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IMPACT OF HUMIC ACID ON GROWTH, DEVELOPMENT AND PRODUCTIVITY OF CORN HYBRID UNDER CONDITIONS OF NORTHERN KAZAKHSTAN

Abstract. The biological activity of humic acids is proven on various types of crops. Domestic preparation "Kazuglegumus" is a fertilizer proposed for increasing crop yields, containing water-soluble organometallic chelate complexes with free C – O, C – O, C-NH functional groups. The authors present the results of a study of the effectiveness of the use of domestic organic fertilizer obtained from oxidized brown coal on the growth and productivity of corn hybrids in the northern regions of Kazakhstan. The agrochemical properties of the soil were studied, phenological observations were carried out on the phases of plant development, taking into account the yield of green mass during harvesting, zootechnical analysis of feed. Field experiments were carried out at «North Kazakhstan Research Institute of Livestock and Crop Production» LLP in 2019 on Hungarian selection hybrids MV 170 and MV 270. Phenological observations on the phases of maize development showed that the use of potassium humate with trace elements has a stimulating effect on the growth and development of maize hybrids, increasing its productivity and yield in the forest steppe conditions of North Kazakhstan. The optimal effective dose of "Kazuglegumus" humate fertilizer was determined for pre-sowing treatment of corn seeds and subsequent extracorporeal feeding.

Key words: foliar top dressing, potassium humate, corn, pre-sowing seed treatment, productivity, fertilizer, coal.

Introduction. For many years, corn has remained an important agricultural crop in Kazakhstan. According to the National Agency for Statistics, in the Republic of Kazakhstan in 2019, corn was grown on an area of more than 252 thousand hectares, which is 3.5 thousand hectares more than in 2018. The largest number of cultivated areas in Akmola, Turkestan, Kostanai and Zhambyl regions. The main exporters of Kazakh corn are Uzbekistan, Russia, Turkmenistan, Afghanistan and Tajikistan. In 2019, Kazakhstan exported about 50 thousand tons of corn, of which 45 942 tons - to Uzbekistan. Currently, relations are being established with the China on the export of agricultural products, including corn [1]. In the light of existing achievements and emerging prospects, the need to maintain soil productivity and soil health becomes apparent. It should be noted that in recent years there has been an increase in interest in "environmentally friendly" soil fertilization in agriculture. A wide range of commercial humic products are used as soil additives to increase crop yields, as well as to increase the efficiency of nutrient utilization by plants. [2]. A qualitative analysis of the soil, seeds, processing technologies, the use of fertilizers to increase productivity - all these issues are quite relevant in obtaining high yields of corn. The properties of Russian-made peat humates are widely studied, and the need for their use in growing corn is scientifically proven. Thus, the studies conducted by the authors on the experimental field of the Belgorod Scientific Research Institute of Agriculture in many years of field experience in the Central Chernozem region on the use of potassium humate growth regulator for spraying vegetative plants of medium early corn hybrid

tillage in the range of 8.51-8.57 t/ha [3]. The effectiveness of the joint use of mineral fertilizers and plant growth regulator potassium-sodium humate with trace elements produced by the "Force of Life" in the cultivation of corn on grain was studied on the irrigated chestnut soils of the Volgograd. Its composition includes (in %): humic acid - 20; other organic acids - 10; nitrogen – 10; phosphorus – 1.0; potassium – 2.0; sodium – 1.0; sulfur – 0.5; magnesium – 0.5; iron – 0.5; copper – 0.5; manganese – 0.5; pine forest – 0.5; zinc – 0.5; molybdenum – 0.01; cobalt – 0.005.

