THE EFFECT OF FERTILIZER AND BIOSTIMULATORS ON SOME ASPECTS OF PRODUCTIVITY IN WINTER WHEAT

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Abstract

In 2008-2009 crop year an experience took place at the Ezăreni-Iaşi farm where there was intended the measured effect of chemical fertilizer and biostimulators on MMB value, weight and number of grain per wheat ear, Boema variety.
The extraradicular application of biostimulators had the effect of increasing the value of MMB by 1.1 g at the treated with BCO-2K variant than at control variant.
Very significant differences to the MMB value than the control variant, 3.8 g respectively 3.3 g , were obtained from the interaction between $N_{160}P_{90}K_{90}$ x BCO-2K and $N_{60}P_{60}K_{60}$ x BCO-4K.
The largest number of grain was obtained in the treated with BCO-2K biostimulators variant , meaning 30.2 grain / wheat ear.
The interaction between fertilization and biostimulators showed BCO-2K biostimulator x $N_{120}P_{90}K_{90}$ with 32.0 grain/wheat ear respectively BCO-2K x $N_{60}P_{60}K_{60}$ 31.6 grain / wheat ear.
The biostimulators influenced grain weight in wheat ears, and close values were achieved on the treated with BCO-2K and BCO-4K biostimulators variants.
Variants treated with BCO-2K biostimulator and fertilized with $N_{160}P_{90}K_{90}$ and $N_{60}P_{60}K_{60}$ have obtained the highest weight of grain in the ear, the difference from the control variant of 1.55g and 1,48 g being very significant.

Key words: wheat, fertilizer, biostimulators, MMB.

Both globally and in our country, it is considered that fertilization is one of the main factors in increasing production.

In the research conducted by Maria Negrilă and colaborators during 1977-1992, one could observe that fertilization with nitrogen and phosphorus significantly influenced the productivity elements: ear/m^2, cariopsys /wheat ear, MMB (Negrilă, Maria et al., 1995).

The research conducted in our country or abroad has highlighted the positive effect of mineral fertilizers on wheat yield (Hera, Cr., 1981, 1985; Naidin, C., 2006).

Establishing the optimal doses of NPK fertilizer, which ensure high yields, but also be economically efficient, is a major goal of the researchers (Neyroud, J.A. et al., 1987; Koteva, V.B., 1998, Nedic, M. et al., 1998; Rusu, C. et al., 2001).

The transition to modern agriculture involves the changing technology of plant cultivation. Increasing quantities of chemical fertilizers determine the growth of plant and the obtaining of high yields. But, increasing the dose of fertilizer above a certain level becomes uneconomic and produces structural changes in mechanical or functional strength, with negative consequences on productivity and production quality.(Milică, C.I.,1960).

In agricultural science, an important place is given to the modern technologies, including acceleration processes or temporary inhibition of growth , development and metabolism with growth regulators.

The extraradicular application of biostimulators has many advantages: it is used in small quantities and can be applied in conjunction with other therapies in various stages of vegetation.

MATERIAL AND METHOD

In 2008-2009 experiments were performed at the Ezăreni Iasi Farm.

Experience had three factors, placed after method subdivided parcels, in four repetitions.

I have studied five doses of chemical fertilizers($N_0P_0K_0$, $N_{60}P_{60}K_{60}$, $N_{90}P_{90}K_{90}$, $N_{120}P_{90}K_{90}$, $N_{160}P_{90}K_{90}$), three biostimulators (BCO 4 DMA, BCO 4K, BCO 2K) and three periods of application of growth regulators (tillering, heading stage, full flowering).

The biostimulators used were obtained from Prof. Dr. Cornelius Oniscu., "Gheorghe Asachi" Technical University of Iasi.

The concentration of the biostimulators was 25 ppm, with 625 l solution per hectare.

The biological material used was the Boema variety created by ICCPT Fundulea.

RESULTS AND DISCUSSIONS

Weight of 1000 grains is closely related to production, as the value of MMB is much greater and the variety of wheat is more productive. The MMB highest value, of 44,3 g was obtained in the fertilized with $N_{60}P_{60}K_{60}$ variant (*Table 1*).

