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PRODUCTIVITY OF SUGAR BEET DEPENDING ON APPLICATION OF EXTRAORDINARY SUB-CODE AND IRRIGATION REGIME ON FLOUR SEEDS OF SOUTH KAZAKHSTAN

Abstract. The article summarizes the results of 3-year scientific research works (2015-2017) and a modern solution to the problems of sugar beet yield increase based on application of basic and foliar top dressing and irrigation regime in meadow gray soils of the South of Kazakhstan.

Key words: sugar beet, basic, foliar top dressing. Liquid fertilizer, kas, novosil, humate, application dose, irrigation regime, yield of root crops, collection of sugar.

Introduction. One of the priority technical crops for the South and South of the East of the Republic is sugar beet, which has a high potential for productivity. This Culture is the only source of local raw materials for sugar production in Kazakhstan. An analysis of the current situation with the production of sugar beet has shown that the crop of this crop in recent years is at a level of 150-240 c / ha. This testifies to the extremely inadequate realization of the potential of this valuable culture, the low level of technology for its cultivation, the insufficient application of agro-technological and chemical measures to combat weed vegetation.

In the context of a decline in the cropping economy, a reduction in the volume of use against the backdrop of shortage of working capital and capital investments, the authors suggest creating a favorable and, first of all, reviving crop rotations, with a short rotation, with a set of priority crops for the regions, taking as a basis new agrotechnologies in highly productive varieties and means of plant protection and are new farms of fertilizers and plant growth regulators.

The choice of fertilizer from the commercially available assortment should be reduced to the definition of such a form, the use of which will be cheaper compared to others and at the same time to ensure the greatest possible increase in yield.

The novelty and practical significance of the work consists in the fact that in the Zhambyl region, in the meadow-gray soils with close groundwater occurrence in short rotary beet crop rotations, the influence of liquid forms of fertilizers (karabamide-ammonium nitrate) CAS and regulators of the plant company (PPP) novosilogamat and irrigation regime for the yield and sugar content of sugar beet. The growth regulator, regardless of the chemical composition, has a close mechanism of action at the level of physiological reactions, activates plant growth, increases the accumulation of biomass due to more active growth of the leaf apparatus by optimizing the irrigation regime.

Conditions and methods of research. The humus content in the plow layer is 1.40-1.59%, total nitrogen 0.106%, and the total phosphorus 0.135-0.153%. The content of nitrates (NO_3) is 22.1; mobile phosphorus (P_2O_5) - 29.3 and exchangeable potassium (K_20) - 302.6 mg / kg soil.

According to the classification of NA. Kachinsky this soil belongs to medium loams. The bulk density is 1.30-1.50 g / cm^3, the specific gravity is 2.50-2.57 g / cm^3, the limiting moisture capacity (PPV) is 18.6-19.5%. The reaction of the soil solution is slightly alkaline, pH is 7.2-7.3.

Field experiments on the use of new forms of liquid fertilizers and biopreparations of a new generation in order to obtain optimal yields of sugar beet were carried out by meadow-serozem soils. The level of occurrence of groundwater to a depth of 100-120 cm.

Table 1 – Scheme of experience

#	1	2	3	4	5	6	7
Options	Without	$N_{150}P_{120}R_{90}$	КАС -	КАС -	КАС -	Новосил -	Новосил -
	Fertilizers	(fon)	0,5 l / ha	0,7 l / ha	1,0 l / ha	20 l / ha	40 l / ha
	(control-1)	(control-2)	3 times	3 times	3 times	3 times	3 times
#	14	13	12	11	10	9	8
Options	fon + Гумат	fon + Новосил	fon +Кас-	Gumat-	Gumat-	Gumat-	Новосил-
	40 g / ha	40 g / ha	-0,7 g / ha	80 g / ha	40 g / ha	20 g / ha	60 g / ha
	3 times	3 times	3 times	3 times	3 times	3 times	3 times

The experiment is laid down in the above scheme in 3-fold repetition (table 1). The plot size is 100 m^2, the total area is 1 hectare. Sowing variety of sugar beet of French selection. Avantage. In carrying out the field experiment, they were guided by methodological provisions [1] and P.N. Konstantinova, B.A. Armor "method of research on sugar beet VNISS" [2]. Agrotechnical experience on the recommendation of 1976, 1988, 1994 adopted [3-5].