The advantage of fertilized plants in development was noted already in the phase of 3-5 leaves and remained until the end of the growing season. It should be noted that the Russian humate of potassium sodium with microelements was used on irrigated chestnut soils, which allowed the authors to obtain results on increasing plant growth by 20% in height, dry ground mass accumulation in the 3-5 leaf phase by 43-48%, in phase of full wax ripeness 53-56% [4]. In the forest-steppe zone of the Republic of North Ossetia-Alania, studies were conducted on the use of preparations derived from humic substances in order to combat weed vegetation and reduce the stress effect on corn plants of Russian selection hybrids. The authors found that the most effective in the forest-steppe zone is the use of the drug «potassium humate 80». Its use in concentrations of 0.01-0.02% allowed to increase the content of chlorophyll in corn leaves by 7.7-17.6% in comparison with the control. At the same time, the authors note that increased concentrations of "potassium humate" have a depressing effect on the intensity of corn photosynthesis [5]. Various methods of applying humate fertilizers. So, in a study to determine the effect of the use of K-Humate on dry matter, elemental composition and absorption of nutrients by corn plants, the drug was applied to the soil or leaves at doses of 150, 300 and 450 g/day when growing plants in pots. The soil used in this study was loamy (38.4% clay, 39.9% water and 21.7% sand), slightly alkaline (pH 7.8), moderate in organic matter (2.90%) and rich in content CaCOa (11.5%). [6,-9]. According to the analysis, the fertilizer contains the following forms of nutrients available for plants: HA- 53-59%, K - 12.53%, N - 1.1%, O - 16.57%, Si - 17.61% [10, 11].

The aim of the research is to analyze the effectiveness of the use of organic fertilizer “Kazuglegumus” on the growth and productivity of maize hybrids in the northern regions of Kazakhstan.

Materials and methods. The object of research is the corn hybrids of the Hungarian selection MV 170 and MV 270. Hybrid corn MV 170 - a hybrid of Hungarian selection with a short growing season of 85-100 days, FAO group 170, height 150-170 cm. The color of the leaves is dark green with the number on the main stem 11-14. The spadix is long, narrow, well covered with a wrapper, length is 14-17 cm. The mass of 1000 grains is 250-280 g. The type of grain is round. The grain yield when threshing 80-84%. Resistant to cold, tolerates drought.

Hybrid corn MV 270 - a hybrid of Hungarian selection with a growing season of 90-105 days, FAO group 300, 160-180 cm high. The color of the leaves is dark green with 11-14 on the main stem. The ear is thick with deeply embedded grains, 15-18 cm long. The mass of 1000 grains is 270-300 g. The type of grain is tooth-like has increased adaptability. Field experiments were conducted in 2019 at «North Kazakhstan Research Institute of Livestock and Crop Production» LLP. The soil of the experimental plot is typical for black earths of forest steppe of North Kazakhstan - black earth is plain, medium-sum medium-weight, heavy and medium-carb.

Gross reserves of basic food elements in the black-earth soils of North Kazakhstan are high, however, most of them (especially phosphorus) are in a difficult state for plants. The soil of the test site is poorly provided with mobile phosphorus, medium - nitrogen, exchange potassium - high. Agrochemical properties of the soil of the test site are characterized by the following indicators (table 1)

Table 1 - Agrochemical characteristics of the soil of the experimental plot

Soil layer, cm	Humus content, %	Pн (H_2O)	gross, %			Movable mg / kg		
			nitrogen	phosphorus	potassium	$N\text{-}NO_3$	P_2O_5	K_2O
0-20	5,7	7,0	0,31	0,18	2,51	15,8	29	415
20-40	5,1	7,3	0,27	0,19	2,12	17,8	28	380
40-60	4,3	7,6	0,21	0,10	1,96	15,2	18	325
60-80	3,7	7,7	0,18	0,09	1,87	12,6	13	310
80-100	3,6	7,8	0,14	0,07	1,85	11,9	11	300

The climate of the region where the experiments were carried out is characterized by sharp continentality. The region is characterized by severe, long winters and hot, short summers. The average long-term temperature of July is + 20.2 °C, of January - 25.4 °C. The frost-free period lasts from 110 to 130 days. The sum of positive temperatures above 10 °C, at which the normal growth and development of annual herbs is observed, is in the range of 2100 °C. The duration of the period with daily average temperatures above 10 °C during 139 days. The average annual rainfall in the region ranges from 280-340 mm. During the growing season, May - August, 180-200 mm falls. This area is characterized by early spring drought, exacerbated by strong winds, which leads to severe desiccation of the soil. The following analyzes were used in the experiments: observations of meteorological conditions, analysis of soil moisture every 10 cm of the 0-100 cm layer during the sprouting period, phenological observations of the phases of plant development, plant density during the sprouting period by counting all plants from 3 meters to four internal rows on two non-adjacent replicates, the dynamics of the height of plants before harvesting by measuring 10 plants on four internal rows, on two non-adjacent replicates, taking into account the yield of green mass during harvesting, by cutting 15 cm all corn plants with 3 meters in four inner rows on each plot.

