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Comparison of some of the cultivars that is cultivated in Kosovo for production of flours for bread

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Abstract

Based on the study on the quality assessment of harvested crops in the Kosovo region, certain flour and variety of baking products have been determined their chemical and technological properties and the possibility of adding additives (redox agents).

The main types of grain cultivars cultivated in the republic of Kosovo are Luna, Isengrain, Europa, Lenta and Andolu, which are included in this study.

To provide a clear picture of the abovementioned cultivars, the study includes detailed analysis of technological qualities starting with the preparation of cultivars for grinding, milling them where we have obtained two types of Tip-500 flour and tip-850 , physicochemical and rheological analysis of flour, bread production, and analysis of bread production.

The obtained physico-chemical and rheological analysis shows that cultivar flours, Luna and Lenta, have very similar and much better qualities than other cultivars. Also, the results of the produced bread show that the loaves produced by the Luna and Lenta cultivars have much better quality than the breads produced by the flour of other cultivars.

Keywords: Wheat, Technological Properties, α-Amylase, Physical-Chemical Properties, Bread.

1 INTRODUCTION

Based on the data, the main grain culture that is cultivated in Kosovo is that of wheat, of which 90% is the soft wheat cultivar (*Triticum aestivum L.).* The flour which is obtained by the grinding of these cultivars is used in the production of bread, partially in the confectionary industry and that of production of pasta (Klusurić S., 2000). The wheat cultivars that are cultivated in Kosovo are mainly imported from the neighboring countries, due to this reason they can be of varying quality in terms of grains, and of flour. Such varieties are not only conditioned by the genetic factors, in addition, they are also conditioned by the external factors that influence the technological qualities of the grains, especially those of baking process (Payne P, 1987; Bassett et al, 1989). The baking qualities of the flour are conditioned by the amount and quality of the proteins in the grains (Lasztity, 2003), the high content of proteins has a very favorable effect regarding the volume and form of bread (Pomeranz, 1988). Regarding the baking attributes, a noted impact on the quality of the flour of these cultivars has the redox factors.

2 MATERIALS AND METHOD

For the scope of this study one took the grain cultivars: Luna, Lenta, Europa, Andolu and Isengrain. The sowing was done in the crops of village Gramove during 2009/2010; the grinding was done in experimental mill "Yukebas" in the lab of flour factory "Xërxë", through the grinding of wheat one obtained two flour fractions Type 500 and Type 850, as well as grits and bran wastes.

One took 10 kg of wheat from each cultivar; subsequently the flour was conditioned for 18-24 hours in order to obtain the humidity 16.5%, whereby one obtained two flour fractions Type 500 and Type 850, as we well as grits and bran wastes.

After the completion of milling process and flour evaluation obtained from these cultivars, one proceeded with baking the bread. Initially, one produced bread using flour Type 500 without/with additives. The procedure included the measurement in electronic scale of 1 kg flour, 15 g of salt, 15 g of dissolved yeast Diego, water based on absorbing attributes with Farinograph with temperature 30°C. The contents were put in the mixer where they were mixed for 8 minutes; subsequently the contents were put into the fermenting rooms with air temperature of 30°C and humidity of 60%. Subsequently, the dough was given the form weighing 750 g, it was sent for second fermentation and eventually it was baked in the baking oven, 230-250°C during 25 minutes. In order to perform further analysis, one took the bread out of the oven and put it on the table where it stayed for 24 hours. In the second test, one took the same amount of flour and same other parameters, salt, water, yeast as it was the case in the first test, however, this time one added appropriate additives: ascorbic acid (30mg/1 kg flour), Xylenase HC2500 (30mg/1kg flour), Lipase HC120 y (5mg/1 kg flour) and Top Bake (3 g/1kg flour) (Official Methods of Analysis of the cereals, December (1988)).