Aqueous solutions of biostimulators were prepared immediately before their use. Spraying of sugar beet plants was carried out with a backpack sprayer with a rate of application of working fluid of 250 liters / ha.

The first treatment with regulators was carried out by closing the beet leaves in rows, the second before closing the leaves in interrow rows, the third before harvesting (30 days prior to harvesting).

Results of the study and their discussion. Growth of plants is a complex and at the same time a well-organized and harmonious process. Back in 1880, Sachs proposed the existence of "chemical messengers", which coordinates the growth between different parts of the plant. A real springboard to the identifications of these messengers, which were called phytohormones (from the Greek phyton-plant hormoo-induce) was the book Darwin (1881) "The power of movement in plants".

Natural growth regulators are produced by the plants themselves, these are the so-called endogenous phytohormones. In very small concentrations, they stimulate or inhibit growth processes. This was known more than 100 years ago. At the beginning of the last century, D.N. Nalyubov discovered the compound - ethylene, which inhibited the growth of plants. In the mid-20-ies Academician N.G. Cold in Germany published a work on plant regulation. [6].

And artificially it is possible to create preparations of complex action, which in some cases show useful qualities of several groups of phytohormones [7].

In the North-Caucasian branch of VNIS (1982-1984), the effectiveness of HCS on foliar top dressing of sugar beet was studied. Studies have shown that the most effective was a two-fold feeding of beets with an aqueous HCA solution in a ratio of 1: 1 with a working fluid flow rate of 100 liters/ha. The sugar content of the root crop increased on average over three years - by 0.7%, an increase in the yield of 2.1 tons / ha, and the collection of sugar by -0.62 tons / ha. [8].

The highest yields against microfertilizers were noted in the conditions of the Vinitsa region of Ukraine - 51.5 t/ha with a sugar content of 18.3% [9].

According to the data of [10] in Russia only humic preparations of albite, novosil, biosil, larixin, milivalikatsin, epin, zircon are widely used from the whole range of registered PPPs. Humates are sodium or potassium salts of humic acids, which are isolated from humic substances of natural organic biocose formations such as chernozem, peat, coal, sapropel, slate.

The movement of water and nutrients from the root system to the aerial organs and plastic substances coming from the root system into the above-ground organs and plastic substances moving from the leaves to the root system occurs through the root crop. Therefore, in the first year of life, as the root crop develops, it has an increasing influence on the nature and intensity of metabolism in both directions.

Moving from the root system, the water completely saturates the tissues of the root crop, and then the above-ground organs. Therefore, the root crop adapts to increased water supply and nutrition, so that it tolerates even the smallest dehydration of tissues. When drought, the growth of the root crop stops, and it intensively draws water and plastic substances from the above-ground organs. With a lack of water, the juicy tissues of the root crop begin to lignify before the temporary drying of the leaf mass and a decrease in the photosynthetic potential.

Therefore, during cultivation it is very important to maintain uninterrupted moistening of the soil.

Proceeding from the above stated, the optimal irrigation regimes for the growing season of sugar beets were constantly adhered to. With this irrigation regime, inter-row cultivation during the growing season is no longer [3,4] when sowing on the width of the rows of 60 and 45 cm, but only cutting irrigation furrows for the first and second irrigation of sugar beet.

Therefore, the number of irrigation was increased to 12 times, so that before irrigating soil moisture during the vegetation period was maintained at a level of 75.0-80% of PPV. The inter-irrigation period at the beginning of the vegetation period was 10-12 days, in the middle of 8-9 days and at the end of 10-12 days. The irrigation norm was 550-600, and the vegetable norm was 6600-7200 m^3/ha (table 2).

Table 2 – Regime of irrigation of sugar beet during the vegetative period on experimental crops, depending on the maximum field moisture capacity of the soil

Number of irrigation / Timing of watering	1	2	3	4	5	6	7	8	9	10	11	12
1. Timing of watering (day of the month)	10.06	19.06	29.06	08.07	18.07	26.07	04.08	15.08	26.08	07.09	18.09	02.10
2. Pre-irrigation soil moisture (h-30 cm), %	14,8	15,0	15,5	15,8	15,7	15,8	16,0	16,0	15,6	15,6	15,6	15,6
3. Maximum field humidity (PWV), %	75,8	76,9	79,5	81,0	80,5	81,0	82,5	82,5	80,0	80,0	80,0	80,0
Note: Inter-row cultivation of the soil during the vegetation period was not carried out, but only cutting of irrigation furrows was performed before the first and second irrigation.												

