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Qualitative indicators of some wheat cultivars that affect the flour quality in Pollog region

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Abstract

Wheat is the most important cereal after as is the main source of carbohydrates, providing fiber, vitamins and mineral salts. From wheat products are fed 70% of the population of the globe, as for the content of calories wheat is higher than other cereals. Since grain crops is the main source of population and the food processing industry, the needs for this grain are growing, so is of interest seeking ways to increase production and improve quality. The aim of the study was, to analyze physical-chemical parameters of some cultivars of local and imported wheat that affect the quality of flour in Pollog climatic conditions. We analyzed chemical parameters of five cultivars of wheat: Radika, Orofcanka, Apache, Ingenio, Pobeda that affect quality of flour. In wheat were analyzed: protein (%), absolute weight (weight of 1000 grains in grams), hectoliter weight in kg/hl, moisture (%), starch, dyes, gluten. In flour were analyzed: protein, ash, moisture, gluten, water absorption. The results obtained showed that there were statistically significant differences of different levels for all varieties investigated compared with standard parameters.

Keywords: Wheat; protein;, gluten; sedimentation; starch;flour quality.

1. Introduction

Cultivation and production of wheat in our country and in the world is a highly valuable work, while the importance of wheat can be estimated depending on the purpose of cultivation, use and value it has. The wheat has a predominant role in peoples' nutrition in the world, hence its economic significance is crucial and strategic, while its user, biological, nutritional value for the people and for the industry, is irreplaceable. Wheat also plays a significant role in supplying the production with carbohydrates, proteins and minerals in human diets [21].

Improving the quality of some wheat cultivars through the determination of physical-chemical parameters that affect the quality of flour, are very interesting in scientific research, therefore it was thought to write this paper, which will study the suitability of main varieties of wheat currently planted in Pollog region. In these conditions it is important to conduct research on wheat varieties assessment concerning the main characteristics that determine the flour quality.

Given that the physical-chemical analysis are indicators of technological qualities and nutritional values of wheat and flour, our main object of this study is to determine the physical-chemical parameters of some domestic and imported cultivars of wheat and flour such as: Radika, Apache, Orovçanka, Ingenio, Pobeda. Analysis are: determination of the moisture of the wheat, ash, fat, protein content in flours, determination of the gluten quantity, water absorption and ashes.

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Qualitative parameters of the grain of wheat such as moisture, protein, ash, size and shape, hectoliter weight, 1000 grains weight, determination of gluten quantity and quality as well as other quality features define wheat technological quality. Wheat proteins are the most important factors for wheat's baking properties [9, 18]. The protein content is determined according to the Kjeldahl method [16], ICC standard method No. 105/2 or by modern rutine methods such as NIR.

In this paper, the qualitative indicators are important to determine the grinding value or forecast the flour radius. Also the physical-chemical analysis of certain wheat are important to make more suitable mixtures for grinding, to obtain flours in accordance with certain standards for the production of bread, pasta and sweets, where the content of proteins determines the production of dough with good volume, resistant to mechanical processing, as well as water absorbing capacity. From the data obtained it is shown that there were significant differences between studied varieties in comparison with the standard of analyzed cultivars.

2. Material and Methods

The realization of the study "Qualitative indicators of some wheat cultivars that determine the flour quality in Pollog region" is based on the analysis of physical-chemical parameters of some wheat cultivars grown in the Pollog region and imported ones that affect the flour quality. Samples were taken from the silos of the flour processing industry "Kokrra e art" and "Vitamill" from three levels through a probe from the top, middle and the bottom of the silo and the same were taken to the Laboratory of the Faculty of Food Technology and Nutrition for analysis of the quality of cultivars of wheat and flour.

During the experimental work for the determination of main physical-chemical parameters of wheat cultivars, were applied different methods. The proteins in wheat grains are determined by two methods, through the standard Kjeldahl distillation method and the NIR (Near Infra Red Reflectans). With these methods are analyzed the following parameters: protein content, ash, fat, starch. Wheat moisture is determined by the standard (AACC, 2000) and by rutine methods such as NIR"Brambender". Yield is defined in each variant of the experiment and the results were obtained through analytical measurement scales. Hectoliter weight is determined by a special Schopper scales. Absolute weight is defined by Analytical scales.The parameters of flour were analyzed with standard methods mostly applied in farinograph and extensograph (Brabender). Cultivars that have been analyzed are: Radika, Orovcanka, Apache, Ingenio, Pobeda.