One field experiment was laid in 2-fold repetition with a total plot area of 240 m^2. The following were determined in soil samples: humus – according to Tyurin in the modification of Simakov; pH of an aqueous extract on a pH meter; total nitrogen - according to Kjeldan; nitrate nitrogen - by ion-selective method; phosphorus and potassium - according to Machigin (before sowing).

The initial moisture was determined in an oven at a temperature of 60-65 °C, moisture moisture - at 105 °C, crude fiber - according to Genneberg-Shtoman; crude fat - according to S.V. Rushkovsky; crude ash - ashing method at a temperature of 450-500 °C; total nitrogen - photocolorimetric method using the reaction of indophenol greens; phosphorus - vanadium molybdate method; potassium oxide - on a flame photometer; carotene in freshly collected Zirrel samples. The content of feed units was calculated according to chemical analyzes.

The soil of the experimental plot was treated according to the type of early winter fall as a flat-cutter with a KPG-2.2 deep-ripper to a depth of 20-22 cm. In winter, double snow retention was carried out, in spring - early spring harrowing in 2-3 traces to close moisture. Before sowing, soil treatment was carried out with the SZS-2.1 seeder and rolling with ZKK-6A ring-spur rollers.

Presowing treatment of corn seeds was carried out with liquid humate fertilizer "Kazuglegumus" in doses of 1 ml / kg, 3 ml / kg, 10 ml / kg according to the following scheme (table 2).

Table 2 - The Impact of humate fertilizer "Kazuglegumus" on the productivity of corn hybrids

Fertilizer dose	Hybrid corn	
	MV 170	MV 270
Control	+	+
Kazuglegumus 1 ml / kg + 1 l / ha + 1 l / ha	+	+
Kazuglegumus 3 ml / kg + 1.5 l / ha + 1.5 l / ha	+	+
Kazuglegumus 10 ml / kg + 2 l / ha + 2 l / ha	+	+
Note: 1 dose - seed treatment, 2 dose - the first foliar top dressing, 3 dose - the second foliar top dressing		

At the time of sowing (May 20, 2019), the supply of productive moisture in the meter soil layer was 95-101 mm. Corn was sown with the SON-2.8A seeder with 70 cm aisle. Seeding depth of 5-6 cm, seeding rate - 75 thousand seeds / ha. After sowing, the plot was rolled in for better contact of the seeds with the soil. To destroy germinating weeds and destroy the soil crust, pre-emergence and post-emergence harrowing was carried out with light harrows across the rows at a low tractor speed. With the appearance of 5-7 leaves, inter-row processing of corn was carried out to a depth of 5-6 cm to further destroy weeds.

The first foliar treatment was carried out in the phase of 6-8 leaves, the second - in the phase of sweeping corn plants. Foliar treatment of corn with a backpack sprayer was carried out by spraying with fertilizer "Kazuglegumus" in doses of 1, 1.5 and 2 l/ha.

Results and discussion. Field germination of seeds was 64.8-78.1%.

Phenological observations on the phases of the development of corn showed that the use of potassium humate with trace elements had an effect when used at a dose of 3.0 and 10.0 ml/kg for seed treatment, and at a dose of 1.5 and 2.0 l/ha at the first and second foliar treatment.

The emergence of seedlings of corn plants of the hybrid MV 170 was noted in the control, in the second and third experiments on May 31, in the version with a maximum dose of 10 ml/kg, 2 l/ha, 2 g / ha on May 30, full germination in the control, in the second and third options - June 3, and in the fourth experiment a day earlier - June 2 (figure 1).

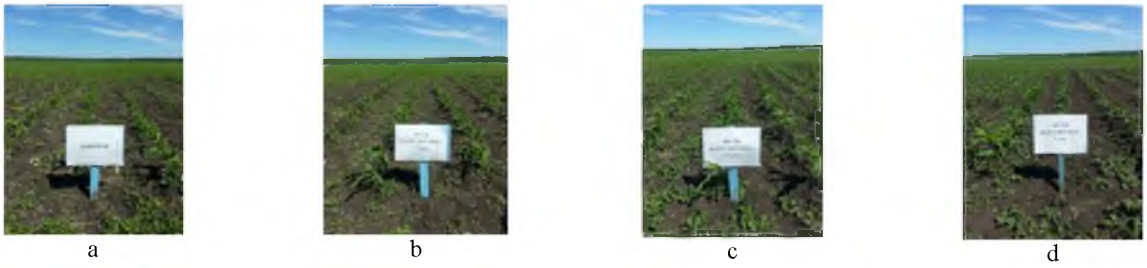

Figure 1 - Seedlings of corn plants of the hybrid MV 170 when treated with different doses of fertilizer: a - control, b) 1 l / ha, c) 1.5 l / ha, d) 2 l / ha

