RESEARCH ON THE INFLUENCE OF FOLIAR FERTILIZATION ON BEER BARLEY QUALITY IN TWO AREAS OF CULTURE

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Abstract: *Both for winter and spring barley, for the main area of use - brewing - of particular importance is their quality.The main elements of quality under the influence of fertilization were followed in eight varieties of winter and spring barley in two areas with different climatic conditions, Timişoara and Mizieş - Bihor. Were determined: dry matter, starch, crude protein, fat, ash, power of germination (germination energy), extract. The research was conducted in two areas with different climatic conditions, Timişoara and Mizieş - Bihor. In both centers, four varieties of spring barley were studied: Aspen, Adonis, Penellope and Hanca and four varieties of winter barley: Laura, Trasko, Plaissant and Clarine. The research aimed to determine the influence of fertilization on yields. Four variants of fertilization were used: $N_{48}P_{48}K_{48}$; $N_{48}P_{48}K_{48}$ + PlantfertU; $N_{48}P_{48}K_{48}$ + MicrofertU and $N_{48}P_{48}K_{48}$ + TerraSorb. The variant $N_{48}P_{48}K_{48}$ was used as control. Foliar fertilizers were applied during vegetation before earing. Research shows that both the studied varieties and the fertilization variants strongly influence the quality of barley. The results show that climatic conditions are essential not only for production but also for its quality, the qualitative values are different in the two research centers. In Timisoara in 2005-2007 grains protein content (raw material) to the four studied varieties are within 8.37 and 9.44. Compared to dry substance, the range of protein content is between 7.51 and 8.45%. Under the influence of the agrofond, protein content of barley and two-row barley grains varies between 8.84% on the agrofond where foliar fertilizer Terra Sorb Foliar was used overlapped on a basic agrofond $N_{48}P_{48}K_{48}$ and 9.14 on the agrofond $N_{48}P_{48}K_{48}$ - without foliar fertilization. Analysis of protein content in barley and two-row barley grains (raw material) in the interaction between the experimental factors (variety x agrofond) is found that commonly at all barley and two-row barley studied varieties, foliar fertilizers causes a lower protein content than the one made on witness agrofond $N_{48}P_{48}K_{48}$.*

Key words: ***barley, winter two-row barley, varieties, foliar fertilizers, production, quality.***

INTRODUCTION

Barley and two-row barley are of special importance both as a source of feed chosen as the main raw material for the production of beer (BADEA ANA, NEDELEA G., 2000, BERZESCU P., M. HOPULELE T., KATHREIN I., STOICESCU A., 1981, BÎLTEANU GH., BÎRNAURE V., 1989, BORCEAN I., V. MINDEA, BORCEAN A., 1994, S. BRISSON, OSTRAIN J.M., 1990, DRĂGHICI L. et al., 1972 SALONTAI AL., LUCA E., MARIA LATES, 1996) are numerous research on malting barley and two-row barley aimed to establish production quality improvement technology for the production of beer.

MATERIAL AND METHOD

Researches were conducted in field in two locations: Timişoara and Mizieş – Bihor and in laboratory. The field determinations were focused on yield and productivity traits. In laboratory were done biometrical measurements, physical attributes and main chemical traits. For production ability testing and research indicators accomplishment, were used bifactorial experiences and the experimental units were:

Unit A–the agrofond, with four graduations:

a_1 - $N_{48}P_{48}K_{48}$ – applied on seedbed preparation

a_2 - $N_{48}P_{48}K_{48}$ + (Plantfert U)

a_3 - $N_{48}P_{48}K_{48}B_{0,0048}$ +(Microfert U)

a_4 - $N_{48}P_{48}K_{48}$ + (Terra Sorb foliar)

Unit B – barley and winter two rows barley with four graduations:

b_1 – Laura – two rows barley

b_2 - Trasko– two rows barley

b_3 - Plaissant - barley

b_4 – Clarine

Excepting the distinctive experimental traits, all other technological traits were those specific for these two crops for brew: barley and two rows barley.

Quantitative and qualitative determinations were done according to experimental technique rules.

RESULTS AND DISCUSSION

In this paper are presented and analyzed the results on protein content in barley and winter two-row barley grains under the influence of foliar fertilization. Average protein content of barley and beer winter two-row barley grains in Timisoara, are presented in Table 1.

