SUITABILITY OF SOME WHEAT CULTIVARS FROM THE REGION TO THE AGRO CLIMATIC CONDITIONS OF KOSOVO FOR PRODUCTION OF BREAD

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Abstract

The study object of this paper is the research conducted on the suitability of some wheat cultivars originating from region for production of bread in the agro climatic conditions of Kosovo. In the study one included seven wheat cultivars *Evropa, Pobeda,* and *Renesanca* (Serbia), *Lenta* and *Luna* (Slovenia), *Isengrain* (France) and *Andolu* (Italy). All these cultivars are registered in the national list of the wheat varieties in Kosovo. The experiment was conducted in the village of Gramove in the Municipality of Viti, which is situated 60 km south of Prishtina, and the terrain elevation is 550 m. During the experiment one surveyed these varieties starting from sowing till milling and bread production.

During the survey one tested the yield per kg/ha, weight of 1000 grains expressed in grams, hectoliter weight (kg/hl), protein content, moisture, wet gluten and sediment, as well as rheological attributes measures with farinograph and extensograph.

Based on the results that were obtained, one can observe a better suitability with the agro

climatic conditions prevailing in Republic of Kosovo for the purpose of production of bread in the cultivars of Renesanca and Luna, given that they have a higher content of moist gluten, 29% respectively 31.4%, in addition to having favorable farinograph and extensograph characteristics for production of bread.

Keywords: agro climatic conditions, Luna, wet gluten, farinograph

Introduction:

Common Wheat (*Triticum aestivum L.*) represents a one year cultivation culture from family of Poacea, genus Triticum and it represents the most suitable plant for production of bread (Sinani A., 2009). In Kosovo this culture is cultivated in a surface of 70 000 – 75 000 hectares per year, which yields in average 3.2 – 3.6 t/ha. The small size of cultivation fields that are cultivated with wheat and relative low yield which is obtained leads to the fact that Kosovo cannot fulfill its needs with this product; therefore the major part of the wheat used in the consumption gets imported from neighboring countries (Kelmendi B., 2007). On the other hand Kosovo has still not produced its own wheat cultivar, which would be suitable for the agro climatic conditions of Kosovo.

The sowing seeds are mostly imported from the countries in the region and a small portion is reproduced and it is processed in Kosovo. Compared to the agro climatic and pedology data, the yield that is obtained from cultivation of wheat indicates to the lack of full utilization of genetic potential of the cultivars that are cultivated in our country. Due to this reason, one needs to use contemporary agro technical equipment in order to make full utilization of genetic potential, which would lead to the realization of yields of high quality for the production of bread and confectionary products, in line with the taste of the consumers. The fertilization represents one of the agricultural measures that improve the physical and chemical conditions of soil, which leads to the increase of soil fertility, hence on the yield of agricultural crops. The purpose of the fertilization is to provide to the soil the sufficient amounts of nutrients for whole the soil part where the roots get developed.

The bread production characteristics of the wheat are conditioned by the amount and the quality of the proteins presents in the grain (Lasztity, 2003), that is the high content of the proteins provides an overall better effect on the volume and the form of the bread (Pomeranz, 1988).

In this study one evaluated the suitability of the seven wheat cultivars from the region, which are cultivated in the climatic conditions of Kosovo for the production of bread with various radius of milling.

Materials and methods

The wheat cultivars that were used are *Evropa, Pobeda,* and *Renesanca* (Serbia), *Lenta* and *Luna* (Slovenia), *Isengrain* (France) and *Andolu* (Italy). For the purpose of research, one utilized the random experimentation method with 3 repetitions, the surface of the cultivation surfaces was 100 m^2, the density of the cultivation 270 kg/ha, Fertilization with 12 kg N, 60 kg P and 60 kg K. The sowing was done on 7 November 2010 in the village of Gramove in the municipality of Viti in a block system with three repetitions for all the cultivars, the first fertilization was done on 25 March 2011 with NAG fertilizer, whereas the second fertilization took place on 26 April 2011.

