i> (L.)	+	-	-	-	-	-	-	+
<i>Sorghum halepense</i> (L.)	-	-	+	-	-	-	-	+
<i>Galium aparine</i> (L.)	+	-	-	+	-	-	-	+
<i>Cynodon dactylon</i> (L.)	+	-	+	-	-	-	-	-
<i>Papaver rhoeas</i> (L.)	+	-	-	-	+	-	+	-

Before harvesting, a quantitative and weight accounting of weeds was carried out; the number of weeds under control on the crops of the two hybrids was approximately the same - 186.2-197.5 pcs/m², with a weight of 502.5-498.5 g/m². Mid-early hybrid Krasnodar 291 AMV: the use of Titus, STS at a dose of 50 g/ha ensured the death of 96.8-98.3% of weeds and a 95.72-97.95% decrease in their weight; Basis, STS 10-15 g/ha - death of 83.22-89.67%, weight reduction, respectively, of 81.25-99.70%. Mid-season hybrid Zernogradskiy 354

MV, Basis, STS 10-15 g/ha: mortality 86.71-90.11%, 84.76-91.78% weight loss. Basis, STS at a dose of 20 g/ha ensured the destruction of 100% of weeds in crops of two corn hybrids (Table 2, Fig. 1).

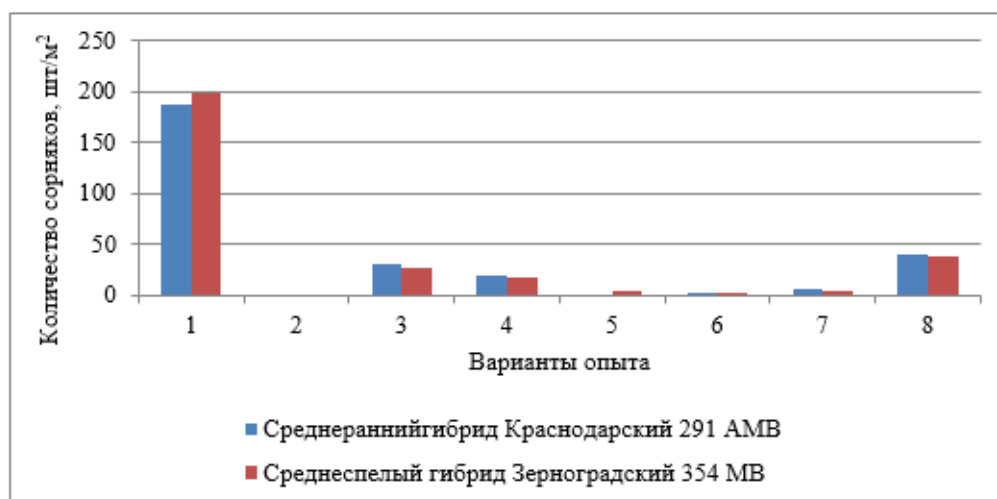


Figure 1 -Efficiency of herbicides in corn agrocenosis

(average for 2016-2019) (1 - control 1 (without herbicides and weeding); 2 - control 2 (cultivation and weeding); 3 - Basis, STS, 10 g/ha+Trend-90, VR, 0.3 l/ha; 4 - Basis, STS, 15 g/ha+Trend-90, VR, 0.3 l/ha; 5 - Basis, STS, 20 g/ha+Trend-90, VR, 0.3 l/ha; 6 - Basis, STS, 25 g/ha+Trend-90, VR, 0.3 l/ha; 7 - Titus, STS, 50 g/ha+Trend-90, VR, 0.3 l/ha; 8 - Elyumis, MD, 1.75 (standard).

It has been established that the surviving specimens of weeds are the plants of the "second wave". It should be noted that Basis, STS is most effective in all studied consumption rates in crops of the mid-season hybrid Zernogradsky 354 MV.