Table 1

The protein content of barley and winter two-row barley grains in conditions of Timisoara in 2005-2007

Nr. crt.	Barley and two-row barley varieties	Grain protein content (%)	(%)	Dif. ± %
1	Laura	9,44	100	Mt
2	Trasko	9,39	99	0,05
3	Plaissant	8,37	89	1,07
4	Clarine	8,46	96	0,98

Among the varieties of barley and winter two-row barley studied in Timisoara stand winter barley variety Plaissant with a protein content of 8.37 % and winter two-row barley variety Clarine with a protein content of 8.46%. Trasko and Laura barley varieties are also distinguished with a grain protein content below 9.5, namely 9.39 % for Trasko variety and 9.44 % for Laura variety. After protein content, all four varieties of winter barley and two-row barley are very good for the brewing industry. Average grain protein content of winter barley and two-row barley from dry substance in Timisoara in 2005-2007 is presented in Table 2.

Table 2

Average grain protein content of winter barley and two-row barley from dry substance in Timisoara in 2005-2007

Nr. crt.	Barley and two-row barley varieties	Grain protein content (%)	(%)	Dif. ± %
1	Laura	8,45	100	Mt
2	Trasko	8,38	99	0,07
3	Plaissant	7,51	89	0,94
4	Clarine	7,55	89	0,90

Analysis of protein content in grains of winter barley and two-row barley reported to dry substance (Table 2) shows that they fall into the high quality standards of the four barley cultivars analyzed and designed for the brewing industry. Typically proteins from barley is of 10.5 to 11.5 compared to dry substance, outliers beeing 8-13.5%. In Timisoara in 2005-2007 grains protein content (raw material) to the four studied varieties are within 8.37 and 9.44.

Compared to dry substance, the range of protein content is between 7.51 and 8.45%. The agrofond factor analysis (foliar fertilizers) on average grain protein content from the four varieties of winter barley and two-row barley shows the following: grain protein content of winter barley and two-row barley reported either to raw substance or to dry substance, is influenced by foliar fertilization. The protein content in the grains of barley and two-row barley reported to raw substance, under the influence of foliar fertilizers is shown in Table 3.

Table 3

Nr. Crt.	Fertilization	Grain protein content (%)	(%)	Dif. ± %
1	$N_{48}P_{48}K_{48}$	9,14	100	Mt
2	$N_{48}P_{48}K_{48}$+ Plantfert U	9,02	99	0,12
3	$N_{48}P_{48}K_{48}$+ Microfert u	8,85	97	0,29
4	$N_{48}P_{48}K_{48}$+ Terra Sorb Foliar	8,84	97	0,30

Under the influence of the agrofond, protein content of barley and two-row barley grains varies between 8.84% on the agrofond where foliar fertilizer Terra Sorb Foliar was used overlapped on a basic agrofond $N_{48}P_{48}K_{48}$ and 9.14 on the agrofond $N_{48}P_{48}K_{48}$ - without foliar fertilization. There is something extremely important for the culture of beer barley and two-row barley: foliar fertilizers improve beer quality by reducing the protein content in grains. In the case of foliar fertilizers Microfert U and Terra Sorb Foliar grain protein content falls below 9.0%.

Grain protein content of barley and two-row barley reported to dry substance under the influence of foliar fertilizers is shown in Table 4.

Table 4

Grain protein content of winter barley and two-row barley reported to dry substance, under the influence of foliar fertilizers in Timisoara in 2005-2007

Nr. Crt.	Fertilization	Grain protein content (%)	(%)	Dif. ± %
1	$N_{48}P_{48}K_{48}$	8,18	100	Mt
2	$N_{48}P_{48}K_{48}$+ Plantfert U	7,91	97	0,27
3	$N_{48}P_{48}K_{48}$+ Microfert u	7,93	97	0,25
4	$N_{48}P_{48}K_{48}$+ Terra Sorb Foliar	7,87	96	0,31

Average protein content analysis reported to dry substance in winter barley and two-row barley under the influence of foliar fertilization in Timisoara highlights some elements in first (not met in the literature references). Foliar fertilizers: Plantfert U, Microfert U and Terra Sorb Foliar lowers the protein content in barley and two-row barley grains which contributes to improving their quality when their destination is brewing.

Among foliar fertilizers most drastic reduction in protein content is achieved when applying the product Plantfert U - 7.91% compared to 8.18% protein content in barley and two-row barley grains on the witness agrofond $N_{48}P_{48}K_{48}$. It is noted that all three foliar fertilizers when applied to barley and two-row barley lead to reduced protein content in grains. Synthesis of the grain protein content results from four varieties of winter barley and two-row barley under the influence of foliar fertilization is presented in Table 5.

