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# Evaluation of cereal cultivar impact on bread quality

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***Abstract***

Technological behavior of flours is the result of complex interactions which should be analyzed through specific quality parameters: protein content, wet gluten, Zeleny index, Falling Number, extensibility and resistance. Many times, reality shows us that the established values for classical quality parameters of flours, didn't assure an optimal technological behavior. The wheat quality is genetically influenced by soil, climate, technological parameters, pest and disease attack.

The aim of this paper was to establish which are the influences of cereal's cultivar on technological behavior of flours and, also, on bread quality. In order to obtain some available data it was used two wheat types from two different habitats of Romania (South West - Oltenia County and North East -Moldavia County). It was established that the wheat result from North East had better qualitative parameters and the obtained bread were the most qualitative.

***Keywords***: rheological properties, humidity, wet gluten, Alveograph curve

## 1. Introduction

The quality of raw materials is an essential requirement to achieve quality finished products. Wheat is the raw material for bread and milling industry and has a decisive influence on baking quality. Worldwide, a great importance is given to the annual quality surveys of wheat crops. They are particularly useful when results are made public as soon as possible after harvest and sampling of areas where culture is representative. Thus, in countries with a tradition of growing wheat (U.S. and France) this type of investigations are conducted by specialists from the offices and institutions of national importance, large industrial corporations and grain analysis centres [1].

The quality of wheat is genetically conditioned and influenced by soil conditions, climate, technology, diseases and pest attack. Therefore, in order to have the chance to harvest quality wheat it is absolutely necessary to cultivate a variety that has the potential to develop that quality and for people to provide conditions for the wheat to achieve its potential. The genetic basis is a necessary but not sufficient condition. The genetic basis, meaning a variety of potential quality, is in actuality an essential condition, because a wheat variety with no potential will not produce a quality crop regardless of the conditions which we create.

Evaluation of wheat quality involves the measurement of a large number of properties. Since many of the tests for quality evaluation are time-consuming and expensive, they have been performed traditionally on a limited number of samples. The number of samples to be evaluated may be reduced by compositing samples over replicates, locations, or years. However, this procedure reduces the precision with which quality characteristics are estimated and may lead to erroneous conclusions if large cultivar by environment interactions for quality parameters occur. Therefore, the relative effect of cultivar, environment, and cultivar by environment interactions must be characterized and quantified to identify superior quality.

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In order to reduce as much as possible the production losses caused by drought and other adverse environmental factors, biotic (foliar and ear diseases) and abiotic (low temperature, high temperature, sprouting in the ear), the research recommends farmers the cultivation of Romanian varieties which, under current given conditions, ensures reliable harvests [2,3].

## 2.Material and Method

In order to obtain some available data it was used two wheat types from two different habitats of Romania (South West - Oltenia County provided by S.C. 7 Spice, and North East - Moldavia County provided by S.C. Panimon Onesti). In order to establish the correlations between the grain's physical-chemical quality parameters and the rheological behaviour, the wheat samples were ground in by laboratory mill Chopin CD 1. The analytical flours quality was determined according to the international standard methods (ash content – ICC104/1, wet gluten – ICC105/2, protein content – ICC106/2, hydration capacity with Pharinograph - ICC115/1). The moisture content of the wheat flour and bran were determined by oven drying at 1300C for 1 hour.

Also, it was made determination of technological properties through Alveograph curves, in order to make recommendation for different usages. A Chopin Alveoconsistograph was used for determination of resistance of deformation (tenacity) P, dough extensibility, L, the value of P/L, and the mixing energy W according with the international standard SR ISO 5530 – 4.

In order to have a complete point of view regarding the quality of flour baking tests were made for each sample. Compacted fresh yeast (*Saccharomyces cerevisiae)* from S.C. ROMPAK, Pascani, with 32.5% dry matter and 46.54% protein content (N x 6.25) was used. For bread preparation we used the direct monophazic method, pan baking. Kneading time was 15 minutes in spiral mixer. The dough temperature was 26° C. The doughs were allowed to rise for 40-55 minutes at 34° C and, after degassing and moulding by hand, for 15 minutes at 34° C. The bread was subsequently baked for 30 minutes at 230° C. After baking, the samples were cooling 6-8 hours in controlled atmosphere (UV lamps). In order to be exam from sensorial point of view (after 24 hours), the samples were sliced for packed in plastic bags. The experiments are made in the research laboratory of "Ştefan cel Mare" University of Suceava, Faculty of Food Engineering.

## 3. Result and discussion

First of all, it were determined the physical-chemical indicators of quality for wheat grains from the two areas. The results are in Table 1.

The wheat derived from the SE area has a mass per storage volume of 78.8 kg / hl, the total extraction flour would need to be higher by 0.8%. This additional extraction will be obtained from the range of low-grade flour. In the case of grinding a batch of wheat with a mass per storage volume below the base (**P1**) - wheat coming from the NE area, the total extraction will decrease by a percentage equal to the difference between the actual and the standard mass per storage base. Water content in grain weight is a criterion for assessing the quality of grain, very important from several points of view. Optimum degree of ripeness at harvest is characterized by wheat moisture to be up to 15%. When the received wheat has moisture less than the basic moisture, P1-14% the result is an extra extraction, and when seeds' from the SE area - P2 humidity is higher than the base value, the calculated extraction percentage will decrease. By further analysing the obtained flours (Table 2) we found that the flour resulted from grinding the wheat from the NE area, respectively the flour resulted from grinding the wheat from the SE area belong to a category of flour with medium humidity and good baking characteristics.