Taking into account the tendency towards an increase in the number of weed components and the expansion of its species composition, it became necessary to use increased doses of herbicides. Thus, The level of chlorophyll in the leaves of the mid-early hybrid maize Krasnodar 291 AMV in the variant with cultivation and weeding (control 2) is 2.92 mg/g. The chlorophyll content in the leaves of the mid-season hybrid maize Zernograd 354 MV is 2.89 mg/g,

respectively. In the variant without herbicides and weeding (control 1), the chlorophyll content in the leaves of the mid-early hybrid maize Krasnodar 291 AMV is 1.05 mg/g, which is 2.8 times less than in control 2. The mid-season hybrid maize Zernograd 354 MV is more susceptible to joint growth with weeds [10].

The use of herbicides Elumis, MD and Titus, STS had a less pronounced stress effect on corn plants, and, consequently, on the intensity of photosynthesis.

Under control 1 height of plants of the hybrid corn Krasnodar 291 AMV is 108.0 cm; mid-season hybrid Zernograd 354 MV – 123 cm.

Table 2 – Effect of herbicides on the mass of the weed component in the corn agrocenosis, g/m² (2016-2019)

Options	Years				Average for 2016-2019	
	2016	2017	2018	2019	g/m ²	% - counter.
Mid-early hybrid Krasnodar 291 AMV						
Control 1 (without herbicides and weeding)	520,00	470,00	580,00	440,00	502.50	0,00
Control 2 (cultivation and weeding)	0,00	0,00	0,00	0,00	0,00	0,00
Basis, STS, 10 g/ha+Trend-90, VR, 0.3 l/ha	98,00	76,00	123,00	80,00	94.25	81.25
Basis, STS, 15 g/ha+Trend-90, VR, 0.3 l/ha	62,00	43,00	76,00	49,00	57.50	88.56
Basis, STS, 20 g/ha+Trend-90, VR, 0.3 l/ha	00,00	0,00	18:00	0,00	4.50	99.11
Basis, STS, 25 g/ha+ Trend-90, VR, 0.3 l/ha	0,00	0,00	6.00	0,00	1.50	99.70
Titus, STS, 50g/ha+Trend-90, VR, 0.3 l/ha	21.00	18:00	29.00	18:00	21.50	95.72
Elumis, MD, 1.75 (standard)	125,00	123,00	147,00	102,00	124.25	75.28
HSR05, g/m ²	3.88	6.42	13,14	12.39		
Mid-season hybrid Zernogradsky 354 MV						
Control 1 (without herbicides and weeding)	482,00	560,00	521,00	431,00	498,50	0,00
Control 2 (cultivation and weeding)	0,00	0,00	0,00	0,00	0,00	0,00
Basis, STS, 10 g/ha+Trend-90, VR, 0.3 l/ha	77,00	69,00	94,00	64,00	76,00	84.76
Basis, STS, 15 g/ha+Trend-90, VR, 0.3 l/ha	44,00	40,00	45,00	35,00	41,00	91.78
Basis, STS, 20 g/ha+Trend-90, VR, 0.3 l/ha	8.90	6.00	7.00	0,00	5.47	98.91
Basis, STS, 25 g/ha+Trend-90, VR, 0.3 l/ha	0,00	0,00	0,00	0,00	0,00	100,00
Titus, STS, 50g/ha+Trend-90, VR, 0.3 l/ha	11.00	9.00	12.00	9.00	10.25	97.95
Elumis, MD, 1.75 (standard)	101.30	111,00	115,00	91,00	104.57	79.03
HSR05, g/m ²	6.79	7.15	9.9	7.37		

The use of herbicides ensures an increase in the height of plants of the early-ripening hybrid Krasnodar 291 AMV by 1.65 times and by 1.75 times for plants of the mid-ripening hybrid Zernograd 354 MV).

