

## RESULTS REGARDING THE YIELD AND QUALITY OF SOME WHEAT VARIETY IN TISA PLAIN

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### Abstract

*This paper present the results regarding the yields and quality of Crisana whinter wheat variety in 4 locations in Tisa plain (2011), three in Romania (Oradea, Felnac and Gataia) and one in Hungary (Kiszombor). Even the climatical and technological conditions are different, the results are comparable and varieties reactions stable. Crisana variety is a middle yielding one but with good milling and backing qualities. The general tendency is the decrease of quality when yield are increassing, with some exceptions. The new breeding Oradea 18 have a verygood yield potential and quality. The varieties: Adelaide, Exotic, Apache, G.K.Csillag, G.K.Elet, Arlequin, Garcia are very productive but with low quality. In opposition, the varieties Faur, Boema, Lovrin 34 and Ciprian has pour yield potential, but a very good wet gluten content*

**Key words::** correlation, wet gluten, wheat variety, yield.

### INTRODUCTION

In Romania, the average area cultivated with winter wheat reaches about 2 million ha, with a total production between 7 and 12 million tones/year, but only 2- 5 million tones are acceptable regarding the quality.

In western Romania (Tisa Plain), one of the most important area for the winter wheat, there are cultivated some romanian varieties (Dropia, Boema, Flamura 85, Glosa, Alex, Romulus, Ciprian, Lovrin 34, Ariesan and Crisana), all being appreciate with good qualities (Tabara and all., 2011). In 2008, the most cultivated varieties in this area were: Alex, Romulus, Dropia, Ariesan (Romanian), Serina, Josef and Renesansa (foreign).

In Hungary are registered more than hundred cultivars, some of them being better in numerous quality parameters: Lupulus (Austrian cultivar), Mv. Palotás, G. K. Rozi, G.K. Bekes. Fatima (Romanian cultivar registered in Hungary) and Lupulus show high wet gluten content in non fertilized conditions (Győri Z. and Sipos P., 2006). Some of these varieties are cultivated in western Romania, too.

Generally, wheat quality is defined by:

- Physical properties: hectoliter weight, (TKW), grain hardness,

- Protein-linked properties: total protein and gluten contents, gluten index, expansiveness, sedimentation volume, protein and amino-acids;
  - Reologic properties: farinograph or valorigraph test, alveograph value;
  - Enzymatic properties: Hagberg falling number, amilograph test;
- Bread-making quality in wheat (Tabara et al., 2011) depends on:

- Starch from the endosperm;
- Fats from the embryo and aleuronic layer;
- Mineral substances in pericarp;
- Vitamins in tegument and pericarp;
- Proteins, which varies between 8- 26%.

Wheat quality, especially protein content and bread-making quality is influenced by type of soil, climate conditions, nitrogen fertilization, plant protection and genotype (Pepó P., 2002; Ranieri R., 2000; Szentpétery Zs. et al., 2004; Tanács L. et al., 2004). The mineral fertilization can increase the protein content with 26- 42%.

Other authors (Ranieri R., 2000) appreciate that the stability of wheat quality is strongly dependent on genotypes, agricultural production technology, soil fertility, nitrogen fertilization and water availability.

High yielding ability with good bread-making quality is the main aim in bread wheat breeding programs (Şemun T., 2008). It is known that the baking quality of wheat is under genetic as well as environmental control (Lupton, F., 2005). Another authors (Kadar R., Moldovan V., Moldovan Maria, 2009) concluded that the heritability coefficients are small for protein content, but large for sedimentation index, gluten content and deformation index. The cultivars created at A. R. S. Turda (Apullum, Turda 95 and Turda 2000) are considered to be a new level of quality in Central and North Romania.

The genetic and molecular control of cereal quality and methods for its manipulations is possible by conventional breeding methods or by genetic engineering (Snape J. Et al, 2005). Using genetic maps, they concluded that the increase of protein content is associated with markers on chromosomes 1A, 2B, 2D, 3B 5BS/7BS and 6B.

An group of co-worker (Tabără V. et al, 2008) present the standard values for wheat quality in Romania (812- ISO 7970/2001): hectoliter weight more than 75 kg/hl, falling number between 180-260 seconds, wet gluten more than 22%, gluten index between 65 and 80%.

## **MATERIAL AND METHOD**

The climatical conditions are similar in western Romania and east south-east Hungary. For this reason, a variable serie of varieties was tested both in Hungary (Kiszombor, near Szeged) and Romania (Gataia, Timis county, Felnac, Arad county and Oradea, Bihor county). All the results are from the year 2011.

The varieties tested are from Romania, Hungary and from another European country: France Austria, Italy, Spain, Serbia. The total number of variantes tested was 119, some of varieties being presentes in 2, 3 or all 4 locations (like Crisana, Dropia, Apache).