The emergence of seedlings of corn plants of the hybrid MV 270 was noted in the control, in the second and third experiments - on June 1, and in the fourth experiment two days earlier - on May 31, full seedlings in the control and in the second and third variants - June 6, and in the fourth experience - June 4 (figure 2).

Figure 2 - Seedlings of corn plants of the hybrid MV 270 when treated with different doses of fertilizer: a - control, b) 1 l / ha, c) 1.5 l / ha, d) 2 l / ha

General data on the results of phenological observation of corn plants of the hybrid MV 170 in experiments on the use of fertilizer "Kazuglegumus" are presented in table 3.

Table 3 - Phenological observations of the growth and development of corn plants of the hybrid MV 170

Hybrid name	Sowing	shoots		Sweeping	Bloom	Ripeness		
		beginning	full			dairy	wax	full
Control	20/05	31/05	03/06	24/07	7/08	07/09	-	-
Kazuglegumus1 ml / kg + 1 l / ha + 1 l / ha	20/05	31/05	03/06	24/07	7/08	07/09	-	-
Kazuglegumus3 ml / kg + 1.5 l / ha + 1.5 l / ha	20/05	31/05	03/06	23/07	7/08	07/09	-	-
Kazuglegumus 10 ml / kg + 2 l / ha + 2 l / ha	20/05	30/05	02/06	21/07	5/08	04/09	-	-

As can be seen from table 3, the phase of emergence of the corn hybrid of MV 170 into the tube of plants of corn was noted in the control and second experiment – June 29, in the third experiment – one day, and in the fourth experiment – three days earlier. The sweeping phase of this hybrid in the control and second experiment was recorded on July 24, in the third experiment - a day earlier, in the fourth experiment - three days earlier. The flowering phase was observed on August 7 in the control, the second and third experiment, and in the fourth experiment two days earlier. The phase of dairy ripeness was noted on September 7 in the control, the second and third experiment. In the fourth experiment, where the maximum dose of humate fertilizer was used, this phase occurred three days earlier.

Generalized data on the results of phenological observation of corn plants of the hybrid MV 270 in experiments on the use of fertilizer "Kazuglegumus" are shown in table 4.

Table 4 - Phenological observations of the growth and development of corn plants of the hybrid MV 270

Hybrid name	Sowing	shoots		Sweeping	Bloom	Ripeness		
		beginning	full			dairy	wax	beginning
Control	20/05	01/06	04/06	28/07	13/08	13/09	-	-
Kazuglegumus 1 ml / kg + 1 l / ha + 1 l / ha	20/05	01/06	04/06	28/07	13/08	13/09	-	-
Kazuglegumus 3 ml / kg + 1.5 l / ha + 1.5 l / ha	20/05	01/06	04/06	28/07	13/08	13/09	-	-
Kazuglegumus 10 ml / kg + 2 l / ha + 2 l / ha	20/05	31/05	03/06	25/07	9/08	11/09	-	-

The sweeping phase of this hybrid in the control, second and third variants were observed on July 28, in the fourth experiment - three days earlier. The flowering phase was noted on August 13 in the control; in the second and third experiments, this phase occurred one day, and in the fourth experiment, four days earlier. The onset of the phase of milk ripeness was recorded on September 15 in the control, in the second and third experiments - in two, and in the fourth experiment, where the maximum dose of humate fertilizer was used, - four days earlier.

At the time of harvesting, corn plants in all experimental plots, incl. and control, were in the phase of milk ripeness, which is associated with prolonged precipitation, which prevented the achievement of the phase of wax ripeness.

When determining the standing density of seedlings of corn plants MV 170 and MV 270, the presence of a relationship and a direct dependence of the dose of fertilizer on the standing density of plants during seedlings were revealed (table 5).