The physic-chemical analyses have been performed in compliance with the standard methods ICC (impurities ICC stand. 102/11, humidity ICC stand. 110/1, ash ICC stand. 104/1, moist gluten ICC stand. 106/2). The determination of rheological attributes was done with Farinograph and Brabender Estensograph, "Chopin" Alveograph, whereas the organleptic attributes of the produced bread was performed in accordance with the regulation on the physic-chemical methods of analysis for grains, products of grinding and oven, pasta and frozen pasta (ICC – Standard No 102/1, Revised 1972).

3 RESULTS AND DISCUSSION

One took 10 kg out of each cultivar for the purpose of grinding and one conditioned the grain for 18-24 hours in order to reach the humidity of 16.5% for grinding, where one obtained two flour fractions Type-500 and Type-850, as well as grits and bran wastes. In table 1 are indicated the

obtained quantities of the flour from grinding the wheat cultivars, one can observe that the largest amount of flour was obtained from grinding the cultivar Isengrain (3.2 km Type-500, 1.51 kg Type-850), whereas the least amount was obtained from cultivar Lenta (2.73 km Type-500 and 1.22 Type-850) (Zawistowskua, Langstajf F., and Bushukw, (1988)).

Based on the data given in table 1, one can observe that the cultivar Isengrain provides for the largest amount of white flour (3.2 kg), compared to the other wheat varieties, however, it provides less grits than Lenta and Andolu, which indicates that the latter two have a higher content of proteins. Next, one will present the obtained results on the physic-chemical and reologic qualities of the obtained flours from each cultivar after the grinding process (Basset L.M. , Allan R.E., Rubenthaler G.L (1989)).

In table 2 one can observe the physic-chemical attributes of flour Type-500 and Type-850 of the mentioned cultivars. The humidity of all the cultivars is within normal values of 13.5 until 14.2%. The amount of mineral contents, respectively ash, for the flours Type-500 is higher than 0.55, therefore the flour is of white color, whereas for flour Type-850, there is aleuronic additive within, a high content in fibers, which as a result have a darker color (Grosch, W. (1986)).

The Sediment which is determined as per Zeleny test indicates that cultivar Lenta has a high sediment, which results in better gas-forming attributes (58 flour Type-500 and 49 flour Type-850); the second is Luna (51 flour Type-500 and 41 flour Type-850), whereas cultivar Andolu and Isengrain have a lower sedimentation, among all cultivars Europa has the lowest sediment.

The amount of gluten, which presents the main protein of technological attributes is higher in the flours of cultivars Lenta (31 for Type-500 and Type-800) and Luna (31 for Type-500 and Type-850), whereas the flours of other cultivars have a lower amount of gluten 20-22, which required the utilization of additives in order to ascertain good baking quality (Atkins, J. H. C. (1971)).

In addition, the flour obtained from cultivar Lenta has a higher amount of proteins (13.1% Type-500 and 14.9% Type-850), all other flours have a lower protein content (varying from 10.3-11.6%), only Type-850 flour of cultivar Luna has protein content of 12.2%. A higher amount of the sugars has the Type-500 flour of cultivar Isengrain (58.4%) which influences a better fermentation of dough, by increasing the pores and the volume in the baking products. Whereas the flours of cultivars Andolu and Lenta have the sugar content between 56.7-56.5%, close to this value is Andolu with 55.4 whereas Europa contains 48.2% (Anon (1957).

A higher absorbing ability have the flour of cultivar Luna (65% Type-500 and 66% Type-850), the second is Lenta with 64% Type-500 and 65% Type-850, whereas the flours of other cultivars have an absorbing ability ranging from 62-64%. This indicator directly influences in the increase of the radius of the bread.

The value of the force of flour (W) compared to the amount and quality of proteins indicates that Type-500 of Luna cultivar has a higher value, the second is the flour of cultivar Lenta with a force 170, whereas the flours of other cultivars have a much weaker force, below 100 (Hoseneyr C., (1986)).