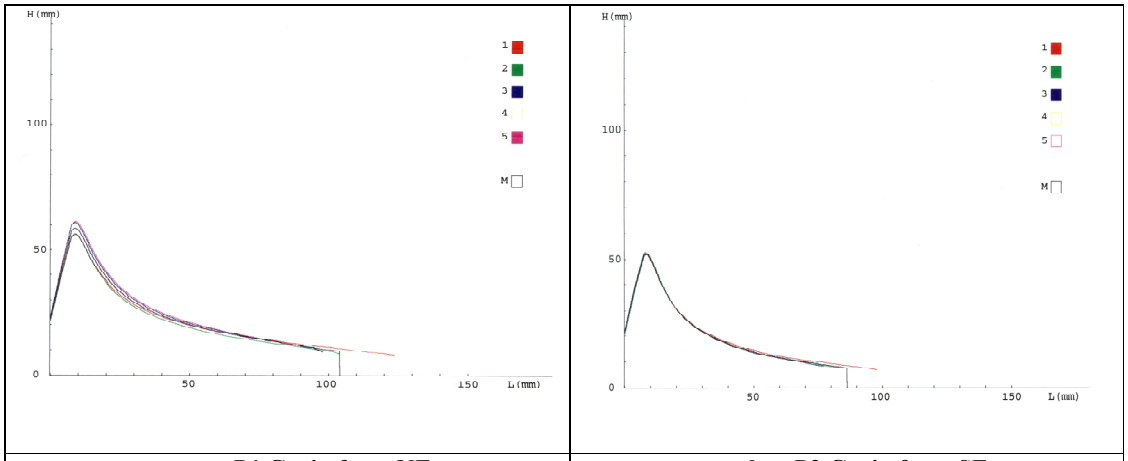
Studying the rheological behaviour of the two types of flour obtained, it is obvious that P1, due to a good wet gluten content and optimal hydration capacity, will produce stable doughs. However, as is seen in the alveographic curves (Figure 1, a), dough strength is not at a very high level, so it will not be able to bear the additives which burden its gluten structure. Flour obtained can be used to make traditional bread or with non-wheat flour additives and common loaf products.

***Table 1.*** Quality of grain samples

| Wheat samples | Sensorial parameters | Hectolitric wheight, Kg/hl | Humidity, % | Impurities % |
|---|---|---|---|---|
| P1 Grain from NE | Healthy grain | 76.5 | 14.2 | 4.5 |
| P2 Grain from SE | Healthy grain | 78,8 | 16.2 | 6.3 |

***Table 2.*** Characterizations of wheat samples from physical-chemical and rheological point of view

| Flour sample | P1 Grain from NE | P2 Grain from SE |
|---|---|---|
| **Moisture content,%** | 14.2 | 14.2 |
| **Ash, %** | 0.67 | 0.69 |
| **Wet gluten, %** | 30.08 | 28.42 |
| **Hydration capacity, %** | 60.75 | 57.74 |
| **Protein content, %** | 12.86 | 12.15 |
| **Resistance of deformation (tenacity) P, mm** | 65 | 57 |
| **Dough extensibility, L, mm** | 104 | 87 |
| **Value of P/L** | 0.62 | 0.66 |
| **Mixing energy W** | 165 | 118 |




**a. P1 Grain from NE** **b. P2 Grain from SE**

***Figure 1.*** Alveografic curves for wheat samples

***Table 3.*** Sensorial analyze of breads

| Nr crt | Sensorial characteristic | Medium score ( 11 peoples) | |
|---|---|---|---|
| | | P1 Grain from NE | P2 Grain from SE |
| 1. | Color of crumb | 2,4 | 2,2 |
| 2. | Softness | 4,4 | 4,2 |
| 3. | Equable of pores dimensions | 1,6 | 1,6 |
| 4. | Fundamentally taste ( sweet) | 3,2 | 4,1 |
| 5. | Residual (little fibers through teeth) | 4,2 | 4 |

***Table 4.*** Characterizations of breads

| Flour sample | P1 Grain from NE | P2 Grain from SE |
|---|---|---|
| **Moisture content,%** | | |
| **Porosity,** | 76.35 | 78.49 |
| **Elasticity** | 94.09 | 93.2 |
| **Volume** | 570 | 561 |
| **H/D** | | |
| ***Bacillus mezentericus* spores/1g** | no | no |
| **Yeast and moulds/1g** | no | no |
| **Coliforms/g** | no | no |

## 4. Conclusions

Following laboratory tests performed, better results were obtained for wheat harvested in the NE area (wheat harvested in the NE area came from Panimon Onesti Mill) than for wheat harvested in SE (wheat harvested by 7Spice Mill ). Quality of raw materials is much better, which influences the quality of finished products. One can say that it is not the variety of the cultivated wheat which is the cause of poor quality wheat for baking industry. There are other causes for this, namely: inadequate wheat cultivation technologies (not according to required standards), harvesting at the wrong time, storage, maintenance and improper handling of production, which reduces the baking quality of wheat.

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