Table 5 - The density of the corn plant during the germination period, depending on the dose of fertilizer

Fertilizer dose	MV 170		MV 270	
	standing density pcs / m^2	± to control, %	standing density pcs / m^2	± to control, %
Control	6,9	-	6,8	-
Kazuglegumus 1 ml / kg + 1 l / ha + 1 l / ha	7,1	2,8	6,8	-
Kazuglegumus 3 ml / kg + 1.5 l / ha + 1.5 l / ha	7,1	2,8	6,9	1,4
Kazuglegumus 3 ml / kg + 1.5 l / ha + 1.5 l / ha	7,2	4,2	7,1	4,2

As can be seen from table 5, the best indicator of plant stand density for seedlings of the hybrid MV 170 for seedlings is 7.2 pcs / m^2, and for the hybrid of MV 270 - 7.1 pcs / m^2, with a fertilizer dose of 10 ml / kg, 2 l / ha and 2 l / ha, which exceeds the control by 4.2%.

A direct correlation was also found between the increase in the dose of fertilizer and the indicator of the height of corn growth (table 6).

Table 6 - Plant height of corn hybrids depending on the dose of fertilizer "Kazuglegumus"

Fertilizer dose	hybrid MV 170			hybrid MV 270		
	height	± to control		height	± to control	
		cm	%		cm	%
Control	164,8	-	-	179,3	-	-
Kazuglegumus 1 ml / kg + 1 l / ha + 1 l / ha	171,2	6,4	3,9	189,8	10,5	5,8
Kazuglegumus 3 ml / kg + 1.5 l / ha + 1.5 l / ha	172,7	7,9	4,8	193,2	13,9	7,7
Kazuglegumus 10 ml / kg + 2 l / ha + 2 l / ha	177,5	12,7	7,7	198,5	19,2	10,7

As can be seen from table 6, the hybrid MV 170 has the highest indicator of plant height in the fourth embodiment. It is equal to 177.5 cm, the difference with the control is 12.7 cm. Hybrid MV 270 the best indicator of height is also noted in the experiment with the maximum dose of potassium humate. It was 198.5 cm, which is 19.2 cm higher than the benchmarks

Analysis of the yield of feed units per hectare of sown area showed that according to this indicator, the best results were revealed according to the results of the fourth experiment, where doses of fertilizer "Kazuglegumus" were applied at 10.0 ml / kg for seed treatment, and 2.0 l / ha during the first and second foliar treatment (table 7).

Table 7 - The output of feed units of corn hybrids depending on the dose of humate fertilizer

Fertilizer dose	MV 170			MV 270		
	productivity green m., c / ha	Sod. in 100 kg green m., feed. units	feed output. units, t / ha	productivity green m., c /ha	Sod. in 100 kg green m., feed. units	feed output. units, t / ha
Control	216,5	23,1	50,9	247,3	23,5	61,7
Kazuglegumus 1 ml / kg + 1 l / ha + 1 l / ha	246,4	23,4	58,7	275,5	23,6	70,5
Kazuglegumus 3 ml / kg + 1.5 l / ha + 1.5 l / ha	263,6	23,6	63,0	294,0	23,9	76,3
Kazuglegumus 10 ml / kg + 2 l / ha + 2 l / ha	275,6	23,5	65,7	301,9	23,7	80,3

As can be seen from table 7, a higher yield of feed units per hectare was obtained in the fourth version of the experiments on both hybrids, which amounted to 65.7 c / ha for the hybrid MV 170, and 80.3 c / ha for the MV 270 hybrid.

Conclusion. The Kazuglegumus fertilizer had a positive effect on the productivity of maize hybrids. The highest yield of green mass of the hybrid MV 170 of 275.6 c / ha was obtained in the fourth group, where the plants were treated with fertilizer at a dose of 10 ml / kg, 2 l / ha, 2 l / ha. The same regularity was also observed in the hybrid MV 270, where the maximum green mass yield was 301.9 c / ha. The high dry solids in both maize hybrids was positively influenced by the dose of humate fertilizer at 3 ml / kg 1.5 l / ha, 1.5 l / ha. In the MV 170 hybrid, it was 34.5, and in the MV 270 hybrid 34.7%.The highest yield of feed units per hectare was obtained for both maize hybrids in the fourth experimental version when treating plants with Kazuglegumus fertilizer at a dose of 10 ml / kg, 2 l / ha, 2 l / ha and amounted to 65.7 c / m in the hybrid MV 170 ha, the hybrid MV 270 - 80.3 c / ha.