Table 1

The influence of fertilization at MMB winter wheat

Fertilization	MMB (g)	% of variant control	Differences (kg/ha)	Significance
$N_{160}P_{90}K_{90}$	43.2	99.76	-0.1	-
$N_{120}P_{90}K_{90}$	42.8	98.84	-0.5	-
$N_{90}P_{90}K_{90}$	43.6	100.69	0.3	-
$N_{60}P_{60}K_{60}$	44.3	102.30	1.0	-
$N_0P_0K_0$	43.3	100.00	Control	-
DL 5% 2.0 g		DL 1% 2.7 g	DL 0.1 % 3.9 g	

The extraradicular application of biostimulators had as result the increasing MMB values by 1.1 g to the treated with BCO 2K variant than the control variant, the difference being very significant. The lower value of MMB was achieved in the treated with BCO-4DMA variant of 42.8 g (*table 2*).

Table 2

The influence of biostimulators at MMB winter wheat

Biostimulators	MMB (g)	% of variant control	Differences (kg/ha)	Significance
BCO 2K	43.9	102.57	1.1	**
BCO 4K	43.6	101.87	0.8	*
BCO 4 DMA	42.8	100.00	Control	-
DL 5% 0.7 g		DL 1% 1.0 g	DL 0.1 % 1.3 g	

The interaction between the highest dose of fertilizers and BCO 2K biostimulators led to the obtaining of highest value of MMB, 45.2 g, with a difference from the control of 3.8 g, distinctly significant (*table 3*).

The unfertilized variants, but on which there have been applied the BCO 2K and BCO 4K extraroot biostimulators, led to the obtained significant differences of 3.0 g and 2.5 g. The interaction between BCO 4DMA biostimulators and unfertilized variant (version control) led to the obtaining of the lowest value of MMB of 41.4 g.

The *table 3* data shows that the variants treated with BCO 4DMA growth regulators led to the obtaining of the lowest values of MMB when they were fertilized with the maximum dose of fertilizer ($N_{160}P_{90}K_{90}$) or in the unfertilized variant.

In the variants treated with $N_{90}P_{90}K_{90}$ x BCO 4 DMA and $N_{60}P_{60}K_{60}$ x BCO 4 DMA, there were obtained four significant differences compared with control variant.

Table 3

The influence of intercation between fertilization and biostimulators at MMB winter wheat

Fertilization	Biostimulators	MMB (g)	% of variant control	Differences (g)	Significance
$N_{160}P_{90}K_{90}$	BCO 2K	45.2	109.18	3.8	**
$N_{60}P_{60}K_{60}$	BCO 4K	44.7	107.97	3.3	*
$N_0P_0K_0$	BCO 2K	44.4	107.25	3.0	*
$N_{60}P_{60}K_{60}$	BCO 2K	44.2	106.76	2.8	*
$N_{60}P_{60}K_{60}$	BCO 4 DMA	44.2	106.76	2.8	*
$N_{90}P_{90}K_{90}$	BCO 4 DMA	44.0	106.28	2.6	*
$N_0P_0K_0$	BCO 4K	43.9	106.04	2.5	*
$N_{90}P_{90}K_{90}$	BCO 4K	43.8	105.80	2.4	-
$N_{90}P_{90}K_{90}$	BCO 2K	43.1	104.11	1.7	-
$N_{160}P_{90}K_{90}$	BCO 4K	43.0	103.86	1.6	-
$N_{120}P_{90}K_{90}$	BCO 4 DMA	42.8	103.38	1.4	-
$N_{120}P_{90}K_{90}$	BCO 4K	42.8	103.38	1.4	-
$N_{120}P_{90}K_{90}$	BCO 2K	42.7	103.14	1.3	-
$N_{160}P_{90}K_{90}$	BCO 4 DMA	41.5	100.24	0.1	-
$N_0P_0K_0$	BCO 4 DMA	41.4	100.00	Control	-
DL 5% 2.5 g		DL 1% 3.4 g	DL 0.1 % 4.7 g		

The grains weight in the wheat ear was influenced by the dosage of the fertilizer used. At the application of $N_{160}P_{90}K_{90}$ dose of fertilisers, there was obtained in the ear of wheat a grain

weight of 1.37 g by 0.21 g, more than the unfertilized control variant (*table 4*).