The experiments from Kiszombor, Gataia and Felnac were dune in randomized blocks in three replications and those from Oradea, in lattice square balanced, in six replications.

The results were statistical processed by correlation and regression and analyze of variances and limit standard deviation.

The results regarding the wet gluten were obtained by using Infratech aparature.

The fertilization vas different in different places: 57 kg/ha a.s. P + 15 kg/ha a.s. K and 124 kg/ha a.s. N, in three stages (Kiszombor), 163 kg/ha a.s. N in 3 stages (Gataia), 84 kg/ha a.s. N (Felnac), 100 kg/ha a.s. N (Oradea). For this reason, the varieties yield results are comparable only in case of same location.

The results from Kiszombor, Gataia and Felnac presented in this paper are a part of Ph. paper "Researches regarding the influence of principals physiologic paramethers on quality and yield of winter wheat", author ing. Octavian Guler.

## **RESULTS AND DISSCUSIONS**

In 2011, the yields varied in the experiment conducted at Oradea (table 1) between 3.423 kg/ha (Dropia, considered to be a very good quality variety) and 6.784 kg/ha (Kiskun Gold). The best varieties between were tested at Oradea, statistical ensured, were, fallowing Kiskun Gold, a breeding new line Oradea 18 and the varieties Litera, Delabrad, Apache, Ariesan and Capo. The list yielding varieties were: Dropia, Flamura 85 and Lovrin 34 (Romanian old varieties), Glosa, Faur and Ciprian.

Regarding the backing quality, it is important to observe that total protein content varied between 14.3% (Serina) and 11.0% (Lovrin 34). Good protein content have Gruia and Miranda, too.

An usual quality index, wet gluten (%), has good values in case of Serina, Miranda, Gruia and Crisana. The values of wet gluten were not corresponding in case of Apache, Alex, Ciprian and Flamura 85.

The third important index of backing quality, sedimentation index were very good in case of Josef, Delabrad, Ardeal and Serina, with sedimentation values up to 40 ml. Extremely bad sedimentation values have Capo and Lovrin 34, so that AgriCheck laboratory apparatus can't determine here values.

It must underline the new breeding wheat line, Oradea 18, with a very good yielding potential, good protein and wet gluten content and sedimentation index, too. This breeding line is in course of testing period in State Institute for Testing and Registration Varieties network, in secondary year.

*Table 1*

Yields and quality results of some wheat varieties. Oradea, 2011.

Variety	Yield (kg/ha)	Relative yield (%)	Differ. (kg/ha)	Signiff. Differ.	Protein (%)	Wet gluten (%)	Sedimentation index (ml)
Kiskun Gold	6784	126.1	+1404	***	12.5	26	25
Oradea 18	6265	116.4	+885	***	13.2	26	35
Litera	6167	114.6	+787	**	13.1	26	33
Delabrad	6160	114.5	+780	**	13.3	26	40
Apache	6091	113.2	+711	**	11.1	20	27
Ariesan	5981	111.2	+601	**	13.0	26	33
Capo	5834	108.4	+454	*	11.7	23	*
Gruia	5819	108.2	+439		13.7	27	37
Izvor	5797	107.7	+417		12.3	23	26
Ardeal	5670	105.4	+290		13.3	26	40
Miranda	5570	103.5	+190		13.7	28	43
Josef	5526	102.7	+146		13.2	26	41
Alex	5442	101.2	+62		11.3	20	15
Renesansa	5424	100.8	+44		12.3	24	27
<b>Exp. Average</b>	<b>5380</b>	<b>100.0</b>	<b>0</b>	<b>-</b>	<b>12.5</b>	<b>24.2</b>	<b>28.7</b>
Romulus	5274	98.0	-106		12.9	25	34
Boema	5267	97.9	-113		12.4	24	26
Serina	5186	97.4	-194		14.3	31	41
Kristina	5174	97.2	-206		11.9	23	24
Crisana	5145	95.6	-235		12.6	27	32
Ciprian	4807	89.3	-573	0	11.3	20	16
Faur	4691	87.2	-689	00	11.7	21	14
Glosa	4610	85.7	-770	00	11.9	23	22
Lovrin 34	4376	81.3	-1004	000	11.0	19	*
Flamura 85	4036	75.0	-1344	000	11.4	20	16
Dropia	3423	63.6	-1957	000	11.9	22	24

LSD5%=444 Kg/ha;

LSD15= 600 Kg/ha;

LSD0.1%+ 800 Kg/ha.