Table 1. The amount of the flour that was obtained from grinding of wheat cultivars

Cultivar	White flour Type 500 (kg)	Plain Flour Type 850 (kg)	Grits wastes (kg)	Bran (kg)
Isengrain	3.2	1.51	1.03	4.35
Europa	2.91	1.15	1.2	4.84
Lenta	2.73	1.22	1.42	4.73
Andolu	2.9	1.21	1.55	4.54
Luna	2.9	1.31	1.34	4.45

Table 2. Physic-Chemical and rheological qualities of the obtained flours after the grinding process of each of the cultivars

The indicating attributes of cultivars	Cultivars									
	Lenta		Andolu		Luna		Europa		Isengrain	
	Flour		Flour		Flour		Flour		Flour	
	T500	T850	T500	T850	T500	T850	T500	T850	T500	T850
Humidity (%)	13.8	13.5	14.1	13.8	13.7	13.8	14.2	13.8	14.1	13.5
Ash (%)	0.57	0.76	0.58	0.81	0.67	0.74	0.56	0.79	0.56	0.76
Sedimentation (ml)	58	49	40	33	51	41	36	31	41	40
Wet gluten (%)	31	31	20.5	20	30	30	22	19	21	18
Proteins (N x 5.7) (%)	13.1	14.9	10.3	11.2	10.5	12.2	10.9	11.4	11.0	11.6
Carbohydrates (%)	56.5	-	56.7	-	55.4	-	48.2	-	58.4	-
Water Absorption (%) Farinograph	64	65	62	63	65	66	62	63	62	64
Value "W" Aveograph "Chopin"	170	-	85	-	229	-	98	-	78	-
R/E Estensograph	1.1	0.9	2.7	1.8	2.6	1.6	1.7	0.9	2.5	1.6
Energy (cm^2) Estensograph	55	-	52	-	68	-	29	-	60	-

Table 3. The attributes of the bread produced from flour Type-500 without/with additives

The quality indicators of bread	Bread produced by flour Type-500									
	Lenta		Andolu		Luna		Europa		Isengrain	
	Without additives	With addit.	Without additives	With addit.	Without additives	With addit.	Without additives	With addit.	Without additives	With addit.
Weight of the bread (g)	503	508.8	488.7	500	500	498.2	498.3	496.3	509.5	500
Radius of Bread (%)	143.2	144.6	140.4	142.6	142.5	143.1	142.8	142.9	145.1	143.7
The yield of volume (cm^3)	2108	2280	1914	1885	1728	2208	1827	1755	1728	1792
Bread Acidity	2.2	2.3	2.52	2.64	2.52	2.63	2.55	2.65	2.4	2.5
The color of the crust	Redish, pale	Redish, Dark	Redish, pale	Redish, Dark	Redish	Redish, Dark	Redish, pale	Redish, pale	Redish, pale	Redish
Porosity according to Dalmat	7	7	7	7	8	7	8	7	7	6
Smell	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Taste	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium

Table 4. The attributes of the bread produced from flour Type-850 without/with additives

The quality indicators of bread	Bread produced by flour Type-800									
	Lenta		Andolu		Luna		Europa		Isengrain	
	Without additives	With addit.	Without additives	With addit.	Without additives	With addit.	Without additives	With addit.	Without additives	With addit.
Weight of the bread (g)	501.9	504.7	494.2	498.9	497.7	497.8	499.1	505.9	493.2	503.2
Radius of Bread (%)	141.3	141.4	139.8	139.6	140.4	140.7	140	141.8	135.1	139.7
The yield of volume (cm^3)	1980	2380	1980	1792	1985	2035	1950	1950	1943	2077
Bread Acidity	2.5	2.65	2.48	2.62	2.5	2.66	2.5	2.68	2.4	2.55
The color of the crust	Redish, Dark	Redish, Dark	Redish, Dark	Redish, Dark	Redish, Dark	Redish, Dark	Redish, Dark	Redish, Dark	Redish, Dark	Redish, Dark
Porosity according to Dalmat	7	7	8	8	7	8	8	8	7	8
Smell	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Taste	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium

