THE INFLUENCE OF FERTILIZERS AND BIOSTIMULATORS ON THE QUALITY AND QUANTITY PRODUCTION OF WINTER WHEAT

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Abstract

In 2008-2009 and 2009-2010 crop years an experience took place at the Ezăreni-Iaşi farm in where it was intended measured the effect of chemical fertilizer and biostimulators on yield and protein content on winter wheat grain, Boema variety. On average for the two agricultural years, first place it was occupied by fertilized with $N_{90}P_{90}K_{90}$ variant, which to obtained 6588 kg/ha, followed by dose $N_{60}P_{60}K_{60}$ with 6524 kg / ha, the differences from unfertilized variant being very significant. Applying BCO 4K biostimulator, the production growth was only 24 kg/ha, and to the BCO2K biostimulator application, decreased by 129 kg/ha, the differences were not statistically assured.
The influence of fertilization on the protein content averaged over the two years highlight, the dose of $N_{160}P_{90}K_{90}$, at which the protein content of wheat grain was 14.5%. It can be observed that increasing the doses of applied fertilizers, can be increase the protein content of grain.

Key words: wheat, fertilizer, biostimulators, production

The world population growth lead inevitably to increased needs for food. To obtain high yields but also quality is necessary to apply the latest technology.

An important role is given, in recent years, to organic compounds that regulate different physiological processes. (Toma Doina, Jităreanu Doina, 2007).

Many researchers (Gherghen, 1988; Goian, 1986; Milică, 1983; Neamţu, 1991) have found positive effects for wheat after the application of stimulant substances.

The protein crisis of human nutrition might diminish by an increase in protein content of wheat grain, following an appropriate fertilization, especially nitrogen. (Münzing, 2001; Levy, 2007).

The application of fertilizers, lead to increase quantitative and qualitative wheat production. (Axinte et al., 2009).

MATERIAL AND METHOD

In 2008-2009 experiments were performed at the Ezăreni Iasi farm, on cambic chernozem soil.

We 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 Iaşi. The biostimulators use belonging from the class of fenoxialchil sulfamoil carboxylic acids which have very low toxicity and they are are also biodegradable.

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

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

RESULTS AND DISCUSSIONS

In averaged on the two years, the conditions of growing were good for wheat, therefore a high level of wheat production, both in the unfertilized variant, especially those that have been fertilized.

Analyzing the influence of fertilization on winter wheat production, averaged over the two years, result that the 2009-2010,agricultural year the most favorable climate in terms, have achieved the highest production, between 5738 kg/ha ($N_0P_0K_0$) and 6803 kg/ha on the variant fertilized with $N_{60}P_{60}K_{60}$ (*table 1*).

On average, first place was occupied by variant fertilized with $N_{90}P_{90}K_{90}$, which were obtained 6588 kg/ha, followed by dose $N_{60}P_{60}K_{60}$ with 6524 kg/ha, the differences being very significant from the control variant.

The biostimulators applyed influenced, on average, the winter wheat production in each of two years. Applying the growth regulator BCO 4K, the increase of production was only 24 kg/ha, and applying BCO 4K the production was lower with 129 kg/ha, the differences aren't statisticaly insured (table 2).

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Table 1

The influence of fertilization on average production of wheat grain

Fertilization	Production (kg/ha)		Average (kg/ha)	% of variant control	Dif. (kg/ha)	Semnif.
	2009	2010				
$N_0P_0K_0$	5220	5738	5479	100.00	Control	-
$N_{60}P_{60}K_{60}$	6246	6803	6524	119.08	1045	***
$N_{90}P_{90}K_{90}$	6428	6748	6588	120.24	1109	***
$N_{120}P_{90}K_{90}$	5790	6627	6208	113.31	729	***
$N_{160}P_{90}K_{90}$	6016	6802	6409	116.97	930	***
DL 5%	171.6	113.5	151.5 kg/ha			
DL 1%	240.9	159.3	203.9 kg/ha			
DL 0.1%	340.1	224.9	271.2 kg/ha			