The same value of 1.37 g was obtained to $N_{120}P_{90}K_{90}$ and $N_{60}P_{60}K_{60}$ fertilization variants, the differences being significally distinct.

The extraradicular application of BCO 2K biostimulators increased the grains weight in the ear of wheat with 0.10 g compared to the control variant, the difference being significantly distinct. (*table 5*).

Table 4

The influence of fertilization on grain weight per ear at wheat

Fertilization	Grain weight (g)	% of variant control	Differences (g)	Significance
$N_{160}P_{90}K_{90}$	1.37	118.10	0.21	**
$N_{120}P_{90}K_{90}$	1.37	118.10	0.21	**
$N_{90}P_{90}K_{90}$	1.34	115.51	0.18	*
$N_{60}P_{60}K_{60}$	1.37	118.10	0.21	**
$N_0P_0K_0$	1.16	100.00	Control	-
DL 5% 0.1 g		DL 1% 0.2 g		DL 0.1 % 0.3 g

Table 5

The influence of biostimulators on grain weight per ear at wheat

Biostimulators	Grain weight (g)	% of variant control	Differences (g)	Significance
BCO 2K	1.38	107.81	0,10	**
BCO 4K	1.34	104.68	0,06	-
BCO 4 DMA	1.28	100.00	Control	-
DL 5% 0.10 g		DL 1% 0.15 g		DL 0.1 % 0.20 g

At the variants treated with BCO-2K and fertilized with $N_{160}P_{90}K_{90}$ and $N_{60}P_{60}K_{60}$, there was obtained the highest weight of grains in the ear of wheat, of 1.55 g and 1.48 g, the differences being very significant from the control variant (*table 6*).

The lowest values of 1.16 g / ear of wheat were obtained in the unfertilized variants, on which there were applied BCO 2K and BCO 4DMA biostimulators.

Table 6

The influence of fertilization and biostimulators on grain weight per ear at wheat

Fertilization	Biostimulators	Grain weight (g)	% of variant control	Differences (g/)	Significance
$N_{60}P_{60}K_{60}$	BCO 2K	1.55	133.62	0.39	***
$N_{160}P_{90}K_{90}$	BCO 2K	1.48	127.58	0.32	***
$N_{90}P_{90}K_{90}$	BCO 4 DMA	1.40	120.68	0.24	**
$N_{90}P_{90}K_{90}$	BCO 4K	1.39	119.82	0.23	**
$N_{120}P_{90}K_{90}$	BCO 4 DMA	1.35	116.37	0.19	-
$N_{120}P_{90}K_{90}$	BCO 2K	1.37	118.10	0.21	**
$N_{160}P_{90}K_{90}$	BCO 4K	1.36	117.24	0.20	-
$N_{60}P_{60}K_{60}$	BCO 4K	1.39	119.82	0.23	**
$N_{160}P_{90}K_{90}$	BCO 4 DMA	1.26	108.62	0.10	-
$N_{120}P_{90}K_{90}$	BCO 4K	1.34	115.51	0.18	-
$N_{90}P_{90}K_{90}$	BCO 4K	1.28	110.34	0.12	-
$N_0P_0K_0$	BCO 2K	1.16	100	0	-
$N_0P_0K_0$	BCO 4 DMA	1.16	100	Control	-
$N_0P_0K_0$	BCO 4K	1.17	100.86	0.01	-
$N_{60}P_{60}K_{60}$	BCO 4 DMA	1.17	100.86	0.01	-
DL 5% 0.2 g		DL 1% 0.2 g		DL 0.1 % 0.3 g	

The number of grains in the ear of wheat is one of the most important components of the winter wheat production. The number of caryopsis is a varietal characteristic, but fertilization and application of the substances to stimulate growth and development processes wheat plant have critical importance.

