

## THE INFLUENCE OF BIOSTYMULATORS SULFONAMIDES CONCENTRATION, APPLIED IN DIFFERENT BIOPHASES, ON WINTER WHEAT PRODUCTION

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### Abstract

An experience in farm Ezăreni-Iasi organized in 2008-2011, on cambic chernozem soil, we studied the effect of biostymulators concentration (BCO - 4 DMA, BCO - 2 K; BCO - 2 K + acetate Zn) in three concentrations applied (50 ppm, 25 ppm, 12.5 ppm) in three biophases (twinning, bellows, flowering) for winter wheat, variety Boema. Climatic conditions were favorable for winter wheat in terms of temperature and rainfall, crop year 2010-2011 the most favorable for wheat. Averaged over three years, comparing yields with version control treated with water, the highest yield was achieved with biostymulators BCO-2 K + zinc acetate, with 6322 kg / ha, 26.16% difference is very significant. Comparing yields with BCO - 4 DMA (control variant 2) production increase was 11.14%, distinct significantly in the variant BCO - 2 K + zinc acetate. In the three years average the concentrations of 12.5 ppm and 25 ppm were found higher compared with the concentrations of 50 ppm. Between biophases application of growth regulators no registered statistically differences, which requires obtaining of similar production value. The interaction between factors showed that the best variant BCO - 2 K x 25 ppm x flowering, with an average of 6844 kg / ha, 11.77% higher than the production control variant (BCO - 4 DMA x 12.5 ppm x twinning). The biostymulators used were potassium salt of the acid-4-chloro-phenoxyacetic amidosulfonil (BCO - 4 K), without and with zinc acetate and dimethylamine salt of 4-chloro acid, 2-phenoxyacetic sulfonyl amide (BCO - 4 DMA) obtained of the Proff. C. Oniscu from the Technical University "Gh. Asachi" of Iasi.

**Key words:** biostymulators concentration, biophase, winter wheat

Increasing agricultural production, both quantitatively and qualitatively, is a key concern worldwide and in Romania, to ensure food safety and security of the population.

In the context of increasing the number over 7 billion people of Earth in 2011 and growing demand for raw materials for the industrialization of farming, agricultural development is a primary goal.

To increase the quantity and quality of wheat production, the main cereal bakeries are followed:

- technological measures on mechanization of process improvement, utilization of fertilizers and pesticides, ecosystems protection;
- use of new techniques in wheat crop, such as fertilization extraroot and use biostymulators;
- general, economic and social measures, such as rational use of land, provision of material resources, technical and financial cooperation at national and European level in this area (Bîlteanu Gh, 2003; Borlan Z., 1989).

All these have direct impact on quality of life in sufficient quantities and quality of food that can be obtained by using biodegradable stimulators, increasingly require sustainable agriculture (Gherghen I., et al., 1988; Goian M. 1986; Merlo L., Nuzzo, V., 1987; Neamtu G., F. Irimie, 1991).

Biostymulators application extraroot wheat has the following advantages (GOIAN M., 1986; Borina, AK, 1959; Oniscu C., 1993):

- prevents their immobilization in the soil;
- can be applied in different biophases of wheat;
- use small amounts of biostymulators;
- is applied in conjunction with other substances, for weed control or pest and disease control;
- apply modern means (airplane, helicopters etc.).

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## MATERIALS AND METHODS

The research was conducted on a cambic chernozem in the Ezăreni farm in 2008-2010.

The soil that had experienced a pH of 7.49 per depth 0-15 cm, humus 3.42%, 0.188% total nitrogen, 101 mg and 594 mg KAL PAL to 100 g soil. In the crop year 2008-2009 temperatures recorded exceeded the annual average of 2°C and rainfall was 162 mm lower. The agricultural year 2009-2010, the period october 2009 - july 2010 exceeded the annual average temperature recorded with 0.76°C and rainfall exceeded the annual average of 68.6 mm, since wheat is more favorable than before. In 2010-2011 rainfall was 40.4 mm lower than the annual average, but were distributed more evenly on critical biofazele asle wheat, recorded the highest production caripose in all variants investigated.

Experience has been placed in subdivided parcels, with four repetitions, with the following factors:

Factor A - Biostimulators with three graduations:

- a<sub>1</sub> - BCO-4DMA biostimulators
- a<sub>2</sub> - BCO-2 K biostimulators
- a<sub>3</sub> - BCO-2 K + zinc acetate biostimulators

Factor B - concentration of promoters with three graduations:

- b<sub>1</sub> - concentration of 50 ppm
- b<sub>2</sub> - concentration of 25 ppm
- b<sub>3</sub> - concentration of 12.5 ppm

Factor C—Biophases biostimulators application with three graduations:

- c<sub>1</sub> - twinning biophases
- c<sub>2</sub> - "bellows" biophases
- c<sub>3</sub> - flowering biophases

The variety used was Boema - because it was the best behavior in other previous experience, with 82 ± 0.8 cm height, 41 ± 2.6 g TSM, 77 ± 2 kg HM and productivity over 6 to/ha.