Table 2

The influence of biostimulators on average production of wheat grain

Biostimulators	Production (kg/ha)		Average (kg/ha)	% of variant control	Dif. (kg/ha)	Semnif.
	2009	2010				
BCO 4 DMA	5731	6824	6277	100.00	Control	-
BCO 4K	5928	6675	6301	100.38	24	-
BCO 2K	6162	6135	6148	97.94	-129	0
DL 5%	127.6	91.6	87.9 kg/ha			
DL 1%	172.0	123.4	117.1 kg/ha			
DL 0.1%	228.3	163.8	151.6 kg/ha			

The interaction between fertilization and stimulators showed the highest production of wheat, of 7438 kg / ha, with 2027 kg / ha higher than the control variant production, to the interaction $N_{60}P_{60}K_{60}$ x BCO 2K (*table 3*).

In the most interactions, differences from controls were very significant.

Table 3

The influence of fertilization and biostimulators on average production of wheat grain

Fertilization	Biostimulators	Production (kg/ha)		Average (kg/ha)	% of variant control	Dif. (kg/ha)	Semnif.
		2009	2010				
$N_0P_0K_0$	BCO 4DMA	5154	5668	5411	100.00	Control	-
	BCO 4K	5255	5826	5540	102.39	129	-
	BCO 2K	5254	5724	5489	101.44	78	-
$N_{60}P_{60}K_{60}$	BCO 4DMA	5341	5726	5533	102.26	122	-
	BCO 4K	6319	6883	6601	121.99	1190	***
	BCO 2K	7077	7800	7438	137.47	2027	***
$N_{90}P_{90}K_{90}$	BCO 4DMA	6681	6775	6728	124.33	1317	***
	BCO 4K	6438	7031	6734	124.45	1323	***
	BCO 2K	6167	6440	6303	116.49	892	***
$N_{120}P_{90}K_{90}$	BCO 4DMA	5698	6234	5966	110.25	555	***
	BCO 4K	5786	6740	6263	115.74	852	***
	BCO 2K	5886	6910	6398	118.24	987	***
$N_{160}P_{90}K_{90}$	BCO 4DMA	5779	6273	6026	111.36	615	***
	BCO 4K	5841	6894	6367	117.67	956	***
	BCO 2K	6429	7247	6838	126.37	1427	***
DL 5%		312.5	215.3	215.4 kg/ha			
DL 1%		421.2	293.5	286.9 kg/ha			
DL 0.1%		559.1	396.3	371.3 kg/ha			

The winter wheat is a food crop, for bakery, farmers not being able to make expenses to get wheat feed. That the production doesn't take this destination,it is necessary to conform to the bakery standards,that meet several quality conditions af grain, flour, bread.

The proteic substances, from the point of view of the nutrition value and backery are very importante at grain. The amplitude variation of protein substances is very high (8-24%), being determined by genetic factors and the technology used.

The content of protein substances differ considerably depending on the fertilizer dose used, especially nitrogen resulting in our experiments.

The influence of fertilization on crude protein content in averaged over the two years shows that the dose of $N_{160}P_{90}K_{90}$ at which the protein content of wheat grain was 14.5% (*table 4*). Is obvious that when the doses of fertilizers applied increase, the protein content of grain is higher.

Table 4

The influence of fertilization on protein percentage of grain on the two years of experimentation

Fertilization	Protein %		Average %	% of variant control	Dif.	Semnif.
	2009	2010				
$N_0P_0K_0$	12.3	11.1	11.7	100.00	Control	-
$N_{60}P_{60}K_{60}$	12.3	11.9	12.1	103.42	0.4	***
$N_{90}P_{90}K_{90}$	12.9	12.8	12.8	109.83	1.1	***
$N_{120}P_{90}K_{90}$	13.9	13.8	13.8	118.38	2.1	***
$N_{160}P_{90}K_{90}$	14.9	14.2	14.5	124.36	2.8	***

DL 5% 0.2 0.5 0.10 %
DL 1% 0.2 1.0 0.15 %
DL 0.1% 0.3 1.5 0.20 %

In the agricultural year 2008-2009 the caryopsis protein percentage, after applying growth regulators, was higher than the 2009-2010 crop year, and on averaged over the two years, equal values were obtained from the application of BCO 2K and BCO 4K growth regulators, of 13.3% (table 5).