Such irrigation regimes of sugar beet in Kazakhstan are given in the works "Irrigation of sugar beet in Kazakhstan" [11].

Sowing of sugar beet was carried out from 3 May with an inter-row spacing of 60 cm. The duration of the seed-sprouting period is 12-14. According to the variants of the experiment, the first, second and third pairs of leaves were noted on May 17-21-26 with fluctuations 2-3 days earlier than between variants with fertilized and background compared to without fertilization.

The number of plants after hollow shoots was in the range of 6 to 9 plants per 1 linear meter of row, and after formation the number of plants varied from 4-5 plants 1 linear meter row.

The first period of vegetation (01.07.), The maximum mass of sugar beet leaves was noted for variants von + humate 40 g / ha, background + cass - 0.7 l / ha, and background + novosil - 40 g / ha. accordingly was 855; 850 and 843 g / plant, and on the control - 2 (N150P120P90) - 810 g / plant. On the variant (without fertilizers), only foliar top dressing of humate-40 g / ha, ca.-0.7 l / ha. novosil - 40 g / ha. respectively, amounted to 750, 700 and 710 gr / plants, and on control - without outside the root feeding - 650 gr. 1 plant.

The maximum growth of leaf mass in the second vegetative period (01.08) was noted in the variants with foliar top dressing of ca. 0.7 l / ha, novosil-40 g / ha, humate-40 g / ha, and background + 0,7 l / ha, Background + humate - 40 g / ha, iphone + novosil-40 g / ha, accordingly was 736; 728; 850; 1030; 1040 and 1020 g / plant.

In the third (01.09) and in the fourth (01.10) term, the total weight of plant leaves gradually decreases in all variants of the experiment, and the increase in the above variants increases during the vegetation period, mainly, respectively, 490; 460; 500; 695; 680 and 710 gr. 1 plant or leaf growth, respectively, 16.7; 9.5; 19.0; 21.9; 24,6 and 19,3% more than from control - 1 and 2 (table 3).

Table 3 – Dynamics of the increase in the mass of sugar beet leaves, depending on the use of KAS and biopreparations of a new generation (average from 1 plant gr.)

#	Options	Date of sampling, + Dynamics of accumulation							+ from controls	
		01.07	01.08	+,- growth	01.09	+,- growth	01.10	+,- growth	Гр.	%
1	Без удобр. К - 1	650	710	+60	477	-233	420	-57	–	–
2	$^{N}150^{P}120^{K}90$ (фон) К-2	810	940	+130	890	-50	570	-320	150	35,7
3	КАС - 0,5 л/га	660	715	+55	551	-164	484	-67	64	15,2
4	КАС - 0,7 л/га. 3 times	700	736	+36	570	-166	490	-80	70	16,7
5	КАС - 1 l/ha	680	720	+40	580	-140	460	-120	40	10,7
6	Novosil - 20 g/ha, 3 times	670	726	+64	558	-168	446	-112	26	6,2
7	Novosil - 40 g/ha 3 times	685	728	+43	575	-153	460	-115	40	9,5
8	Novosil - 60 g/ha 3 times	710	750	+40	583	167	456	-127	36	8,6
9	Gumat - 20 g/ha 3 times	720	800	+80	594	-206	466	-128	46	10,9
10	Gumat - 40 g/ha 3 times	750	850	+100	586	-264	500	-86	80	19,0
11	Gumat - 80 g/ha 3 times	755	863	+108	580	-283	510	-70	90	21,0
12	Fon + КАС - 0,7 lg/ha.	850	1030	+180	969	-61	695	-174	125	21,9
13	Fon + Novosil - 40 g/ha 3 times	843	1020	+177	950	-70	680	-270	110	19,3
14	Fon + Gumat - 40 g/ha 3 times	855	1040	+185	1010	-30	710	-300	140	24,6

