THE FERTILIZATION – THE BASIS OF PRODUCTION AND QUALITY OF WINTER WHEAT

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Abstract. *After a somewhat long period in which agricultural production was a priority, the issue of wheat quality is again in actuality. To obtain high quality crops, besides the wheat varieties sown, a fundamental contribution rests in fertilization culture. The nitrogen and phosphorus from chemical fertilizers, individually but especially while interacting, contribute to the accumulation of protein and gluten in wheat caryopsis.*

Keywords: *winter wheat, fertilizers, fertilization, protein*

INTRODUCTION

The long-term fertilization system, utilized in stationary experiments, is the most complex method of highlighting the quantitative and qualitative degree of supply and soil nutrient balance. Also, its effect on productivity, production quality and plant health is well known (HERA, 1980, POPESCU, 1981).

Long-term usage of fertilizers causes a series of disturbances in the chemical structure of the soil, by manifesting antagonistic interactions between the main nutrients and through the appearance of visible symptoms of deficiency in plants, that influences the optimal development of the plant's physiological processes (HERA, 1981; NEDELCIUC, 1995).

The paper highlights the long-term effect of phosphorus- and nitrogen-based fertilizer application on wheat grain quality.

MATERIAL AND METHOD

The research was conducted at ARDS Lovrin, under a long-term experience (founded in 1967), on a weakly-gleizated and weakly-alkalinised semicarbonatic chernozem(pH in $H_2O = 6.90$) with a mobile P content of 75.7 ppm, mobile K of 205 ppm and a humus content of 3.47%. The average yearly rainfall is about 500 mm, and the average temperature of 10.8 ° C.

Each year, from the installation of the experimental device, the following doses of fertilizers were applied: nitrogen ($N_0, N_{30}, N_{60}, N_{90}, N_{120}$) and phosphorus ($P_0, P_{40}, P_{80}, P_{120}, P_{160}$).

In this paper, we show the effect of nitrogen- and phosphorus-based fertilizer application , both individually and in various combinations, on the quality of wheat grain, during the period of 2014-2016. The research was conducted on wheat of the Ciprian variety, created at ARDS Lovrin, by performing chemical analysis for the determination of crude protein and wet gluten and physical analysis in order to highlight hectoliter mass.

In order to set the quality for the bakery of wheat, the following level of assessment, already existing in the literature(DUMBRAVA, 2012). ,was used:

Quality Indicator	The Bakery value			
	Very good	Good	Satisfying	Unsatisfactory
Hectoliter mass kg/hl	> 78	75-78	70-75	< 70
Crude protein %	> 13	12-13	10-12	< 10
Wet gluten %	> 26	24-26	22-24	< 22

RESULTS AND DISCUSSIONS

Table 1

The nitrogen and phosphorus fertilizers influence on the production of wheat variety Ciprian (2014-2016)

Doz P / Doz N	0	40	80	120	160	**Media N kg/ha**	%	Dif	Semn
0	5329	5749	6161	5995	6145	**5876**	100	0	
30	5772	5979	6474	6539	6430	**6239**	106	363	**
60	5802	6161	6830	6866	6000	**6332**	108	456	***
90	6214	6429	7049	6610	7132	**6687**	114	811	***
120	6480	6908	7210	7231	7295	**7025**	120	1149	***
Media P	**5919**	**6245**	**6745**	**6648**	**6601**				
%	100	106	114	112	112				
Dif	0	326	826	729	681				
Semn		**	***	***	***				

N - $LSD_{5\%}$=423 kg $LSD_{1\%}$=562 kg $LSD_{0,1\%}$=731 kg
P - $LSD_{5\%}$=642 kg $LSD_{1\%}$=901 kg $LSD_{0,1\%}$=1272 kg

Analyzing the data presented in Table 1, resulting the effect of nitrogen and phosphorus fertilizers on wheat production.

The unilateral application of nitrogen, make a significant production compared to control (N_0 variant). The production ranges from 5329 kg / ha in variant N_0 to 6480 kg / ha of fertilizer at N_{120}, registered the increase of production of 1151 kg / ha.

The phosphorus applied unilaterally to wheat, brings smaller production increases, but still statistically. Compared to the control (P_0), the production increase to P_{80}, then it registers a decrease in P_{120} and P_{160} variants.