It is worth noting the fact that corn plants of both hybrids during the growing season were not susceptible to any diseases inherent in this type of plant, although corn was also the precursor. In the course of the experiments, the optimal effective dose of humate fertilizer was determined: for pre-sowing treatment of corn seeds - 10 ml / kg, for the next two foliar dressings - 2 l / ha and 2 l / ha, respectively. The use of potassium humate with trace elements in the form of humate fertilizer "Kazuglegumus" stimulates plant immunity and prevents the death of corn plants from specific diseases

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СОЛТҮСТІК ҚАЗАҚСТАН ӨҢІРІНДЕ ЖҮГЕРІ БУДАНДАРЫНЫҢ ӨСІМІНЕ, ДАМУЫНА ЖӘНЕ ӨНІМДІЛІГІНЕ ГУМИН ҚЫШҚЫЛЫНЫҢ ӘСЕРІН ЗЕРТТЕУ

Аннотация. Гумин қышқылдарының биологиялық белсенділігі ауылшаруашылығы дақылдарының алуан түрінде дәлелденген. «Казуғлегумус» отандық препаратының құрамында C–O, C–O, C-NH функционалды топтар мен суда еритін металл орғаникалық хелатты кешендері бар, ауылшаруашылығы дақылдарының өнімділігін арттыру үшін ұсынылған тыңайтқыш. Авторлар Қазақстанның солтүстік аймағындағы жүгері будандарының өсімі мен өнімділігіне, тотыққан қоңыр көмірден алынған отандық орғаноминералды тыңайтқыштарды қолданудың тиімділігін зерттеу нәтижелерін ұсынған. Топырақтың агрохимиялық қасиеттері зерттелді, өсімдіктердің даму фазалары бойынша фенолоғиялық бақылау

жүргізілді, егін жинау кезеңінде жасыл массаның шығымдығы есепке алынды, жемге зоотехникалық талдау жүргізілді. Егіс тәжірибесі 2019 жылы «Солтүстік Қазақстан малшаруашылығы және өсімдікшаруашылығы ҒЗИ» ЖШС-де MV 170 және MV 270 Венгр селекциясы буданында жүргізілді. Жүгерінің даму фазасы бойынша фенологиялық бақылау микроэлементтері бар калий гуматын қолданылу, жүгері буданының өсімі мен дамуына, өнімділігі мен шығымдығын арттыруға ынталандырушы әсер ететінін көрсетті.

Жүгері тұқымын себу алдында өңдеу үшін «Казуглегумус» гуматты тыңайтқыштың оңтайлы тиімді дозасы және одан кейінгі тамырдан тыс қоректендіру анықталды. «Казуглегумус» сауда маркасындағы отандық калий гумат препараты – ауылшаруашылығы дақылдарының өнімділігін арттыру үшін ұсынылатын ісіну және шетелдік тыңайтқыштар тізбегіндегі жаңа бренд. Фульв қышқылы және гумин қышқылымен күрделі комбинацияда тірі агзаны сауықтыру бойынша биожетімді кешен құрайды. Құндылығы 70-тен астам түрлі компонентті минерал, 20-дан астам амин қышқылы, витамин, табиги полисахарид, стерин, гормон, майлы қышқыл, өсімдік пигменттері (флавоноид) және табиги антиоксиданттарга (катехиндер) байланысты.

Осы кешен құрамында табигитекті стероидты емес фитоэстрагендер – изофлавоноидтар, сондай-ақ хинонды антибиотиктерінің қасиеттері бар және басқа да пайдалы компоненттер табылды. Биологиялық белсенді заттардың мұндай концентрациясы гумин қышқылдарының тірі организмдерге оң әсерінің алуан түрлілігін тудырады.

«Казуглегумус» калий гуматы негізіндегі отандық органоминералды тыңайтқыш (ОМУ) – қоңыр көмірді тотықтыру арқылы алынган қара қоңыр түсті субстанциясы. Тыңайтқыштарды өндіру технологиясын «Көмір химиясы және технология институты» ЖШС авторлық ұжымы және «Казтехноуголь» ғылыми-өндірістік бірлестігі» ЖШС өндірушісі әзірледі.

