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Agricultural Research and Development Station Turda, Agricultural Research and Development Station Turda, Agricultural Research and Development Station Turda, Agricultural Research and Development Station Turda, Agricultural Research and Development Station Turda

16 November 2017

THE INFLUENCE OF MINERAL FERTILIZATION UPON PRODUCTION AND QUALITY OF SPRING BARLEY ON AGRICULTURAL RESEARCH AND DEVELOPMENT STATION TURDA

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Abstract: *In order to clarify some aspects of the spring barley reaction on the production and accumulation of the protein in grain, at different levels of fertilization, some estimates of this chemical component were made at 16 levels of fertilization with N: P: K in the period 2016-2017 . The increase in protein content was achieved at the highest levels of nitrogen and phosphorus, even when potassium fertilizers were not used, but the highest protein content in grain accumulating at the level of $N_{60}P_{80}K_0$ was 11.78%. The highest yield can be attributed to the fertilization variant $N_{120}P_{80}K_{40}$, which confirms the negative relationship between production and protein content.*

Keywords: *climacteric conditions, quality,fertilization, spring barley, yeld*

Classification JEL: Q 01, Q15, Q16

INTRODUCTION

Establishing a fertilization program is based on the relationship between the soil chemical structure and the productive potential of the spring mesh, the fertilizer problems have two essential aspects related to the destination of the crop, for beer or forage. It is known that generally higher nitrogen doses increase the content of protein in the bob, which is not desirable if the destination is brewing and desirable in the case of animal feed. Consequently, besides the many aspects related to the optimal doses of fertilizers (pre-plant, resistance to fall, soil moisture, roots system, etc.), we must also take into account the use of the crop. In addition to the genotype factor, a particularly important role in achieving higher, quantitative and qualitative barley productions has proper fertilization. Another important aspect in establishing an optimal fertilization plan is the short vegetation period, 90-120 days in case of spring barley, and the intense absorption rate of mineral substances. According to Maior (2005), nitrogen fertilizers increase grain protein content and protein yield at the surface unit by increasing grain yield. Phosphorus fertilizers influence protein production/ha only by increasing the grain yield and not the protein content of the grains (Maior, 2005). Potassium is one of the most important nutrients used in agriculture, which, in the conditions of high quality plant and quality objectives for consumers, is constantly increasing its effects and contributing to its realization.

From national or international experiences, it has been noticed that on soils with low N content, the use of moderate doses of fertilizers with this element leads to increased production but has little or no influence on the increase in protein content, the increase of which is influenced in a way significant only by the use of high doses with N.

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MATERIALS AND METHODS

Research was conducted at ARDS Turda, in the long-term experiments NP (nitrogen and phosphorus fertilizer), on chernozem soil during the years 2016 and 2017.

Experiences have taken place in a five-year rotation; soybean-soybean-wheat-wheat maize and corn, is placed in randomized blocks with 25 variants in 6 reprtitions.

The experimental factors and their graduations were: the year of culture: 2016 and 2017; phosphorus doses with five graduations: P_0; P_{40}; P_{80}; P_{120} and P_{160}; Nitrogen doses with five graduations: N_0; N_{30}, N_{60}, N_{90} and N_{120}.

The biological material used in this experience was represented by the Romaniţa cultivar created at ARDS Turda, with a wide range of spreading in the favorable areas of spring culture and mostly in the southern parts of the country. It is a medium-sized cultivar but with fairly good tolerance to fall due to sclerenchimatic tissue resistance and elasticity of the straw. The spikes are approximately 14 cm long, lax to semilaxed, slightly curved and light yellow in color. The beans are large, globular, golden yellow, with a MMB around 44-52 g and a good germ energy. The higher protein content of this variety, around 12.5%, involves some restrictions on fertilization, especially when production is for beer production. Due to the higher height of this variety, we recommend the use of moderate doses of nitrogen, especially on soils with good fertility, and if growth retardants are not used to avoid plant fall.

RESULTS AND DISCUSSION

The variance analysis (Table 1) reflects the very significant influence of fertilizer doses on the production of the spring barley production. Sample F shows that nitrogen fertilizers have the greatest influence and crop years do not significantly influence production; from the analysis of climatic data results that they were very close to favoring this culture.

Table 1. Variance analysis for grain production (kg / ha), spring barley, NP fertilization system (Turda 2016-2017)

Sursa variației	**GL**	**s^2**	**Sample F**
Years in culture (A)	1	7340	0.096
Phosphorus dose (P)	4	2224037	60.160***
Nitrogen dose (N)	4	87132290	2248.967***
AxP	4	373385	10.100
AxN	4	732975	18.919
AxPxN	16	468203	12.085***
Error A	5	76764	
Error P	40	36968	
Error N	200	38743	
Total:	299		

From the data presented in Table 2 it follows that in 2016, the best fertilizer variant was $N_{90}P_{80}$, and in 2017 $N_{90}P_{120}$.