The largest number of caryopsis, of 29.9, was obtained in the $N_{160}P_{90}K_{90}$ variant (*table 7*).

The equal values of 29.5 caryopsis / ear of wheat were obtained at $N_{60}P_{60}K_{60}$ and $N_{120}P_{90}K_{90}$ fertilization variants.

The largest number of grains, of 30.2, was obtained in the variant treated with BCO 2K growth regulators the difference was not statistically assured (*table 8*).

Table 7

The influence of fertilization on the caryopsis number of wheat in the ear

Fertilization	Number of grains	% of variant control	Differences	Significance
$N_{160}P_{90}K_{90}$	29.9	103.46	1.0	-
$N_{120}P_{90}K_{90}$	29.5	102.07	0.6	-
$N_{90}P_{90}K_{90}$	29.4	101.73	0.5	-
$N_{60}P_{60}K_{60}$	29.5	102.07	0.6	-
$N_0P_0K_0$	28.9	100.00	Control	-
DL 5% 5.7 grains / ear		DL 1% 8.0 grains / ear		DL 0.1 % 11.2 grains / ear

Table 8

The influence of biostimulators on the caryopsis number of wheat in the ear

Biostimulators	Number of grains	% of variant control	Differences	Significance
BCO 2K	30.2	101.34	0.4	-
BCO 4 DMA	29.8	100.00	Control	-
BCO 4K	28.3	94.97	-1.5	-
DL 5% 1.9 grains / ear		DL 1% 2.6 grains / ear		DL 0.1 % 3.4 grains / ear

Between the number of grains per ear of wheat and the production per hectare, there is a positive correlation. The research objective is to identify variants which led to the obtaining of the largest number of grains in the ear of wheat. At the interaction between BCO 2K x $N_{120}P_{90}K_{90}$,there was achieved value of 32.0 caryopsis/ear, which is the highest, the difference from the control variant being of 1.5 caryopsis/ ear (*table 9*).

Table 9

The influence of fertilization and biostimulators on the caryopsis number of wheat in the ear

Fertilization	Biostimulators	Number of grains	% of variant control	Differences	Significance
$N_{120}P_{90}K_{90}$	BCO 2K	32.0	104.92	1.5	-
$N_{60}P_{60}K_{60}$	BCO 2K	31.6	103.61	1.1	-
$N_{90}P_{90}K_{90}$	BCO 4 DMA	30.8	100.98	0.3	-
$N_0P_0K_0$	BCO 4 DMA	30.5	100.00	Control	-
$N_{160}P_{90}K_{90}$	BCO 2K	30.5	100.00	0.0	-
$N_{160}P_{90}K_{90}$	BCO 4K	29.7	97.38	-0.8	-
$N_{120}P_{90}K_{90}$	BCO 4 DMA	29.5	96.72	-1.0	-
$N_{160}P_{90}K_{90}$	BCO 4 DMA	29.4	96.39	-1.1	-
$N_{90}P_{90}K_{90}$	BCO 2K	29.2	95.74	-1.3	-
$N_{60}P_{60}K_{60}$	BCO 4 DMA	28.6	93.77	-1.9	-
$N_0P_0K_0$	BCO 4K	28.4	93.11	-2.1	-
$N_{60}P_{60}K_{60}$	BCO 4K	28.4	93.11	-2.1	-
$N_{90}P_{90}K_{90}$	BCO 4K	28.2	92.46	-2.3	-
$N_0P_0K_0$	BCO 2K	27.8	91.15	-2.7	-
$N_{120}P_{90}K_{90}$	BCO 4K	26.9	88.20	-3.6	-
DL 5% 6.9 grains / ear		DL 1% 9.5 grains / ear		DL 0.1 % 13.1 grains / ear	

CONCLUSIONS

The use of chemical fertilizers. but also the biostimulators have caused increases of MMB's, ear weight and caryopsis number in wheat ears.

The highest value of MMB was obtained from the $N_{160}P_{90}K_{90}$ x BCO 2K interaction with 45.2 g and the caryopsis weight in the ear of 1.55 g to the $N_{60}P_{60}K_{60}$ x BCO 2K interaction.

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