The first period of vegetation (1-term 01.07), the largest mass of sugar beet root crops was noted for variants (K-2) N150P120K90 + top dressing with a background rate + guum-40 g / ha, background + CAS-0.7 l / ha. And the background + novosil-40 g / ha. respectively 567; 576 and 550 gr. or the daily increase was 12.5; 12,7 and 12,2 gr., And on a background without basic fertilizers on variants KAS-0,7 l / hectare. -40 g / ha. the root mass of 1 plant has 293; 283 and 293 gr., And the daily increment of 1 root is equal to 6.5; 6,3 and 6,5 gr., And on the control-245 and 5,4 gr. respectively.

It should be noted that both the leaf mass (Table 3) and the root mass in the second period (01.08) of the vegetation of sugar beet reaches a maximum of 40 g / ha in von + humate, background-CAS-0.7 l / ha. and background + novosil-40 g / ha. the mass of 1 root crop reaches 1087; 1024 and 1090 grams. or the daily increase was 17.3; 14.9 and 15.0 grams. and on the control - 668 and 13.3 gr. respectively, and subsequent terms (01.09 and 01.10) of the determination of the root growth are gradually reduced in the variants of background + humate, background + CAS and background + novosil 5.0-2.7; 4,0-2,8 and 4,3-2,7 gr. per day, and on variants without basic fertilizers KAS-0,7 l / ha, novosil-40gr / ha and Humat-40 g / ha. and was 4.0-1.8; 3,2 and 1,8 and 3,0 - 1,7 gr. per day, and at the control 2: 8 and 1.8; 3,5 and 2,0 gr. per day, respectively (K-2 and K-1) (Table 4).

So, as against the background of mineral fertilizers, the root mass of 1 root vegetable with foliar top dressing 3 times for humate 40 g / ha. 1 novosil-40 g.ha and KAS-0.7 l / ha, the increase was 234; 131 and 96 gr. or 20.1; 11.9 and 8.3%, and on the basis of the above-mentioned options, the increase was 113; 121 and 150 gr. or 18.3; 19.8 and 24.6%, respectively, compared to the control of K-2 and K-1.

One of the most important directions for the further rise of agricultural production in beet-growing agro-formations is a scientifically-based fertilizer system developed taking into account local soil-climatic conditions, as well as ecological features of culture.

An effective way to increase the productivity of sugar beet, which is widely used at present, is carrying out foliar top dressing by plant growth regulators.

Humaton - sodium and potassium salts of humic acids. Humaton and humic acids are the chemical basis of humus. Humic acids in a place with carbon dioxide dissolve minerals and contribute to the release of nutrients. The composition of the CAS includes a mixture of carbamide - 35.4%, ammonium nitrate - 44.3%, water 19.4%, ammonia water - 0.5%.

Average for the period 2015-2017gg. the density of standing of plants for harvesting in variants treated with PPP was 3.1-4.3 thousand plants more than that of control, and was in the variants with KAS-0.5 l / ha -63.9, novosil 60 g / ha. - 64.9; humate-40 g / ha. - 67,6 thousand plants per hectare.

Table 4 – Dynamics of the increase in the mass of root crops of sugar beet, depending on the use of CAS and biopreparations (per plant gr.)