Table 2. Production results (kg / ha) at different levels of fertilization obtained at spring marshland in the years 2016-2017

Year		2016		2017	
Fertilization doses		**Production (kg/ha)**	**Witness (%)**	**Production (kg/ha)**	**Witness (%)**
P_0	N_0	2847	100.0 (Mt)	3237	100.0 (Mt.)
	N_{30}	4255	149.5	4467	138.0
	N_{60}	5382	189.1	5282	163.2
	N_{90}	5753	202.1	5889	181.9
	N_{120}	6141	215.7	5541	171.1
P_{40}	N_0	3267	114.8	3439	106.2
	N_{30}	4996	175.5	4478	138.3
	N_{60}	5478	192.4	5321	164.4
	N_{90}	6163	216.5	6481	200.2
	N_{120}	6121	215.0	6379	197.1
P_{80}	N_0	3358	117.9	3341	103.2
	N_{30}	4964	174.4	4965	153.4
	N_{60}	6431	225.9	5475	169.1
	N_{90}	6500	228.3	6220	192.2
	N_{120}	5604	196.8	5920	182.9
P_{120}	N_0	3452	121.3	3360	103.8
	N_{30}	5145	180.7	4684	144.7
	N_{60}	5583	196.1	5572	172.1
	N_{90}	6397	224.7	6687	206.6
	N_{120}	5819	204.4	5905	182.4
P_{160}	N_0	3406	119.6	3417	105.6
	N_{30}	4971	174.6	4574	141.3
	N_{60}	6174	216.9	6293	194.4
	N_{90}	6279	220.5	6762	208.9
	N_{120}	5487	192.7	6529	201.7
DL (p 5%)			224		
DL (p 1%)			295		
DL (p 0.1%)			380		

In spring crops, as with other crops, the protein content is closely related to the nitrogen dose and the protein content in all experimental variants is higher in 2016 compared to 2017 (Table 3). As it is known, the starch content of barley for beer should be between 55-60%, noting that it drops to variants with a higher protein content. Good results in terms of protein and starch content were obtained in the $N_{60}P_{80}$ fertilizer variant, which is even more economically efficient.

Table 3. Protein content and starch content (%) at different levels of fertilization obtained at spring marshland in the years 2016-2017

Year		Protein (%)		Starch (%)	
Fertilisation Dose		**2016**	**2017**	**2016**	**2017**
P_0	N_0	8.66	8.44	57.56	53.75
	N_{30}	9.30	8.38	57.53	54.24
	N_{60}	10.04	9.26	54.34	55.42
	N_{90}	11.68	10.47	55.15	53.63
	N_{120}	12.34	10.96	53.75	56.65
P_{40}	N_0	8.81	8.52	55.60	55.11
	N_{30}	8.86	8.25	56.29	54.63
	N_{60}	10.34	8.95	56.83	54.16
	N_{90}	11.58	9.98	56.18	56.01
	N_{120}	12.94	11.53	54.83	55.77

P_{80}	N_0	8.85	8.22	57.31	56.85
	N_{30}	9.09	8.38	56.79	56.24
	N_{60}	9.77	8.91	57.75	56.76
	N_{90}	11.36	10.51	54.25	55.93
	N_{120}	12.90	11.23	55.86	56.31
P_{120}	N_0	8.94	8.33	57.39	56.49
	N_{30}	8.93	8.19	57.49	57.20
	N_{60}	9.33	8.73	57.83	57.98
	N_{90}	11.29	11.10	54.92	55.92
	N_{120}	11.83	12.22	56.51	57.73
P_{160}	N_0	8.70	8.21	59.53	57.25
	N_{30}	9.87	8.39	58.58	57.57
	N_{60}	9.74	8.89	57.85	57.21
	N_{90}	11.25	10.83	57.10	57.47
	N_{120}	12.99	12.22	56.70	57.01
DL (p 5%)		0.82		2.84	
DL (p 1%)		1.09		3.76	
DL (p 0.1%)		1.41		4.96	

CONCLUSIONS

Recent changes in the climate require reconsideration of this crop, and in the years 2016 and 2017 there have been very favorable conditions in the Transylvanian Plain for obtaining high yields for the brewing of beer.

The largest outputs were obtained on agrofond $N_{90}P_{80}$, in 2016, the agrofond which is the most balanced in terms of nitrogen: phosphorus.

From the point of view of requirements for beer production, the most favorable agrofond was $N_{60}P_{80}$, - obtained between 8.91-9.77% protein and 56.76-57.75% starch.

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