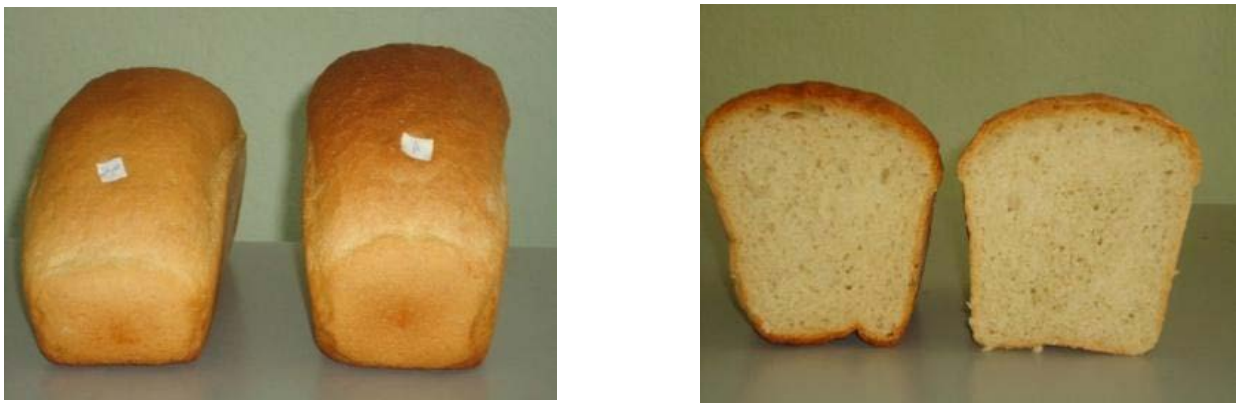
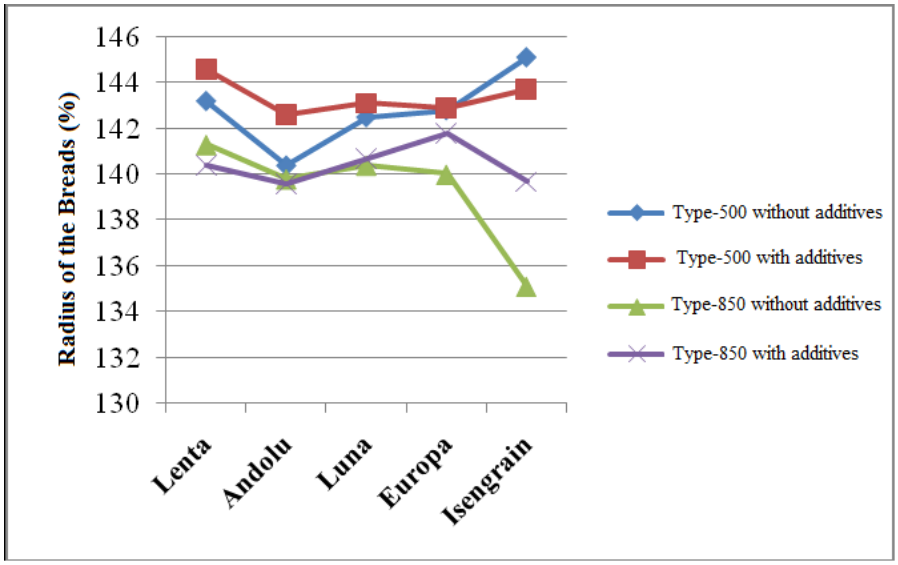


Figure 1. Illustrating photos of the bread treated/not treated with additives Reference +20 ppm α-amilase



Graph 1. The radius of the breads produced by flour Type-500 and Type-850 with and without additives

The optimal ratio between the resistance and extendibility (R/E) for baking ranges from 1.5-2.5 where most of the results are within optimal limits, only the flour of Type-850 of cultivars Lenta and Europa have a lower ratio of 0.9. The energy of the dough represents the value of the surface that the curve of graph obtains in abscise and it is represented in cm^2. A higher energy is observed in the flour of cultivar Luna (68 cm^2), the second is Insengrain (60 cm^2), Lenta (55 cm^2), Andolu (52 cm^2) and Europa with only 20 cm^2 (Anon (1957)).