Table 5

Protein content in barley and two-row barley grains (raw material) under the influence of foliar fertilization in Timisoara 2005-2007

Varieties	Fertilizer fund				Average of fertilizer fund		
	$N_{48}P_{48}K_{48}$	$N_{48}P_{48}K_{48}$+ Plantfert U	$N_{48}P_{48}K_{48}$+ Microfert u	$N_{48}P_{48}K_{48}$+ Terra Sorb Foliar	Average yield kg/ha	%	Difference ± kg/ha
Laura	9,47	9,52	9,48	9,29	9,44	100	Mt
Trasko	9,47	9,26	9,43	9,41	9,39	99	-0,05
Plaissant	8,68	8,24	8,21	8,36	8,37	89	-1,07
Clarine	8,93	8,35	8,28	8,29	8,46	96	-0,98

The average yields of factor B - Variety

Yield kg/ha	9,14	9,02	8,85	8,84
%	100	99	97	97
Diff. ± kg/ha	Mt	-0,12	-0,29	-0,30

Analysis of protein content in barley and two-row barley grains (raw material) in the interaction between the experimental factors (variety x agrofond) is found that commonly at all barley and two-row barley studied varieties, foliar fertilizers causes a lower protein content than the one made on witness agrofond $N_{48}P_{48}K_{48}$. An exception to the rule is the variety LAURA to which the highest protein content in grains is obtained by foliar fertilization with Plantfert U - 9.52% and Microfert U - 9.48% compared to 9.47% protein content in grains on witness agrofond $N_{48}P_{48}K_{48}$. Protein content in barley and two-row barley grains (dry substance) under the influence of foliar fertilization is presented in Table 6.

As well as in the case of reporting the protein content of barley and two-row barley grains to raw substance, also in the case of protein content of barley and two-row barley grains reported to dry substance, the influence of the variety can be seen especially that of the used foliar fertilizers. Depending on the variety, the highest protein content in barley and two-row

barley grains is made at Laura variety - 8.45% followed by Trasko variety with a protein content of 8.38%

Table 6

Average protein content in barley and two-row barley grains reported to dry substance under the influence of foliar fertilizers in Timisoara in 2005-2007

Fertilizer fund	Varieties				Average of fertilizer fund		
	Laura	Trasko	Plaissant	Clarine	Average yield kg/ha	%	Difference ± kg/ha
$a_1N_{48}P_{48}K_{48}$	8,48	8,48	7,80	7,97	8,18	100	Mt
a_2 Plantfert	8,52	8,28	7,40	7,45	7,91	97	0,27
a_3 Microfert	8,49	8,45	7,36	7,40	7,93	97	0,25
a_4 Terra Sorb	8,30	8,31	7,48	7,38	7,87	96	0,31

The average yields of factor B - Variety

Yield kg/ha	8,45	8,38	7,51	7,55
%	100	99	89	89
Dif ± kg/ha Diff. ± kg/ha	Mt	0,07	0,94	0,90

On barley Plaissant and two-row barley Clarine varieties, grain protein content reported to dry substance is 7.48% respective 7.55.

Analysis of protein content under the influence of foliar fertilizers shows that they reduce the protein content in grains except barley variety Laura at which foliar fertilization with Plantfert U and Microfert U - increases the protein content in grain - 8.52% respective 8.49% compared to 8.48% recorded on the witness agrofond $N_{48}P_{48}K_{48}$.

CONCLUSIONS

Research on the influence of foliar fertilizers on protein content in barley and two-row barley grains in Timisoara in 2005-2007 allows us to extract some conclusions useful in agronomic practices.

1. The variety has a certain specificity regarding protein content in beer - larger at Laura and Trasko varieties and lower at Plaissant and Clarine varieties.
2. Protein content in grains at the studied varieties is less than 9%, which includes them in the category of those great for the beer industry.
3. The used foliar fertilizers reduce the protein content in grains - an exception being Laura variety where the foliar fertilizers used Plantfert U and Microfert U causes a slight increase in grain protein content.

We can make the recommendation of introduction in the fertilization technology of foliar fertilization with Plantfert U, Microfert U and Terra Sorb Foliar for improving the quality of grains used in the brewing industry.

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