#	Options	Date of sampling, + Dynamics of accumulation							Addition and control of gr. %	
		01.07	01.08	+,- growth	01.09	+,- growth	01.10	+,- growth		
1	Without fertilizer. K-1	245 / 5,4	445	200 / 7,1	550	105 / 3,5	610	60 / 2,0	–	–
2	$^{N}150^{P}120^{K}90$ K-2	268 / 6,1	668	400 / 13,3	1,068	850 / 2,6	1,153	55 / 1,8	540	89,0
3	КАС-0,5 л/га. 3 times	303 / 6,7	553	250 / 8,3	658	95 / 3,2	713	55 / 1,8	103	16,9
4	КАС - 0,7 л/га 3 times	293 / 6,5	585	292 / 9,7	706	121 / 4,0	760	54 / 1,8	150	24,6
5	КАС - 1 л/га 3 times	287 / 6,4	590	303 / 10,1	700	110 / 3,7	758	58 / 1,9	148	24,5
6	Novosil - 20 g/ha 3 times	316 / 4,8	586	270 / 9,0	681	95 / 3,2	731	50 / 1,7	121	19,8
7	Novosil - 40 g/ha 3 раза	283 / 6,3	583	300 / 10,0	678	95 / 3,2	731	53 / 1,8	121	19,8
8	Novosil - 60 g/ha 3 times	280 / 6,2	576	290 / 9,7	672	96 / 3,2	722	50 / 1,7	112	18,4
9	Gumat - 20 g/ha 3 times	270 / 6,0	570	300 / 10,0	665	95 / 3,2	710	45 / 1,5	100	16,4
10	Gumat - 40 g/ha 3 times	293 / 6,5	583	290 / 9,7	673	90 / 3,0	723	50 / 1,7	113	18,3
11	Gumat - 80 g/ha 3 times	291 / 6,5	591	300 / 9,7	686	95 / 3,2	739	53 / 1,8	129	21,7
12	Fon + KAC 0,7 l/ha 3 times	376 / 12,7	1024	438 / 14,9	1144	120 / 4,0	1249	85 / 2,8	96	8,3
13	Fon + Novosil + 40 g/ha 3 times	550 / 12,2	1090	500 / 15,0	1220	130 / 4,3	1,290	70 / 2,3	13,7	11,9
14	Fon + Gumat - 40 g/ha 3 times	567 / 12,5	1087	520 / 17,3	1237	150 / 5,0	1,387 / 1,307	80 / 2,7	234	20,1

Note. In the denominator is a monthly increase, and the numerator is the daily increase in root crop, gr.

On the yield of root crops and sugar sugar beet harvest, plant growth regulators also had a significant effect. The highest yield and collection of sugar were obtained in variants with processing plants by growth regulators humate - 40 g / ha, novosil - 40 g / ha. and carbamide ammonium mixture - 0.7 l / ha along the background of mineral fertilizers 77.1; and 12.0; 71.0, 11.1; 69.8 and 10.9 t / ha or an increase of 12.9 and 2.0, respectively; 6.8 and 1.1 and 5.6 and 0.9 t / ha or 20.0; 11.0 and 9.0% more than the control variant (K-2), and on humate-40 g / ha, novosil-40 g / ha. and ca. 0.7 l / ha. on without basic backgrounds the yield of root crops was obtained and the collection of sugar 52.9 and 8.1; 51.5 and 8.0

and 48.7 and 7.6 t / ha, i.e. The increase in the yield of root crops and the collection of sugar amounted to 12.5 and 2.2; 11.9 and 2.1 and 9.3 and 1.7 tons / ha. or 30.9 and 36.7, respectively; 30.7 and 35.6; 23.6 and 28.8% more than in comparison with control-1 (table 5).

Table 5 – The productivity of sugar beet and the collection of sugar, depending on the use of liquid forms of fertilizers and biopreparations. (Data for 2015-2017)

#	Options	Density of the planting. thousand pieces/ha.	Root weight, gr.	Harvest, t / ha	Suga-riness %	Sugar collection t / ha.	Addition to			
							root crop		collection of sugar	
							t / ha	%	t / ha	%
1	Without fertilizer. Control 1	1.60,6 2.64,5*	65,3 62,5	39,4 40,4	15,0 14,85	5,9 6,0	- -	- -	- -	- -
2	$^{N}150^{P}120^{K}90$ Control 2	63,1	1,017	64,2	15,5	10,0	58,9	4,0		
3	КАС-0,5 l/ha 3 times	63,9	698	44,6	15,5	6,9	5,2	13,2	1,0	16,9
4	КАС-0,7 l/ha 3 times	63,7	765	48,7	15,6	7,6	9,3	23,6	1,7	28,8
5	КАС-1 l/ha 3 times	62,0	768	47,6	15,6	7,4	8,2	20,5	1,5	25,4
6	Novosil - 20 g/ha 3 times	63,1	748	50,5	15,4	7,8	11,1	21,2	1,9	32,2
7	Novosil – 40 g/ha. 3 times	63,6	809	51,5	15,5	8,0	11,9	30,7	2,1	35,6
8	Novosil – 60 g/ha. 3 times	64,9	798	51,8	15,4	7,8	12,4	31,4	1,9	32,2
9	* Gumat- – 20 g/ha 3 times	64,4	717	47,6	15,3	7,3	7,2	17,8	1,3	21,7
10	* Gumat- – 40 g/ha 3 times	67,6	782	52,9	15,3	8,1	12,5	30,9	2,2	36,7
11	* Gumat- – 80 g/ha 3 times	66,8	739	49,4	15,3	7,6	9,0	22,3	1,6	26,7
12	Фон +КАС- 0,7 l/ha 3 times	66,5	1,050	69,8	15,6	10,9	5,6	8,7	0,9	9,0
13	Фон+ Novosil -40 g/ha 3 times	65.2	1,089	71,0	15,6	11,1	6,8	10,6	1,1	11,0
14	Фон+ Gumat-– 40 g/ha 3 times	64, 1	1,203	77,1	15,6	12,0	12,9	20,1	2,0	20,0
*Average data for two years.										