After the production and evaluation of the obtained flour, one baked the bread. Initially one proceeded with the production of the bread from flour Type-500 and Type-850 without/with additives (Pomeranz, Y. (1988)).

In Table 3 and 4 one can observe attributes of the bread produced from the flour Type-500 and Type-850, with/without additives (Grosch, W. (1986).

In table 3 one can observe that the bread produced from flour Type-500 of cultivar Lenta has a larger radius and volume compared to cultivar Andolu, Luna and Europa (Hoseneyr, C. (1986)).

All the bread produced from flour Type – 500, with additives taken in general they have a larger radius than the bread produced without additives, which can be observed in graph 1. The same phenomenon can be observed for flours Type-850 by using 20 ppm, hence the bread with additives has a larger radius compared to those without additives (Atkins, J. H. C. (1971)).

The result of the volume of bread produced from Type-850 flour is higher than that of the breads produced from flour Type-500, both if one considers with or without additives (Sinani, 2009). A small amount of baked breads scored the highest score in terms of gained volume (the bread produced with flour Type-850 and Type-500 from Lenta cultivar with additives 2380 cm^3, 2280 cm^3), whereas the majority of other breads, disregarding the type of lour or cultivar, have scored very good, or good mark, only the bread made of Type-500 flour of cultivar Europa, with or without additives, has scored with a pass mark, whereas the bread made of Type-500 flour of cultivar Luna without additives, has scored with a low mark (Pomeranz, Y. (1988)). The acidity of the breads is normal, however, the bread made of Type-500 flour have a lower amount of acidity. In addition, all the breads produced of the same type of flour with additives have a higher amount of acidity than the breads produced without additives. The color of the crust of the breads made of Type-500 flour is pale redish, except for a part of the breads produced using additives. All the breads made of Type-850 flour are in dark redish hue (Payne P. I. (1987)) all the breads produced with Type-500 and Type-850 flour, be it with additives or without them, have a porosity of 7 and 8 according to Dalmat, whereas the bread made of Type-500 with additives of cultivar Isengrain has a porosity of 6 (Grosch, W. (1986).

All the breads produced using either flour Type-500 or Type-850, with or without additives taste and smell characteristically the odor of bread. (Pomeranz. Y (1988).

4 Conclusion

1. Based on the obtained results regarding the physic-chemical and rheological attributes of the cultivars that are cultivated in Kosovo, one can conclude that out of the cultivars that were selected, regarding Type-500 flour, the best attributes can be found in Luna cultivar, given that the amount of wet gluten was 30%, sediment 51 ml, a much higher force of the flour according to Alveograph 229 and energy according to Estenogram of 68cm^2;
2. Similar attributes can be found in flour Type-500 of cultivar Lenta with the amount of wet gluten 30%, sediment 58ml, the Alveograph value of 170 and the energy of 55 cm^2. Also, the flours Type-850 from cultivars Luna and Lenta have favorable physic-chemical and rheological attributes.
3. The breads produced from Type-500 flour, the bread of cultivar Lenta with additives, has a larger radius and volume (144.6% and 2280 cm^3), as well as better porosity according to Dalmat, with a favorable color, smell and very

good taste. Also, the breads produced of Type-500 flour without additives of cultivar Luna and Isengrain have similar attributes, however, slightly less favorable;

4. Of the breads produced with Type-850 flour, the best attributes can be found in the bread produced with additives of Luna cultivar given that it has weight, radius and volume which is very favorable (504.7g, 141.3% and 2380 cm^3), as well as color, smell and very good taste;

5. To conclude, cultivar Luna and Lenta have very favorable physic-chemical and reologic and baking attributes, all other cultivars that were taken into consideration in this study, they are usable, however by mixing them 20-30% (with Luna and Lenta) or with utilization of additives (20 ppm).

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