THE STUDY OF SOME QUALITIES AND YIELD OF SOME WINTER WHEAT VARIETES USED IN THE BREEDING PROCESS

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Abstract. : *In the present paper we make an analysis of 10 winter wheat varieties, both qualitatively and quantitatively, of the wheat production made at Agricultural Research and Development Lovrin, aiming at identifying valuable sources of genes to be introduced in the breeding process of wheat. The results obtained show that the Apache, Aerobic and Azimut varieties have produced statistically ensured yields superior to the average of the experience, also that the Ciprian variety is a source of important genes for simultaneous breeding in protein content and wet gluten in wheat. Current and future concerns include sustaining wheat production and grain quality by getting breeding line and varieties with high production yield and high quality.*

Keywords*: winter wheat, quality, production, varieties*

INTRODUCTION

Wheat is of great importance as a food, providing much of the carbohydrates and proteins needed to man and more than half of the calories consumed by mankind. Considering both its economic importance and its particular role in human nutrition, the current and prospective trend is to increase world production. After KAMALUDDIN ET AL. (2007), wheat production depends on the number of grains / surface unit and grain weight. Wheat production is dependent on the general genetic potential of the plant. The productivity of the cultivar is dependent on the hereditary factor, on which the environmental conditions and the genotype-environment interaction play a major role in phenotypic expression (KNEŽEVIĆ, 2008). Therefore, wheat production is a quantitative character with high variability, which is given by many components of production, their formation under the influence of environmental conditions (KRALJEVIC-BALALIC ET AL., 2001). In addition to this direction, other trends, such as the introduction into production of varieties with a high protein content of high nutritional value, as well as the cultivation of varieties with superior qualities, are increasingly emerging. The emphasis on quality improvement is highlighted by many international research and meetings on the quality of wheat. The main determinants of wheat quality are: protein content, gluten content and endosperm texture (grain hardness). The quality of the wheat is determined by the cultivated variety and the technological and pedoclimatic conditions. The qualities of the quality are strongly influenced by the applied technology (V. TABĂRĂ, 2008). Proteins, in which gluten is the most important component, along with other substances contained in grain, give nutritional, technological and processing value (TODEA MARIA, GH. V. ROMAN, 2004). The lower limit of gluten content accepted in baking is 22% (TABLE V. AND COLLECTION 2008). Many studies and research on wheat quality (BUNTA ET AL., 2015; KADAR ET AL., 2002; MARINCIU, 2008; TAYYAR, 2010) have shown that there is a negative correlation between grain production and grain quality.

MATERIAL AND METHODS

In this paper, ten varieties of wheat varieties were studied in a comparative culture, which was conducted at Agricultural Research and Development Lovrin in order to identify the best genotypes of production potential and very good quality parameters for use in the breeding

process. The experimenter was sown according to the method of placement in randomized blocks in 4 rehearsals, with harvesting parcels 14 square meters of surface. The statistical processing of the experimental data was done by analyzing the variant and establishing the correlations between the characters. (CIULCĂ, 2006). The soil on which experimentation was performed was semi-carbonate chernozem slightly glerified with pH in water 6.89; humus content of 3.34; nitrogen index: 2.29%; P2O5l: 3.5 ppm; K2O: 156 ppm. Fertilization consists of 115 kg / ha of nitrogen (active substance) applied in 2 steps. The varieties studied were analyzed both in terms of production and quality, namely: protein content, wet gluten content and hardness of wheat grains. Determination of protein content, of gluten content and grain hardness is analyzed with laboratory equipment like the Perten Inframatic 9200 (Fig. 1). This laboratory equipment has the ability to analyze wheat samples without destroying the sample, and the quantity of a sample is of 12.5 ml.

Figure 1. Perten Inframatic 9200

In table 1 shows the varieties tested at the Lovrin Agricultural Research Station and their country of origin.

Table 1

Country of origin and name of wheat varieties tested at Lovrin.