2.1. Statistical Analysis

Analysis of variance was performed using a general linear model procedure (SAS Institute, 1995), where the effect of cultivar was estimated for response variables. The Duncan multiple-comparison test was used as a guide for pair comparisons of treatment means. The level of significance of differences between treatments was considered at $P < 0.05$.

3. Results and Discussion

From the results and analysis obtained atthe laboratory of the Faculty of Food Technology and Nutrition on wheat and flour cultivars were investigated these parameters: Absolute weight, hectoliter weight, yield, moisture, ashes, proteins, fat, starch, gluten, water absorption.

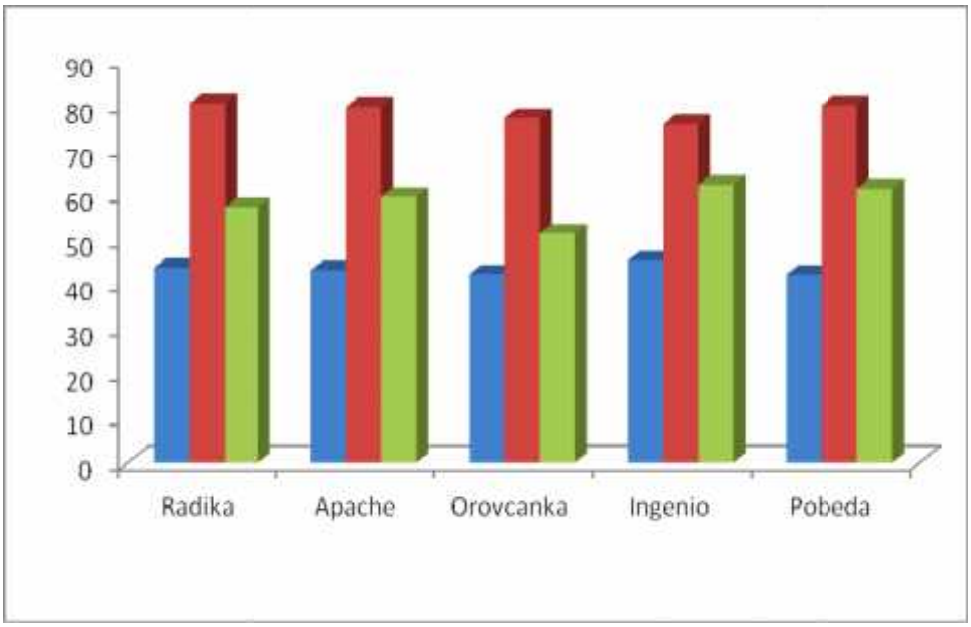

Figure 1. Absolute weight (blue), hectoliter weight (red) and the yield (green) of studied wheat cultivars.

There are significant differences (P<0.05), for the absolute weight between Ingenio (45.3) and Pobeda (42.1), but no significant differences was conducted between the Radika, Apache and standard Orovcanka cultivars.

No significant differences were found for the hectoliter weight, the highest weight has reached the Radika cultivar with value of 80.4, and the lowest value of 75.8 kg has the Ingenio cultivar, also were found differences regarding this parameter for the studied Pobeda cultivar with the value of 79.9 compared to the standard variety (77.1), while there were no differences between Apache and Pobeda cultivars. The achieved results in this work as for the performance of cultivars in comparison with the standard are presented in figure 1. In this figure can be noticed the differences between cultivars in terms of yield kg/ha. Higher yields has the Ingenio cultivar (6220 kg/ha), whereas the lowest has the standard one (5140kg/ha). There are no differences (P<0.05) between Radika and Apache cultivars. The obtained results of Wheat cultivars are presented in the table below.

Table 1.Thechemical parameters of studied wheat cultivars

Cultivars	Moisture %	Proteins %	Starch %	Fat %	Gluten %	Ashes %
Pobeda	10.90± 0.42 ^{a}	11.45± 0.07^{b}	71.40± 0.14^{bc}	1.85±0.07^{b}	27.45±0.21^{b}	1.20±0.14^{ab}
Radika	11.95± 1.20^{ab}	14.00±0.14^{c}	69.85± 1.48^{ab}	2.20 ±0.14 ^{c}	33.30±0.28^{c}	1.85±0.07^{c}
Orovcanka	11.70±0.42^{ab}	13.10± 0.71^{c}	68.90± 0.57^{a}	1.65± 0.07^{b}	32.25± 1.63^{c}	1.45 ±0.07^{ab}