The treatment of the cultivation surface against the weeds was performed 2 May 2011, whereas the harvest of the experiment crop was performed 17.07.2011 in order to determine certain parameters of the yield, such is the weight of the 1000 grains, for that purpose one cut the ears of grain in 1 m^2, afterwards one utilized the harvesting experimental machine for the purpose of harvesting the ears of grain.

The milling was done in the experimental milling machine "Yukebas" in the lab of the flour factory "M-Silos" in Xerxe, a process which resulted in obtaining two fractions of flour type 500 and type 850, as well as bran.

The physical-chemical analysis was performed in compliance with the standard ICC methods (the ICC impurities with standard values 102/1, ICC moisture 110/1, ICC ash 104/1, ICC moist gluten 106/2). The determination of the rheological attributes was done by utilizing Farinograph and Extensograph produced by Brabender in compliance with the regulation on physical and chemical methods for analysis of wheat's, of milling products and of baked products, pastas, frozen dough products, *Official Gazette of RSFJ 74/88.*

Results and discussions

Based on table 1, one can observe the difference between cultivars for 1000 grains, the hectoliter weight and the yield, despite the fact that all cultivars received the same amount of fertilizers.

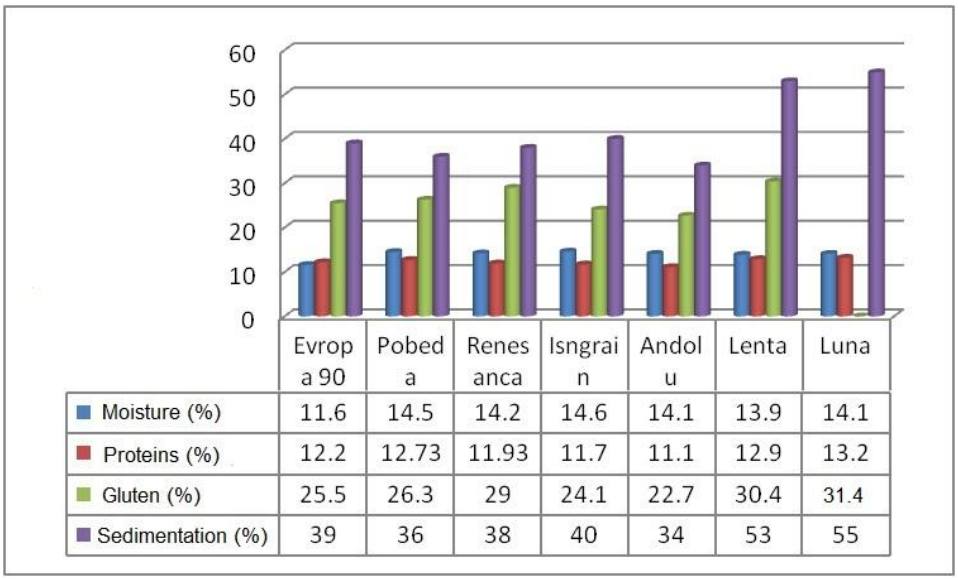
Based on the weight of 1000 grains, one can observe that the highest weight for 1000 grains (absolute weight) was observed with the cultivar Renesanca (41.80 g), whereas the

lowest weight for 1000 grains was observed with cultivar Andolu (37.39 g). The highest hectoliter weight (kg/hl) was observed with cultivar Evropa 90.84 kg/hl, whereas the lowest hectoliter weight was observed with Andolu 77.2 kg/hl. Based on the yield (kg/ha) one could observe differences between cultivars, and in this context the highest yield was provided by Renesanca 7520 kg/ha, whereas the lowest yield was with Andolu 5350 kg/ha.

Table 1. The surveyed parameters of wheat cultivars

Wheat Cultivar	Weight of 1000 grains (g)	Hectoliter weight (kg/hl)	Yield (kg/ha)
Evropa 90	40.27	84.4	7020
Pobeda	40.95	81.2	6897
Renesanca	41.80	83.5	7520
Andolu	37.39	78.2	5350
Isengrain	38.90	78.8	5610
Lenta	41.10	82.5	6720
Luna	40.12	81.4	6900

In graph 1, one can see the physical and chemical characteristics of the cultivars of wheat, whereby one can observe large differences between the tested wheat cultivars, especially in the percentage of wet gluten, as well as that of sedimentation, cultivars Lenta and Luna display a larger percentage (%) of wet gluten and sedimentation.