Nr.	Name of the wheat variety	Country of origin
1	Alex	Romania
2	Ciprian	Romania
3	Boema	Romania
4	Faur	Romania
5	Izvor	Romania
6	Glosa	Romania
7	Apache	Franta
8	Aerobic	Franta
9	Azimut	Franta
10	Litera	Romania

RESULTS AND DISCUSSIONS

Regarding the yield of the analyzed varieties, Apache (8680 kg / ha), Aerobic (7530 kg / ha) , Azimut (7396 kg / ha) has achieved a production superior to the average of the experience with a very significant increase, and the varieties Boema (6223 kg / ha) ,Ciprian (6273 kg / ha) and Faur(5976kg/ha) were recorded in the lower yields of the production than the average.

Table 2

Results on the yield potential of some winter wheat varieties, Lovrin

Class.	Variety	Yield (kg/ha)	Relative yield (%)	Differences to experimental average (kg/ha)	Significance of differences
1	Apache	8680	124.7	+1717	***
2	Aerobic	7530	108.2	+567	*
3	Azimut	7396	106.2	+433	*
4	Izvor	7130	102.4	+167	
5	Glosa	7012	100.7	+49	
Media experientei		6963	100	0	-
6	Litera	6863	98.6	-100	
7	Alex	6553	94.2	-410	
8	Ciprian	6273	90	-690	**
9	Boema	6223	89.4	-740	**
10	Faur	5976	85.9	-987	***

DL 5% = 431 kg; DL 1%=662 kg; DL0.1%=961 kg

Table 3

Results on the qualities of some autumn wheat varieties, Lovrin

Class.	Variety	Protein (%)	Wet gluten (%)	Hardness (%)
1	Ciprian	15.5	36.6	46
2	Boema	13.8	31.9	47
3	Litera	13.7	33.4	50
4	Glosa	13.3	32.1	48
5	Izvor	13.0	30.5	49
Media experientei		13.07	29.79	49.3
6	Alex	12.3	28.2	51
7	Azimut	12.2	26.2	50
8	Faur	12.2	27.7	50
9	Aerobic	12.1	26.4	51
10	Apache	11.9	24.9	51

One of the most important qualities of wheat is the content of wheat protein grains. Protein content ranged between 11.9% and 15.5% in the 10 genotypes analyzed . From this point of view, with high protein content was highlighted: Ciprian (15.5%), Litera (13.7%), Glosa (13.3%) and the other with lower protein content Apache (11.9%), Aerobic (12.4%) and Azimut (12.6%).

Gluten by its quantity and quality determines the properties of wheat bread.

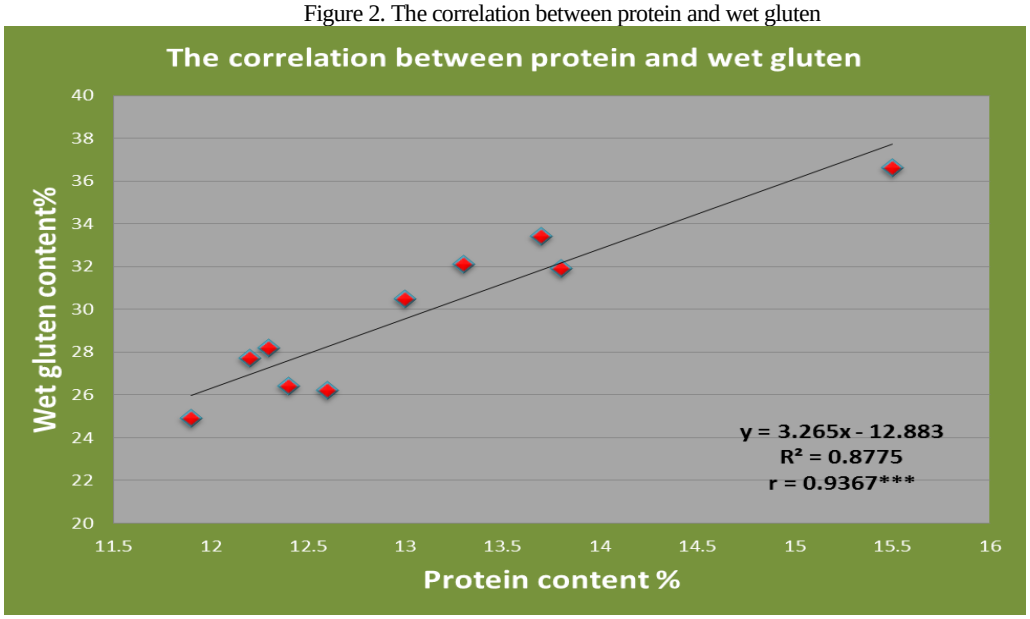
The wet gluten content ranged from 24.9% to 36.6% in 2015. From this point of view, the varieties that have been noticed are: Ciprian (36.6%), Letter (33.4%), Glosa (33.4%), and with lower gluten content, Apache (24.9%), Azimut (26.2%), Aerobic (26.4%).