The biggest increases in production are recorded by administering two types of fertilizers in various combinations. Thus, the production obtained in $N_{120}P_{160}$ variant is 7295 kg / ha, with an increase of 1966 kg / ha compared to control (N_0P_0). In $N_{120}P_{80}$ variant, production growth compared to unfertilized variant is 1881 kg / ha, with only 85 kg higher than $N_{120}P_{160}$ version, which does not justify phosphorus supplementation dose of 80 kg / ha.

Production of 5329 kg / ha in unfertilized variant is the result of the influence of the previous plant. Wheat has been sown in a four-year rotation wheat-soybean-corn-rape and the previous plant for wheat was soybeans.

Table 2

The effect of N and P fertilizers on the protein content of the wheat variety Ciprian (2014-2016)

Doza P / Doza N	0	40	80	120	160	Avarage N	100%	Diff.
0	12.1	12.2	12.7	12.6	12.7	**12.5**	**100**	**-**
30	12.7	12.9	13.4	13.1	13.9	**13.2**	**105.6**	**0.7**
60	13.4	13.6	13.8	13.9	14.7	**13.9**	**111.2**	**1.4**
90	14.4	14.4	14.8	14.8	14.9	**14.7**	**117.6**	**2.2**
120	15.1	15.0	15.2	15	15.2	**15.1**	**120.8**	**2.6**
Average P	**13.5**	**13.6**	**14.0**	**13.9**	**14.3**			
100%	**100**	**100.7**	**103.7**	**103.0**	**106.0**			
Diff.	**-**	**0.1**	**0.5**	**0.4**	**0.8**			

Table 3

The effect of N and P fertilizer on the gluten content of wheat variety Ciprian (2014-2016)

Doza P / Doza N	0	40	80	120	160	Average N	100%	Diff.
0	28.1	28.2	29.2	29.6	30.1	**29.0**	**100**	**-**
30	30.5	30.8	31.2	33.3	36.2	**32.4**	**111.7**	**3.4**
60	32.3	32.4	33.5	33.9	35.1	**33.4**	**115.2**	**4.4**
90	32.2	35.2	36.5	36.5	36.7	**35.4**	**122.1**	**6.4**
120	34.4	36.7	36.9	37.5	37.9	**36.7**	**127.0**	**7.7**
Average P	**31.5**	**32.7**	**33.5**	**34.2**	**35.2**			
100%	**100**	**103.8**	**106.3**	**108.5**	**111.7**			
Diff.	**-**	**1.2**	**2.0**	**2.7**	**3.7**			

Getting a high quality production is achieved both through unilateral application of the two types of fertilizers, especially their combination. Thus, the phosphorus does not cause an increase in protein content and gluten with high percentages. The percentage of protein varies from 12.1% (P_0) to 12.7% (P_{160}) and wet gluten content is within the range 28.1% - 30.1% in the same experimental variants.

The nitrogen is the chemical element that contributes most to increasing the quality of wheat. Data presented in Tables 2 and 3 show an increased percentage of protein and gluten with increasing the nitrogen dose. In version control (N_0), the percent of protein is 12.1% and increase to 15.1% in the version with the maximum dose of nitrogen (N_{120}). The gluten varies between 28.1% (N_0) - 34.4% (N_{120}).

Of physical attributes, the one presented in this paper is hectoliter mass (MH kg / hl).

Table 4

The effect of N and P fertilizer on the hectoliter mass of wheat variety Ciprian (2014-2016)

P N	0	40	80	120	160
0	80.0	79.8	80.0	80.2	79.6
30	80.6	80.7	80.0	80.5	80.0
60	80.8	80.8	80.2	80.3	79.2
90	80.4	80.2	80.3	79.8	79.2
120	80.1	80.1	79.8	79.4	78.9

In the analyzed period, the MH in all experimental variants exceeds 78%, a value that falls variety, from this point of view, in the category of cereals with bakeries very good value.

CONCLUSIONS

1. Formation and accumulation production is favorably influenced by the applyed fertilizers and climatic conditions;
2. The interaction between nitrogen and phosphorus caused significant increase of production. The $N_{120}P_{160}$ variant production was 7295 kg / ha, with an increase in production compared to the control of 1966 kg / ha;
3. The protein content, depending on the level of fertilization, varies between 12.1% - 15.2%, ranking the variety in the category of varieties with very good baking value;
4. The wet gluten percentage varies between 28.1% - 37.9%;
5. Ciprian variety, fall in terms of quality, in the category of best wheat varieties which are cultured, part of the cereals category with bakeries very good value.

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