The experiment conducted at Kiszomor (fig. 1), in different technical conditions, evidentiates some wheat varieties with good yield (up to 70

q/ha), like: Adelaide, Exotic, Apache, G.K.Csillag, G.K.Elet, Arlequin, Garcia. From this group of good yielding varieties, only Exotic has an good wet gluten content.

The lowest content in wet gluten has Garcia and Banquet, but this two varieties are used in biscuit industry.

Another group of varieties (Soissons, Apache, Arlequin) from France are very productive, but with pour quality.

Some Romanian varieties (Faur, Boema, Lovrin 34 and Ciprian) realized low yields but with very good gluten content. Crisana, a wheat variety created at Agricultural Research Station Oradea, has a good yield potential (exceeded 7.000 kg/ha) and quality (26.5% wet gluten), comparable with G.K.Rozi, G.K.Kalasz, G.K.Feny, G.K.Koros and G.K.Petur (all created at A.R.I. Szeged, Hungary). All these varieties are good yielding and have good backing quality. So, Crisana variety is competitive with Hungarian varieties, even in here zone.

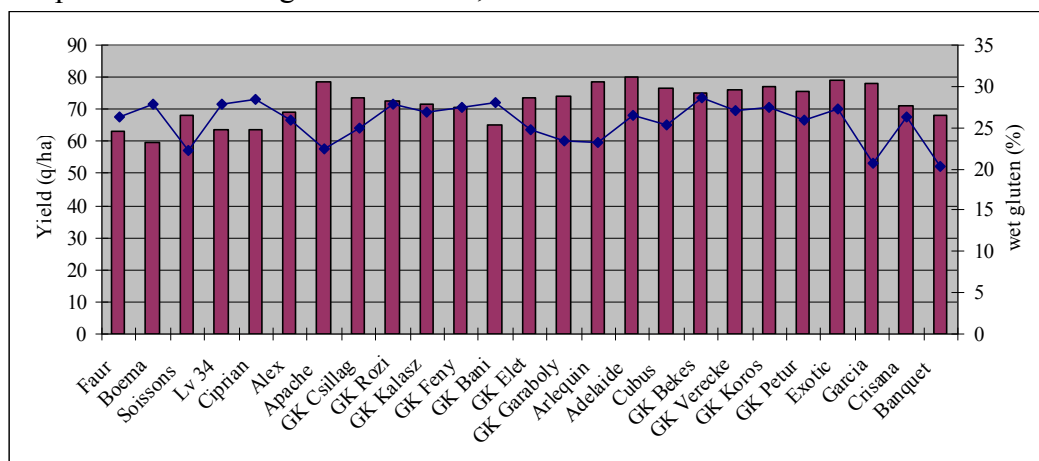


Fig. 1 The link between yield and wet gluten content in some wheat varieties. Kiszombor, 2011.

Another experiment conducted in Romanian Banat area (Gataia, Timis county) with 37 varieties, with comparable climatically conditions, repeat the same scheme of organization (fig. 2). With very good grain yield were: Kubus, Altigo, Apache, Azimuth and Garcia (around 7.000 kh/ha), but all of them have low content in wet gluten. Very good content of wet gluten have: G.K.Bekes, Josef, B 52, Faur, Alex and Capo, but here yields do not exceed 6.200 kg/ha.

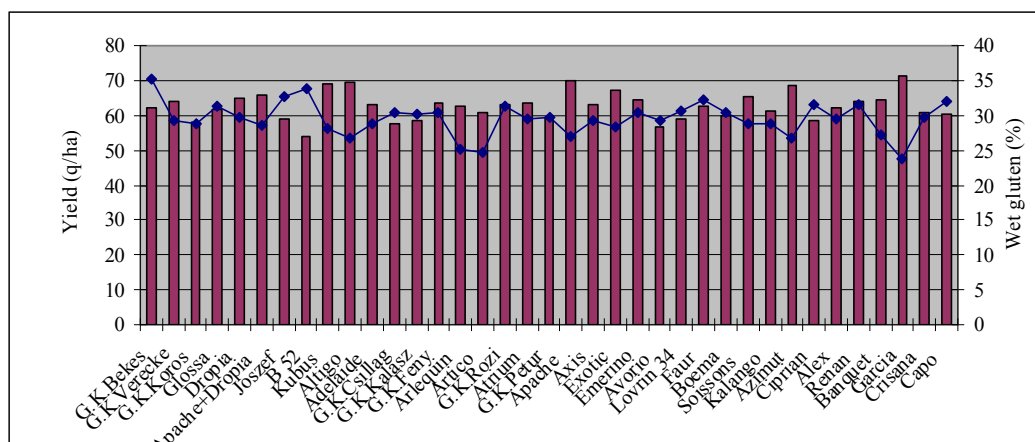


Fig. 2 The link between yield and wet gluten content in some wheat varieties. Gataia, 2011.