A surface plot was 16 m<sup>2</sup>.

The seeds were treated against pests and pathogens using a density of 600 g.s./m<sup>2</sup> at sowing. Common technology was used in experimental

conditions. During the vegetation phenological observations were made and biometric measurements. Statistical calculation was made by variance analysis method.

## RESULTS AND DISCUSSION

Following research in three years (2008-2009, 2009-2010 and 2010-2011) was resulted important data on the use of biostimulators in the wheat crop, the concentrations used and biophases on application.

Analyzing the influence of biostimulators on the production of wheat, the variety Boema, was found (*table 1*), in the year 2009-2010, was more favorable wheat, achieving higher production than in 2008-2009. In the year 2008-2009 biostimulators BCO-2K determined highest yield of wheat, 5055 kg, with 355 kg/ha higher than control variant (BCO-4DMA), difference is significant distinct. Compared with treated water variant to production difference was very significant, of 800 kg /ha.

In 2009-2010, the highest yield was obtained with biostimulators BCO-2K + zinc acetate, with 5658 kg / ha and a difference from the control variant of 660 kg/ha, very significant and treated water variant the difference was 1260 kg / ha.

In 2010-2011 most agricultural production was obtained in variant BCO - 2 K + zinc acetate, with 8416 kg / ha, to water treaty variant the difference is very significant, 2014 kg/ha.

Averaged over three years, biostimulators BCO-2K + zinc acetate achieved a production of 6322 kg/ha, with a very significant difference of 1311 kg/ha, followed by BCO-2K to 1141 kg/ha, difference from control variant is a very significant water treated. To control variant 2 (BCO-4 DMA) difference was 634 kg/ha distinct significantly.

Table 1

**Influence of growth regulators on wheat production. Average of the years 2008-2010**

Biostimulators	Production (kg/ha)			Average 2008- 2011	Comparisons with control variant 1			Comparisons with control variant 2		
	2008- 2009	2009- 2010	2010- 2011		% of CV-1	Diff. (kg/ha)	Signifi- cance	% of CV-2	Diff. (kg/ha)	Signifi- cance
BCO-2 K+Ac.Zn	4892	5658	8416	6322	126.16	1311	***	111.14	634	**
BCO - 2 K	5033	5302	8122	6152	122.76	1141	***	108.15	464	**
BCO -4 DMA	4678	4998	7389	5688	113.51	677	***	100.00	C.V.2	
Water	4233	4398	6402	5011	100.00	C.V.1		88.09	677	ooo
LSD 5%	316.8	212.2	262.5	263.8	kg/ha					
LSD 1%	479.1	351.9	350.0	393.6	kg/ha					
LSD 0.1%	770.6	657.2	490.2	639.3	kg/ha					

The biostimulators concentration was determined differently wheat production, depending on the weather year conditions (*table 2*). In 2010-2011 production were higher than in 2008-2009, driest and wettest 2009-2010. In 2008-2009,

the driest, 12.5 ppm concentration caused the highest production of 5003 kg/ha, and in 2009-2010, made the same concentration, of 5704 kg/ha. In 2010-2011 the concentration of 25 ppm determined the highest yield of 8203 kg/ha.

Averaged over three years, the concentration of 12.5 ppm resulted in a yield of 6263 kg / ha, followed by concentration of 25 ppm, with 6107 kg / ha.

The biophase of biostimulators application not significantly different production (*table 3*). In 2008-2009 the highest yield was obtained from the

application of biostimulators in flowering biophase in 2009-2010 in the "skin" biophase, and in 2010-2011 in twinning biophase. On average the three years of maximum production was obtained in the twinning biophase. Differences between variants were not statistically.

Table 2

**The concentration of biostimulators on the production of winter wheat. Average of the years 2008-2011**

Concentration of biostimulators (ppm)	Production (kg/ha)			Average 2008-2011 (kg/ha)	% of control variant	Difference (kg/ha)	Significance
	2008-2009	2009-2010	2010-2011				
50	4955	4812	7940	5902	94.23	361	Oo
25	4646	5444	8203	6107	97.50	156	
12.5	5003	5704	8083	6263	100.00	C.V.	
LSD 5%	171.2	205.9	250.2	209.1	kg/ha		
LSD 1%	234.8	289.0	340.0	287.9	kg/ha		
LSD 0.1%	319.6	408.0	450.1	392.5	kg/ha		

Table 3

**The production of winter wheat in depending on the application of biostimulators**

Periods of biostimulators application	Production (kg/ha)			Average 2008-2011	% of control variant	Difference (kg/ha)	Significance
	2008-2009	2009-2010	2010-2011				
Twinning	4761	5342	8354	6155	100.00	C.V.	
Bellows	4856	5395	8059	6103	99.15	-52	
Full flowering	4969	5224	7813	6002	97.51	-153	
LSD 5%	246.5	152.8	202.5	200.6	kg/ha		
LSD 1%	328.7	204.8	250.0	261.1	kg/ha		
LSD 0.1%	428.0	270.3	320.0	339.4	kg/ha		

Differences were not statistically we can say that in any biophase may apply biostimulators inquiry, but better to twinning and bellows.