Basis, STS (10-25 g/ha) promotes an increase in the height of plants of the mid-early hybrid Krasnodar 291 AMV by 1.38-1.61 times; mid-season hybrid Zernogradsky by 1.39-1.63 times, respectively.

the height of the plants increased and amounted to 65.7% and 75.6% of the control, respectively. As a result of using herbicides in corn crops, the diameter of the stem in the root part increased by 59.8-64.8%. This is important - in the forest-steppe zone of Chechnya, rainfall often occurs.

The height of attachment of the first cob, which is important during harvesting, was 40.0-47.0 cm in control 1. The use of herbicides made it possible to increase it to 56.0 cm (Krasnodar 291 AMV) and 67.4 cm (Zernograd 354 MV).

Over the years of research, the yield of corn was stable, i.e. the climatic conditions of the zone are favorable for growing the crop. Both hybrids in the control variant showed approximately equal yield - 4.45-4.59 t/ha. On monitor lizards with the use of Titus, STS and Basis, STS, a significant increase in yield was recorded. It was maximum in the Titus, STS variants (50 g/ha): for the hybrid Krasnodarsky 291 AMV - 5.20 t/ha, for the hybrid Zernogradsky 354 MV - 4.99 t/ha, i.e. in comparison with the control without herbicides and weeding 113.28 and 112.13%, respectively. Against the background of Basis, STS (20 g/ha), the yield increase for these hybrids was 3.92 t/ha and 5.10 t/ha, i.e. (85.40% and 114.60%, respectively (Table 3, Fig. 2).

Table 3 – Grain yield of corn hybrids (2016-2019)

Options	Years				Average for 2016-2019, t/ha	Increase in yield	
	2016	2017	2018	2019		t/ha	%
Mid-early hybrid Krasnodar 291 AMV							
Control 1 (without herbicides and weeding)	4.98	5.39	3.86	4.15	4.59	0,00	0,00
Control 2 (cultivation and weeding)	9.47	10.15	8.98	10.07	9.66	5.07	110.45
Basis, STS, 10 g/ha+Trend-90, VR, 0.3 l/ha	7.18	7.91	5.45	6.20	6.68	2.09	45.53
Basis, STS, 15 g/ha+Trend-90, VR, 0.3 l/ha	8.40	9.30	6.38	7.03	7.77	3.18	69.28
Basis, STS, 20 g/ha+Trend-90, VR, 0.3 l/ha	8.40	8.84	8.66	8.14	8.51	3.92	85.40
Basis, STS, 25 g/ha+ Trend-90, VR, 0.3 l/ha	7.08	8.42	8.71	8.05	8.06	3.47	75.59
Titus, STS, 50g/ha+Trend-90, VR, 0.3 l/ha	11.08	11.37	8.02	8.72	9.79	5.20	113.28
Elumis, MD, 1.75 (standard)	7.93	9.02	5.89	6.47	7.32	2.73	59.47
HSR05, t/ha	0.18	0.21	0.15	0.16			
Mid-season hybrid Zernogradsky 354 MV							
Control 1 (without herbicides and weeding)	4.52	4.87	4.07	4.34	4.45	0,00	0,00
Control 2 (cultivation and weeding)	9.94	9.98	9.25	10.26	9.85	5.40	121.34
Basis, STS, 10 g/ha+Trend-90, VR, 0.3 l/ha	6.66	7.25	5.80	6.65	6.59	2.14	48.08
Basis, STS, 15 g/ha+Trend-90, VR, 0.3 l/ha	7.57	8.53	6.88	7.49	7.61	3.16	71.01
Basis, STS, 20 g/ha+Trend-90, VR, 0.3 l/ha	9,10	9.71	9.79	9.60	9.55	5.10	114.60
Basis, STS, 25 g/ha+Trend-90, VR, 0.3 l/ha	8.93	9.26	9.13	8.76	9.02	4.57	102.69
Titus, STS, 50g/ha+Trend-90, VR, 0.3 l/ha	9.86	10.40	8.30	9.22	9.44	4.99	112,13
Elumis, MD, 1.75 (standard)	7.08	8.27	6.23	6.83	7.10	2.65	59.55
HSR05, t/ha	0.20	0.16	0.09	0.17			