	Evropa 90	Pobeda	Renesanca	Isngrain	Andolu	Lenta	Luna
Moisture (%)	11.6	14.5	14.2	14.6	14.1	13.9	14.1
Proteins (%)	12.2	12.73	11.93	11.7	11.1	12.9	13.2
Gluten (%)	25.5	26.3	29	24.1	22.7	30.4	31.4
Sedimentation (%)	39	36	38	40	34	53	55

Graph 1. The physical/chemical characteristics of wheat cultivars

Based on the general content of moisture, lowest level was observed with cultivar Evropa 90 (11.6 %), whereas the highest content of moisture was observed with Isengrein cultivar (14.6 %). Based on the content of proteins, the largest percentage was observed with cultivar Luna (12.9%), whereas the lowest percentage was displayed by cultivar Andolu (11.1 %). Based on the content of wet gluten, there were observed large differences between the researched cultivars, and in this regard the highest percent of gluten was displayed at cultivars Luna (31.4%), Lenta (30.4%) and Renesanca (29.0%), whereas the lowest was with cultivar Andolu (22.7%). Based on the content of the sediment, the highest level is observed with cultivar Luna (55%), whereas the lowest was at Andolu (34%).

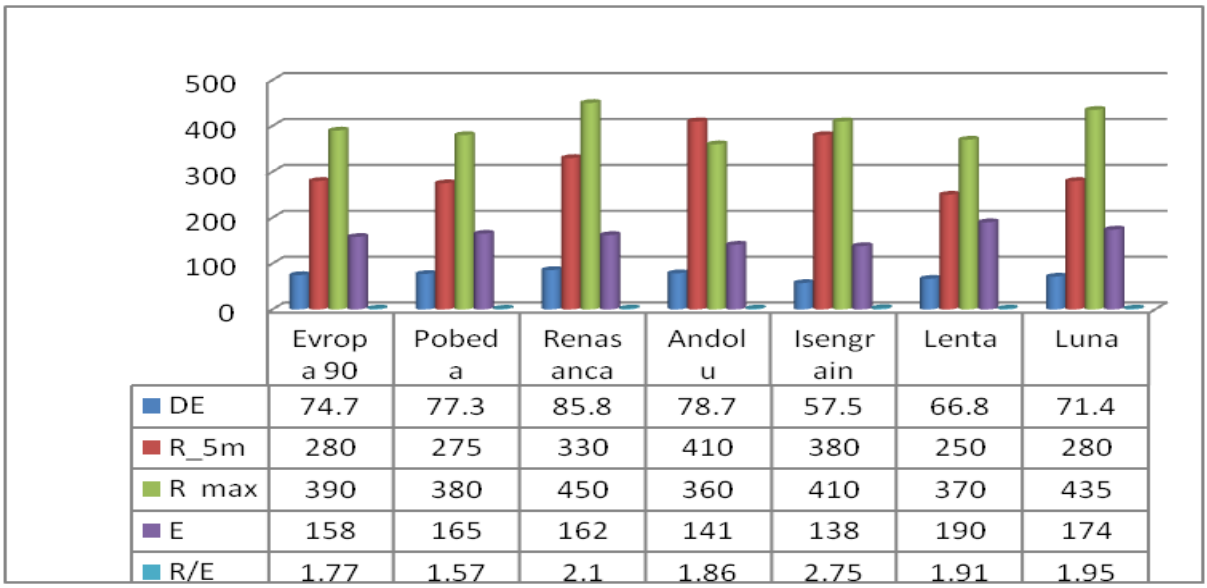
Rheological characteristics were measured with farinograph and extensograph Brabender. The consistency of the dough until the point of reaching the optimal consistency by mixing it with a constant speed and the level of absorption of water, all these were determined by using the Brabender farinograph (Sinani A., 2009).