Thus, the highest increase in the yield of root crops and the collection of sugar was obtained on the variants of foliar dressing of plants by the growth regulators of humate-40l / ha, novosila-40l / ha and carbamide-ammonium mixture-0.7l / ha on the background of mineral fertilizers respectively amounted to 12.9 and 2 , 0 6.8 and 1.1 and 5.6 and 0.9 t / ha, or 20.1 and 20.0; 10,6 and 11,0 and 8,7 and 9,0% more than from control-2, and in variants without basic fertilizers, the yield of root crops was increased and the collection of sugar accordingly was 12.5 and 2.2; 11.9 and 2.1 and 9.3 and 1.7 tons / ha. or by 30.9 and 36.7; 30.7 and 35.6; 23.6 and 28.8% higher than from control without fertilizers.

Conclusions. Optimum supply of irrigation water during the vegetative period of sugar beet within the limits of 70-80-70% of PPV, on fertilized and without fertilized background application of foliar top dressing of HCS and growth regulators provided high yields of root crops and sugar intake from 69.8 and 10.9 and to 77 , 1 and 12.0 t / ha. and 48.7 and 7.6 to 52.9 and 8.1 t / ha. respectively.

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ОҢТҮСТІК ҚАЗАҚСТАННЫҢ ШАЛҒЫНДЫ СҰР ТОПЫРАҒЫНДА ТАМЫРДАН ТЫС ҚОРЕКТЕНДІРУ МЕН СУҒАРУ РЕЖИМІНЕ БАЙЛАНЫСТЫ ҚАНТ ҚЫЗЫЛШАСЫНЫҢ ӨНІМДІЛІГІ

Аннотация. Мақалада 3-жылғы ғылыми-зерттеу жұмыстарының (2015-2017ж.) нәтижелері қортындыланып, Оңтүстік Қазақстан суғармалы шалғын сұр топырақты алқабында қызылша егісіне негізгі тыңайтқыштармен қатар жапырақ алаңына берілген сұйық тыңайтқыштардың және суғару режимдерінің қызылша өніміне тиімділігі зерттелген.

Түйін сөздер: негізгі тыңайтқыш, қосымша қоректендіру, сұйық тыңайтқыш, жапырақ арқылы, карбамидаминакселитра (КАС), жаңа күш, гумат, нормасы, суғару режимі, тамыр жемісі, қант өнімі.

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ПРОДУКТИВНОСТЬ САХАРНОЙ СВЕКЛЫ В ЗАВИСИМОСТИ ОТ ПРИМЕНЕНИЯ ВНЕКОРНЕВОЙ ПОДКОРМКИ И РЕЖИМА ОРОШЕНИЯ НА ЛУГОВО СЕРЕЗОМАХ ЮГА КАЗАХСТАНА

Аннотация. В статье обобщены результаты 3-х летних научно-исследовательских работ – (2015-2017 гг.) и своевременное решение задач по повышению урожайности сахарной свеклы на основе применения основные и внекорневые подкормки и режима орошения на луговых сероземах Юга Казахстана

Ключевые слова: сахарная свекла, основная, внекорневая подкормка, жидкое удобрение, касс, новосил, гумат, доза внесения, режим орошения, урожайность корнеплода, сбор сахара.

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