Бұл технология ультрадисперсті мицеллаларды алуға мүмкіндік беретін ультрадыбыс және ауа оттегінің Б2 маркалы тотыққан қоңыр көмірге бірлескен әсеріне негізделген. Алынған өнім бөлшектерінің мөлшері өсімдіктердегі кеуектердің өлшемінен әлдеқайда аз, бұл өсімдіктер ағзасына тез енуге ықпал етеді. Осылайша алынған калий гуматы құрамында C–O,C–OH, c - NH функционалды топты суда еритін металл органикалық хелатты кешендері бар.

Түйін сөздер: тамырдан тыс қөректендіру, калий гуматы, жүгері, казуглегумус, тұқымды алдын ала өңдеу, өнімділік, тыңайтқыш, көмір, фенологиялық бақылау.

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ВЛИЯНИЕ ГУМИНОВОЙ КИСЛОТЫ НА РОСТ, РАЗВИТИЕ И ПРОДУКТИВНОСТЬ ГИБРИДОВ КУКУРУЗЫ В УСЛОВИЯХ СЕВЕРНОГО КАЗАХСТАНА

Аннотация. Биологическая активность гуминовых кислот доказана на различных видах сельскохозяйственных культур. Отечественный препарат «Казуглегумус» – удобрение, предлагаемое для повышения урожайности сельскохозяйственных культур, содержащее водорастворимые металлоорганические хелатные комплексы со свободными C–O,C–OH, C-NH функциональными группами. Авторами представлены результаты изучения эффективности применения отечественного органоминерального удобрения, полученного из окисленного бурого угля, на рост и продуктивность гибридов кукурузы в северных регионах Казахстана. Изучены агрохимические свойства почвы, проведены фенологические наблюдения по фазам развития растений, учет урожайности зеленой массы в период уборки урожая, зоотехнический анализ кормов. Полевые опыты проводились в 2019 году в ТОО «Северо-Казахстанский НИИ животноводства и растениеводства» на гибридах венгерской селекции MV 170 и MV 270. Фенологические наблюдения по фазам развития кукурузы показали, что применение гумата калия с микроэлементами оказывает стимулирующий эффект на рост и развитие гибридов кукурузы, повышение ее продуктивности и урожайности в условиях лесостепи Северного Казахстана.

Определена оптимальная эффективная доза гуматного удобрения «Казуглегумус» для предпосевной обработки семян кукурузы и последующих внекорневых подкормок. Отечественный препарат гумата калия под торговой маркой «Казуглегумус» – новый бренд в линейке отечественных и зарубежных удобрений, предлагаемый для повышения урожайности сельскохозяйственных культур. В сложной комбинации с фульвовой кислотой, гуминовые кислоты образуют биодоступный комплекс по оздоровлению живого организма. Его ценность обусловлена наличием более 70 различных компонентов из минералов, более 20 аминокислот, витаминов, природных полисахаридов, стеринов, гормонов, жирных кислот, растительных пигментов (флавоноиды), природных антиоксидантов (катехины).

В составе данного комплекса обнаружены нестероидные фитоэстрагены натурального происхождения – изофлавоноиды, а также, обладающие свойствами антибиотиков хиноны и прочие полезные компоненты. Такая концентрация биологически активных веществ обуславливает многообразие положительного влияния гуминовых кислот на живые организмы.

Отечественное органоминеральное удобрение (ОМУ) на основе гумата калия «Казуглегумус» – субстанция темно-коричневого цвета, полученная путем окисления бурого угля. Технология производства удобрения разработана авторским коллективом ТОО «Институт химии угля и технологии» и производителем ТОО «Научно-производственное объединение «Казтехноуголь».

Технология основана на совместном воздействии на окисленный бурый уголь марки Б2 ультразвука и кислорода воздуха, приводящем к получению ультрадисперсных мицелл. Размеры частиц полученного продукта намного меньше, чем размеры пор в растениях, что способствует к быстрому проникновению в организм растений. Полученный таким образом гумат калия содержит себе водорастворимые металлоорганические хелатные комплексы со свободными С–О,С–ОН, С- NH функциональными группами.

Ключевые слова: внекорневые подкормки, гумат калия, кукуруза, казуглегумус, предпосевная обработка семян, продуктивность, удобрение, уголь, фенологические наблюдения.

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