Hardness is a physical property of endosperm and is an important quality feature because it facilitates the grading of wheat and affects milling, baking and final quality. Hardness is one of the important factors for differentiating wheat for its evaluation for commercial purposes and plays an important role in the results obtained in terms of hardness, had values between 46% for the Ciprian variety and 51% for the Apache variety. After Meyer et al., 1997 depending on the hardness of the grains wheat, the wheat varieties are divided into two categories:

- hard varieties(with hardness between 50-60%);
- soft varieties (with hardness between 40-45%).

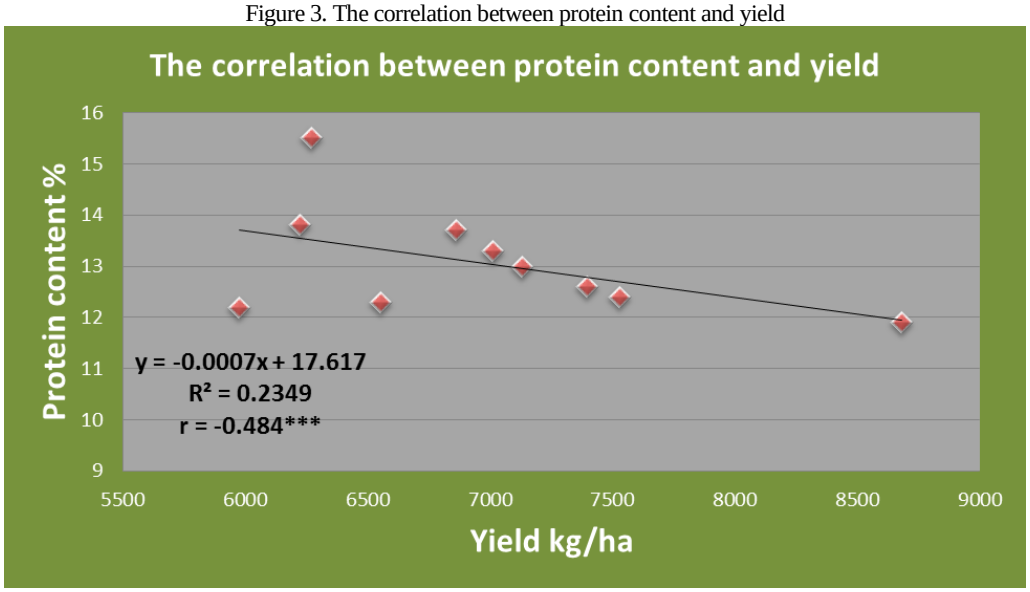
Analyzing the results we can say that all varieties tested under the conditions of S.C.D.A. Lovrin fall into the category of hard varieties.

Figure 2. The correlation between protein and wet gluten



The association of protein content with wet gluten content in the experience at SCDA Lovrin (Fig.2) in winter wheat varieties is described by a regression line with a strong ascending slope (y = 3.26) showing that the content of wet gluten is directly proportional to the protein content. The distribution of wheat varieties around the regression line is very clustered, indicating the very close relationship between the two properties analyzed, with the correlation coefficient r = 0.9367. The calculated determinant (R2) indicates that the total variation in wet gluten content of 87% is determined by the variation in protein content.