In neighbour county Arad was conducted another experiment at Felnac (fig. 3).

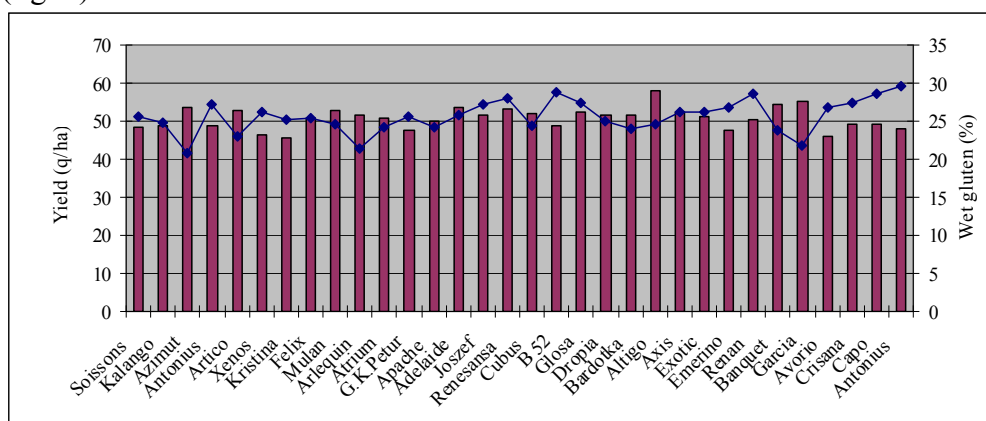


Fig. 3 The link between yield and wet gluten content in some wheat varieties. Felnac, 2011.

There, the levels of grain yield were lower than in precedent locations, but the tendency is the same: the varieties with very good yield (Azimut, Artico, Arlequin, Altigo, Banquet and Garcia) have low quality (lower than 25% wet gluten content). The varieties with good quality (Antonius, Josef, B 52, Emerino, Renan, Avorio, Crisana and Capo) realized only 4.500-5.000 kg/ha.

In attempt to identify the general tendency in relation between yield and quality, we analyzed the functions which reproduce the best this relation: linear, exponential, power, logarithmic and polynomial (2) trend (fig. 4). The trend function, ensured statistical, were the polynomial one (fig. 4). There are one zone, under 5.000 kg/ha, where the wet gluten content enrich with yield (positive trend). This situation is done by the effect of fertilization. The next zone (between 5.500 and 6.500 kg/ha) is the optimal one, where the genetic factors interfere with level of fertilization.

Up to this level of yield, the content of wet gluten decline (negative trend to yield), the explication of this situation being an genetical one: the varieties with very good yield potential have low backing quality.

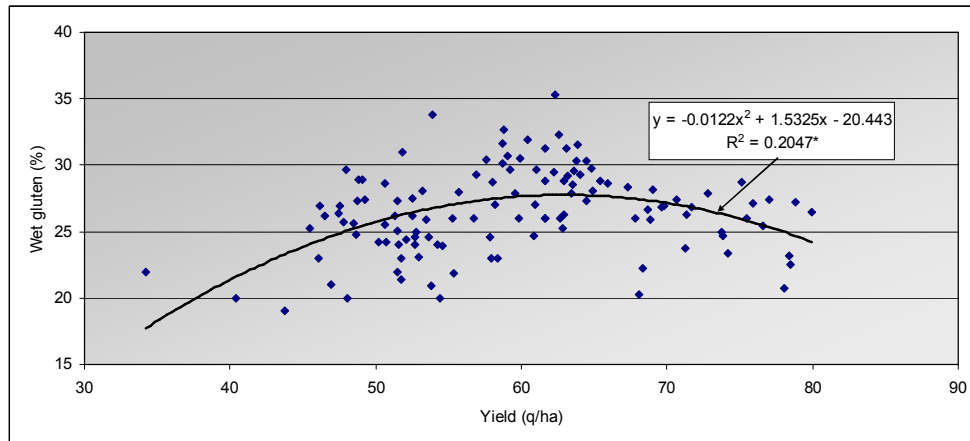


Fig. 4. The polynomial trend between yield and wet gluten.

## CONCLUSIONS

- 1.The content of wet gluten depends of two factors: genotype and fertilization.
- 2.The varieties with good yielding potential are, in general, the same in all locations and the genotypes with good wet gluten content repeat the same tendency.
- 3.The variety Crisana has a good yield potential, competitive to the varieties from the same class of quality.
- 4.The breeding line Oradea 18 is a promising one, with very good yield and quality.
- 5.There are some varieties with optimal raport between yield and quality: Crisana, G.K.Rozi, G.K.Kalasz, G.K.Feny, G.K.Koros and G.K.Petur

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