Table 2. Depiction of rheological parameters with farinograph

Farinograph						
Flours of cultivars	Water absorption capability	Dough Development	Dough Stability	Degree of softening	Quality Class	Quality Group
Evropa 90	63.6	1.0	4.5	110	65	B1
Pobeda	65	2.5	3.5	100	68	B1
Renasanca	64.7	2.0	3.4	90	66.7	B1
Andolu	62	1.7	4.5	75	54.3	B2
Isengrain	64	1.3	1.4	100	56.6	B1
Lenta	66.3	2.6	2.7	105	59.2	B1
Luna	66.7	4.0	3.7	80	67.5	B1

In table 2 one can observe the farinograph parameters, whereby it is displayed that the highest water absorption characteristic is with dough of cultivars Luna and Lenta with 66.7 and 64%, whereas the lowest is with dough of cultivar Andolu 62%. The dough development is of a higher scale with dough of cultivar Luna and Lenta with 4 respectively 2.6 minutes. Better dough stability is displayed by cultivar Evropa 90 and Andolu with 4.5 minutes; cultivars that follow are Luna with 3.7 minutes, Pobeda and Renesanca with 3.5 minutes, whereas Lenta and Insengrain have only 2.7, respectively 1.4 minutes. The degree of softening of dough is to be observed with cultivar Andolu with 75 FU, whereas the lowest is with Evropa 90 with 110 FU. All the wheat cultivars fall under quality group B1, only cultivar Andolu falls within group B2.

Extensograph measures the extendibility and resistance of dough during strain; the better characteristics are as a trait of gluten, as well as protolitic activity of enzymes or the damage that is done to gluten as a result of improper artificial drying (Xhabiri G. et al. 2011).



	Evropa 90	Pobeda	Renasanca	Andolu	Isengrain	Lenta	Luna
DE	74.7	77.3	85.8	78.7	57.5	66.8	71.4
R_5m	280	275	330	410	380	250	280
R max	390	380	450	360	410	370	435
E	158	165	162	141	138	190	174
R/E	1.77	1.57	2.1	1.86	2.75	1.91	1.95

Graph 2. Rheological parameters which were tested with Extensograph

The dough energy represents the value of the surface that is displayed by the curve in reference to the abscise axis and it is represented with cm^2, the highest is with dough of cultivar Renesanca 85.8 cm^2, cultivars that follow are Andolu (78.7 cm^2), Pobeda (77.3 cm^2), Evropa (74.7 cm^2) and Luna (71.4 cm^2), whereas the lowest values are with cultivars Lenta (66.8 cm^2) and Insengrain (57.5 cm^2). The highest resistance represents the highest level that curve reaches and it is expressed in U E units, based on the results this value varies in different cultivars, Evropa 90 390 EU, Pobeda 380 E U, Renesanca-450 E U, Andolu-360 E U, Isengrain 410 E U, Lenta 370 E U, Luna 435 E U, therefore the highest resistance is displayed by cultivar Renesanca. The optimum ration between resistance and extendibility (R/E) for bread production is 1.5-2.5, most of the results displayed by cultivars fall within optimum limits, only cultivar Isengrain has a higher value of 2.7.

Conclusion:

Based on the results and the tested parameters, we can conclude that:

– Based on the weight of 1000 grains, it results that the yield obtained from cultivar Renesanca has the highest weight for 1000 grains with 41.8 g, as well as the yield of 7520 kg/ha;

– The best hectoliter weight is observed with cultivar Evropa 90 with 84.4 kg/hl;

– Based on the chemical parameter results that cultivar Luna is the highest quality cultivar with content of proteins of 13.2%, wet gluten 31.4 % and sedimentation 55 ml.

- Based on rheological analyses performed by farinograph, it results that cultivar Luna has the best rheological characteristics with a water absorption capability of 66.7%, the dough development of 4.0 minutes, the degree of softening 80 U.F.
- Based on the rheological analysis performed by estensograph, it results that cultivar Renesanca has the best rheological characteristics with energy of 84.5 cm^2, as well as the best ration R/O of 2.1.

Therefore, based on the above mentioned results regarding the wheat cultivars, based on physical-chemical characteristics of the flours obtained from these cultivars, as well as rheological characteristics of the dough obtained from these cultivars, it results that the cultivar Renesanca and Luna have the best characteristics for production of bread.

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