Table 5

The influence of biostimulators on protein percentage of grain on the two years of experimentation

Biostimulators	Protein %		Average %	% of variant control	Dif. %	Semnif.
	2009	2010				
BCO 4 DMA	13.8	12.7	13.2	100.00	Control	-
BCO 4K	13.9	12.8	13.3	100.75	0.1	-
BCO 2K	13.8	12.8	13.3	100.37	0.1	-

DL 5% 0.10 0.10 0.10 %
DL 1% 0.15 0.15 0.15 %
DL 0.1% 0.20 0.20 0.20 %

The interaction between fertilization and stimulators highlights the important role they have fertilizer to increase grain quality.

On the $N_{160}P_{90}K_{90}$ and $N_{120}P_{90}K_{90}$ variants, the higher protein content were obtained from the application of growth regulators BCO 4K, of 14.5 respectively 14.9%. (table 6).

Table 6

The influence of fertilization and biostimulators on protein percentage of grain on the two years of experimentation

Fertilization	Biostimulators	Protein %		Average %	% of variant control	Dif.	Semnif.
		2009	2010				
$N_0P_0K_0$	BCO 4 DMA	12.2	11.1	11.6	100.00	Control	-
	BCO 4K	12.3	11.2	11.7	100.86	0.1	-
	BCO 2K	12.2	11.1	11.6	100.00	0.0	-
$N_{60}P_{60}K_{60}$	BCO 4 DMA	12.8	11.9	12.3	106.01	0.7	***
	BCO 4K	13.0	12.0	12.5	107.29	0.8	***
	BCO 2K	13.0	12.0	12.5	107.29	0.8	***
$N_{90}P_{90}K_{90}$	BCO 4 DMA	14.1	13.0	13.5	116.31	1.9	***
	BCO 4K	13.9	12.8	13.3	114.59	1.7	***
	BCO 2K	13.7	12.7	13.2	113.30	1.5	***
$N_{120}P_{90}K_{90}$	BCO 4 DMA	14.8	13.8	14.3	122.74	2.6	***
	BCO 4K	15.0	14.0	14.5	124.46	2.8	***
	BCO 2K	14.9	13.9	14.4	123.60	2.7	***
$N_{160}P_{90}K_{90}$	BCO 4 DMA	15.2	14.2	14.7	126.18	3.0	***
	BCO 4K	15.4	14.4	14.9	127.90	3.2	***
	BCO 2K	15.4	14.2	14.8	127.04	3.1	***

DL 5% 0.2 0.50 0.10 %
DL 1% 0.2 1.00 0.15 %
DL 0.1% 0.3 1.15 0.20 %

CONCLUSIONS

The variant fertilized with $N_{90}P_{90}K_{90}$ were obtained 6588 kg/ha wheat caryopsis followed by $N_{60}P_{60}K_{60}$ dose with 6524 kg/ha.

The biostimulators apply influenced the winter wheat production averaged over the two years.

The highest production of wheat, of 7438 kg/ha, with 2027 kg/ha higher than the control variant production, we obtained at the interaction $N_{60}P_{60}K_{60}$ x BCO 2K.

In average over the two years at the $N_{160}P_{90}K_{90}$ dose, caryopsis protein content of was 14.5%.

On averaged over the two years, equal values were obtained from the application of BCO 2K and BCO 4K growth regulators, of 13.3%

On the $N_{160}P_{90}K_{90}$ and $N_{120}P_{90}K_{90}$ variants, the higher protein content were obtained from the application of growth regulators BCO 4K, of 14.5 respectively 14.9%.

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