Figure 3. The correlation between protein content and yield



The linear regression between protein content and grain production is shown in Figure 3. The association of protein content with grain production is described by a regression line with a strong downward

slope suggesting that the increase in protein content of wheat grains is inevitable reducing grain production. The determinant (R2 = 0.234) shows that only about a quarter of the variation in protein content can be explained by the variation in grain yield.

CONCLUSIONS

1. The results show that the Apache (8680kg / ha), Aerobic (7530kg / ha) and Azimut (7396 kg / ha) varieties have obtained statistically superior levels of the average of the experience, and in terms of quality , the variety Apche obtained the lowest protein content of 11.9% and a wet gluten content of 24.9%.
2. Wheat variety Ciprian, with a protein content of 15.5% and a gluten content of 36.6% is a source of important genes and will be used in future breeding programs.
3. The results confirm: by increasing the wheat grain protein content, it is inevitable to reduce grain production.

BIBLIOGRAPHY

1 .BUNTA GH.,* TOMA I.,GORINOIU G., PITU S.,2015 The relationship between genotypes, diseases attack, yield and quality in winter wheat in western Romania, Volume 19(1), 30, JOURNAL of Horticulture, Forestry and Biotechnology,Romania;

2. CIULCA S., 2006, Metodologii de experimentare în agricultură şi biologie. Ed. Agropirnt, Timişoara;

3. KADAR, ROZALIA, 2002, Studiul interacţiunii genotip-condiţii de cultură în realizarea calităţii de panificţie la grâul de toamnă, Teza de doctorat. Biblioteca USAMV Cluj-Napoca;

4. KAMALUDDIN; RISHI M. SINGH; LAL C. PRASAD; MALIK Z. ABDIN, ARUN K. JOSHI, 2007, Combining ability analysis for grain filling duration and yield traits in spring wheat (Triticum aestivum L. em. Thell.), Genet. Mol. Biol. vol.30 no.2 São Paulo Mar;

5 .KNEŽEVIĆ, D., VESELINKA ZEČEVIĆ, NEVENA ĐUKIĆ AND D. DODIG, 2008, Genetic and phenotipyc variability of grain mass per spike of winter wheat genotypes (Triticum aestivum L.) , Kragujevac J. Sci. 30: 131-136;

6 .KRALJEVIC-BALALIC, MARIJA, WORLAND, A.J., PORCEDDU, E., KUBUROVIC, M., 2001, Variability and gene effect in wheat. In: Monograph Genetic and Breeding of Small Grains. (eds. S. QUARRIE et al.) pp. 9-49;

7. MARINCIU CRISTINA ŞI N.N. SAULESCU, 2008, Cultivar effects on the relationship between grain protein concentration and yield in winter wheat, Romanian Agricultural Research , 25, 19-27;

8. MEYER L., ZABEL S., SCHMIEDER W., HARTMANN G. (1997): Qualitätsuntersuchungen zu Getreide, Ernte 1997. Landwirtsch. Unters.- Forsch.-Anst. Sachsen-Anhalt: 77;

9. TABĂRĂ V., OLTEANU G., 2008- Principalele însusiri de calitate ale grâului Triticum durum (soiul Pandur) sub influenta unor măsuri agrotehnice. Buletinul Agir, 1-2, p. 9-13;

10 .TABĂRĂ V., PUSCĂ I., WAGNER L., POP G., NITĂ S., GORINOIU GABRIELA, PRODAN M.,2008- Calitatea panificabilă a unor soiuri de grâu de toamnă în conditiile Statiunii de cercetări Agricole Lovrin. Buletinul AGIR, 1-2., p. 5-6;

11. TAYYAR, S., 2010, Variation in grain yield and quality of romanian bread wheat varieties compared to local varieties in northwestern turkey, Romanian Biotechnological Letters, 15 ,2, 5189-5196