The interaction of three factors (*table 4*) was resulted in average three years, the largest production version BCO-2K 25 ppm x flowering, with 6844 kg / ha, the difference of 721 kg / ha compared to the control variant is significant.

The interaction BCO-2 K + x 12.5 ppm zinc acetate x twinning achieved 6692 kg/ha, with a significant difference from the control variant, of 569 kg / ha.

The year 2008-2009, under climatic conditions influence, has made poduction more less than the year 2009-2010 and 2010-2011, with rainfall amounts greater or well distributed.

In the year 2008-2009, the highest yield was achieved by the interaction BCO-2K x bellows x 12.5 ppm, with 6092 kg/ha, and in 2009-2010 the interaction BCO-2K x 25 ppm x flowering, with 6474 kg /ha.

In the 2010-2011 highest production of 8875 kg/ha was obtained from interaction BCO-2K + zinc acetate x twinning x 25 ppm, with a very significant difference from the control variant.

## CONCLUSIONS

The biostimulators investigated in the three years of experience had a positive wheat plants, increasing production;

Averaged over the three years of experimentation highest yield was achieved with biostimulators BCO-2K + zinc acetate, increase production of 1311 kg / ha is very significant to the control variant - treated water;

The concentration of 12.5 ppm resulted in the highest yield of 6263 kg / ha with a distinctly significant difference from variant 50 ppm;

Different biophases biostimulators application (twinning, bellows, flowering) have not determined to significant differences of production;

The interaction of the three factors highlighted biostimulators BCO-2K x 25 ppm x flowering, with a very significant production increase of 11.77% on average for three years.

Use of biostimulators is a sustainable method of increasing wheat production.

**The influence of interaction of three factors of production investigated.  
Average of the years 2008-2010**

Biostymulators	Concentration of biostymulators (ppm)	Periods of application	Production (kg/ha)			Average (kg/ha)	% of control variant	Difference (kg/ha)	Significance
			2008-2009	2009-2010	2010-2011				
BCO – 2 DMA	50	Twinning	5250	4687	7687	5874	95.93	-249	
		Bellows	5085	4477	7477	5679	92.74	-444	
		Flowering	4908	4351	7351	5536	90.41	-587	
	25	Twinning	3833	5684	8684	6400	104.52	277	o
		Bellows	3770	5043	8043	5952	97.20	-171	
		Flowering	4837	4344	7344	5508	89.95	-615	
	12.5	Twinning	5047	5661	7661	6123	100.00	C.V.	o
		Bellows	4645	6318	7520	6161	100.62	38	
		Flowering	4727	4421	7440	5529	90.29	-594	o
BCO – 2K	50	Twinning	4152	4022	8020	5398	88.15	-725	o
		Bellows	5503	4670	7770	5981	97.68	-142	
		Flowering	4990	4733	7820	5847	95.49	-276	
	25	Twinning	4309	5360	8360	6009	98.13	-114	
		Bellows	4928	5481	8200	6203	101.30	80	
		Flowering	5940	6474	8120	6844	111.77	721	*
	12.5	Twinning	4586	5481	8481	6182	100.96	59	
		Bellows	6092	5494	8320	6635	108.36	512	
		Flowering	4791	6003	8010	6268	102.36	145	
BCO -2K + Ac. Zn	50	Twinning	5044	5699	8720	6487	105.94	364	
		Bellows	5023	5783	8520	6442	105.20	319	
		Flowering	4632	4890	8100	5874	95.93	-249	
	25	Twinning	4920	5875	8875	6556	107.07	433	
		Bellows	4445	5089	8189	5907	96.47	-216	
		Flowering	4832	5640	8020	6164	100.66	41	
	12.5	Twinning	5776	5601	8700	6692	109.29	569	*
		Bellows	4291	6201	8500	6330	103.38	207	
		Flowering	5064	6152	8120	6445	105.23	322	
		LSD 5%	776.7	529.4	329.4	542.2	kg/ha		
		LSD 1%	1041.2	709.4	509.3	753.3	kg/ha		
		LSD 0.1%	1367.6	936.3	736.3	1013.4	kg/ha		

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