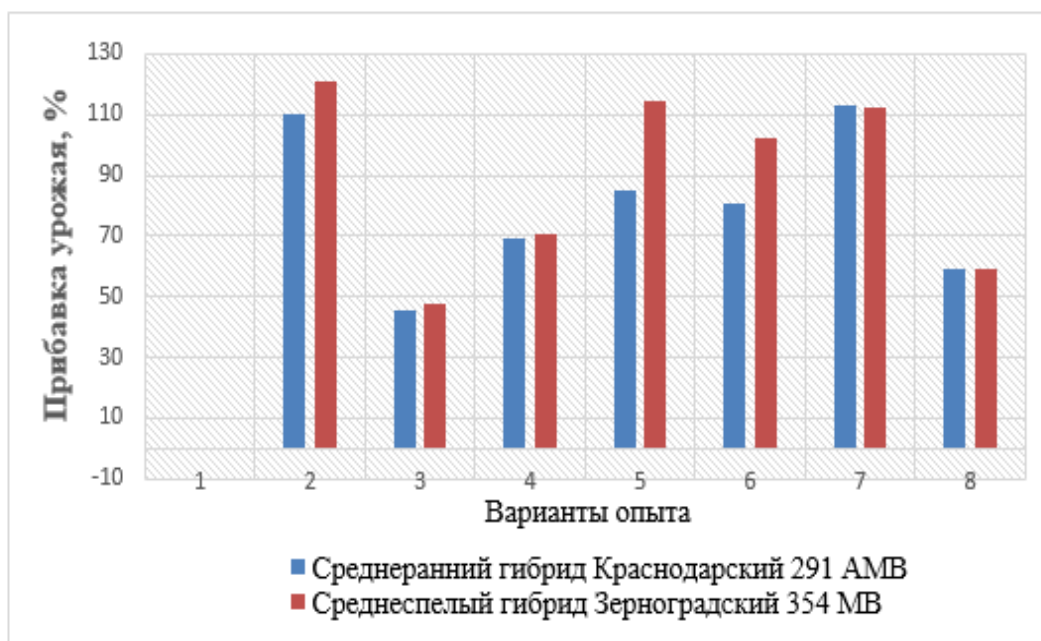


Figure 2 - Effect of herbicides on corn yield

(average for 2016-2019) (1 - control 1 (without herbicides and weeding); 2 - control 2 (cultivation and weeding); 3 - Basis, STS, 10 g/ha+Trend-90, VR, 0.3 l/ha; 4 - Basis, STS, 15 g/ha+Trend-90, VR, 0.3 l/ha; 5 - Basis, STS, 20 g/ha+Trend-90, VR, 0.3 l/ha; 6 - Basis, STS, 25 g/ha+Trend-90, VR, 0.3 l/ha; 7 - Titus, STS, 50 g/ha+Trend-90, VR, 0.3 l/ha; 8 - Elyumis, MD, 1.75 (standard).

To study the dynamics of accumulation of the active substance of agro-processes in the arable layer, a laboratory and field experiment was conducted. The test plant was winter wheat, the Soratnitsa variety, the seeds were sown 5 and 30 days after treatment with the herbicide. During the experiment, samples were taken from the upper (0-5 cm) soil layer.

Based on the results of the laboratory and field experiment, it can be concluded that after harvesting corn grain from a plot treated with Basis, STS, the active substance of the preparation was not detected in the soil; other crops can be grown on the plot. Consequently, Basis, STS in the studied standards is not hazardous to the environment.

Conclusion.

Based on the conducted studies, in order to reliably reduce the infestation of crops of the studied corn hybrids, in order to minimize the pesticide load on the agrocenosis, it is optimal to use Basis, STS at a dose of 20 g/ha in the conditions of the forest-steppe zone of the Chechen Republic.

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