Apache	14.50 ±0.85[b]	10.15± 0.07[a]	70.25± 0.07[ab]	1.10± 0.01[a]	23.30± 0.85[a]	1.38 ±0.59[ab]
Ingenio	12.00±0.14[ab]	13.80 ±0.42[c]	68.85± 0.78[a]	1.75± 0.07[b]	34.00 ±0.14[c]	1.00±0.14[a]

Mean ± SD (three repetitionswithin the columns with different letters show difference (P <0.05)

The wheat varieties differ significantly for the content of moisture content. Apache wheat cultivars (Table 1) contains the highest percentage of moisture (14.5%) than Pobeda (10.9%). The results of our studies indicate a slightly higher level compared with the results of other researchers 10.90-14.50 [22] and [20] In moisture content besides the genotype and agronomic factors an important role play also conditions of the environment where wheat is grown. High moisture content increases the proteolytic and lipolytic activities leading to the loss of nutritional components [13].

Proteins are vital components of wheat grain and very influential in flours nutritional, functional and technological qualities [22]. Wheat varieties have a significant influence (P <0.05) in protein content. Radika cultivars has protein content (14.00%) higher than Apache cultivars (10.15%) (Table 1). Protein content is similarly with the findings of other authors [2] and [10] who reported that the protein content ranged from 9.68% to 13.45% and 10.30% -11.72%. Our results are in correspondence with results of other authors [3] and [7]. Wheat proteins provide a major contribution to the rheological qualities of wheat flour [9].

One of the main factors for the cultivation of wheat are atmospheric conditions that control the content of ashes [17]. In wheat processing technology the flour type is determined through the ashes content. The effect of wheat varieties was not significant in ashes content in wheat flour in both wheat varieties. The highest content of ashes was found in Radika cultivar (1.85%) while the lowest value was found in Ingenio cultivar (Table 1).

The effect of gluten in wheat cultivares is very important to determine the quality of flour. Higher content of gluten has the Ingenio cultivar 34.00% while the lowest content has shown the Apache cultivar, 23.30%

Flour water absorption is determined by Farinograph "BRABENDER", wheat flour were significantly affected by the variation between wheat cultivars.

Table 2. The chemical parameters of flour

Cultivars	Moisture	Proteins	Water abso.	Gluten	Ashes
Pobeda	13.97±0.21[b]	11.13±0.31[b]	54.13±2.45a	26.07±1.39b	0.56±0.05a
Radika	14.90± 1.10[c]	11.73±0.15c	54.60±0.95a	29.53±0.15d	0.59±0.02ab
Orovcanka	13.33±0.12[a]	8.87±0.06a	53.63±0.15a	21.23±0.15a	0.71±0.02d
Apache	15.27±0.15[d]	8.80±0.26a	53.10±0.20a	20.40±0.10a	0.65±0.01c
Ingenio	14.93±0.15[c]	13.40±0.36d	59.03±0.42b	27.63±1.31c	0.62±0.02bc

Mean ± SD (three repetitionswithin the columns with different letters show difference (P <0.05)

Based on the results from Table 2. it is clearly shown that there are significant differences in water absorption percentage, which is higher in Ingenio cultivar (59.03%), while the lowest value has Apache cultivar (53.10%) (Table 2). The results of this study are consistent with the findings of many authors as [6].

Concerning the results obtained from the analysis, the highest content of gluten in the flour, showed Radika cultivar (29.53%) and Ingenio (27.63%), while the lowest value had Apache (20.40%).

4. Conclusions

According to the protein content, Radika cultivar (14.00%) and Ingenio(13.80%) have the highest amount of proteins, and the lowest has the Apache cultivar, 10.15%.The content of wet gluten is also the highest in Ingenio cultivar 34.00% and Radika (33.30%), while the lowest is in Apache cultivar(23.30). The flour obtained from Ingenio cultivar has better water absorption affinities due to the high protein content, wet gluten and their quality which affects the flour's water absorption ability. Results obtained through the Pharinographclearly indicate that the flour obtained from Ingenio and Radika cultivars have higher quality compared to Apache cultivar. Ingeniocultivar has not only higher contentsbut also better quality of proteins and makes the dough more elastic. According to "W" value,the flour produced from these cultivars hasbetter baking qualities. Given the quality of wheat cultivars and the fact that local flour-producing factories mainly produce flour for the production of bread, cakes and pies, then, the wheat should be used mixed at this percentage: Ingenio 40%, Radika 40% and Pobeda 20% in order to obtain good-quality bread baking flours. According to the physical-chemical andrheological characteristics of the flour obtained from the cultivars, Ingenio and Radika have the best characteristics for bread production.

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