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# Research of Agronomic and Quality Traits of Winter Barley Varieties (*Hordeum vulgare* L.) under Growing Conditions in the Republic of Kosovo

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## Abstract

The object of this paper is the research of agronomic and quality traits of winter varieties (*Hordeum vulgare* L.) their adaptability and specific reactions towards growing conditions in the Republic of Kosovo. During three year trials on localities in Dukagjini area and area of Kosovo we researched 5 winter barley varieties. Environment has been explored together with estimation of significant parameters of grain yield, hectoliter weight, protein and starch content. Impact of year, location and variety on grain yield, hectoliter grain weight, protein and starch content has been estimated by analysis of variance. Environmental effects of planting barley cultivars in the Dukagjini area and area of Kosovo is based on a study that determines the influence of climatic factors, temperature and moisture, the quality of barley for beer production. Experiments were set according to the method of randomized blocks in three repetitions. Area of each experimental plot was 10 m<sup>2</sup>. In the laboratory at the Agricultural Institute of Kosovo, and close laboratory brewery in Peja were analyzed: the content of protein (%), weight (1000 seeds in grams), hectoliters weight (kg), humidity (%), yield (kg/ha), starch, color, aroma, impurity. Results obtained showed that parameters of achieved grain yield show that under favorable growing conditions one can expect better results of varieties Zlatko, Barun and Vanesa.

**Key words:** barley, variety, grain yield, quality.

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## 1.

## Introduction

Study in the field of evaluation of new cultivars of interest in agricultural research. Barley in Kosovo, it is culture that planted every year to meet the necessary requirements of manufactures for high yield, quality and many other factors necessary for high yield, quality and many other factors for malt as raw material for the production of beer, it is necessary cultivars research new to growing conditions in the Republic of Kosovo [4,10]. Kosovo has very good agronomic conditions for the cultivation of this crop. Barley is a plant in Europe occupies an important place in the structure of the cultivated plants. In our country, the years of transition, there was a significant reduction of the area planted with barley. Changing the structure of the variety that has come as a result of planting new varieties, has necessitated a study of the suitability of these varieties associated with different climatic conditions in Kosovo [15, 16]. This adaptability not only see the impact of climatic conditions in different varieties manufacturing capabilities, but also on the impact of climatic factors in the qualitative barley destined for the production of beer [14.1]. Currently no planting barley research is mainly focused on (two) areas in the Republic of Kosovo. These areas are: Dukagjini Plain and Kosovo Plain. Planting barley cultivars in these areas is based on a study that determines the impact of climatic factors, temperature moisture on barley for beer production qualities. For this reason it was thought up this study, which will get underway to study the suitability of the main varieties of barley for beer in Kosovo currently planted areas climatic conditions different ecological zones (Dukagjini Plain and

Kosovo Plain). In these circumstances it is important to conduct studies for the evaluation of different varieties of barley on the main characteristics that define the quantity and quality of beer production [13, 17]. From various studies it appears that the main characteristics of manufacturing malt from barley seeds are protein content and their energy to come on earth [5, 12]. These features of seeds affected by growing conditions particularly in the grain formation stage (Schelling et al. 2003) [8, 7]. The impact of these conditions will be studied in two different climatic zones (Dukagjini Plain and Kosovo Plain) five different varieties of barley. The average yield achieved during the past three years is around 2.5 - 3.2 t / ha. Kosovo's agro-climatic and pedological data, compared with the yields obtained in the culture of barley indicate that, potentially, the amount of barley stocks that can be produced are enormous production potential of barley cultivars that are grown in our conditions is over 8 t / ha, while the use of this potential in the country's average level is 30-40% (2.5 t / ha).

## 2. Materials and methods

Plots were organized lines and cultivated land area of real property Agricultural Institute of Kosovo in location Arbesh, 6 km from Peja. Soil type, soil brown lesivuar on reddish sediments, and the altitude are 488 meters and the Plain of Kosovo (Pestova) where the nature of the soil is smonic, and altitude is 560 meters. Research of agronomic traits and quality of winter barley varieties (*Hordeum vulgare* L.) in growing conditions in Kosovo were made during the three years from 2010 to 2011 and 2012. Planting is done with experimental planter plots Hege 80. Research undertaken over the years varieties are: Bingo, Vanessa, Zllatko, Rex and Esterel. Experiments are set according to the system block system with three replication in randomized [3, 11]. Each experimental plot area is 10 m<sup>2</sup> (10 m length x 1 m width). Depth of planting 3 - 5 cm. Between Varieties will be left separating distance 30 cm and between iterations 50 cm.

### 2.1. Phenological parameters ( fenostages)

Growth and development of the barley plant comprises and scrolled through some relevant biological stage, in which, under the influence of ecological factors, initial vegetative and generative organs are formed [2,6]. These stages: germination stage, brotherhood phase, establishment phase, the phase of the report, blooming and maturation.

- Germination stage - it was found that the optimum temperature for the transcription of this phase of barley germination ranges from 15 - 20 0 C.
- brotherhood phase - and agro climatic optimum conditions, when the values of daily temperatures range from 10 - 16 0C and optimum moisture, it begins 15 days after germination phase.
- Establishment phase - in the raising phase, in optimal conditions ecological first begins to extend and further increase nodusi (node) of the first stem.
- Phase charges - depending on the type, cultivar and seeds ecological, in a region in which the cultivated barley, for a period of 25 - 45 days after completion of the previous raise, the initial step of the report.
- Flowering stage - at this stage in optimal conditions of temperature of 17-260 C and humidity is the maximum formation of ears on the cob and optimal formation of flowers in ears (2-4).
- Stages of ripeness - After process polenizimit and fertilize the flowers in the ear of barley, begins with an intensity increase speed and full formation of all parts of the fruit (grain) of barley. All of barley yellow plant, most of the leaves fall, and humidity in grains of barley is constant, 13-14%

## 3. Results and discussion

After planting barley in plots immediately started tracking parameters such as the density of plants in experimental fields on the tenth day after planting which measurement results are present in Table 1. On the day of 10 (ten) after planting in all varieties of barley in plots has become the definition of plant density barley variety and cease it by counting three lines in length (3x1metër), random system. On the day of 10 (ten) after planting in all varieties of barley has become the definition of plant density on the lines that counting three lines in length (3 x 1 meter) with random system. Based on the data in table 1 and figure 1. Seen that varieties with high density over three year's research have variety Bingo average value of 82 cm. 3.1. Count brotherhood

In the second decade of April, the three lines for each line is numbered all the primary and secondary folicles in order to determine the level of brotherhood varieties for research. The results achieved have presented in tab. 2 and Chart 2. Where we have put the number of seedlings average value over three years research has highest cultivar Vanesa 7.3 Regarding the stem height of all cultivars of barley tested were found positive differences in relation to the cultivars. Cultivars of barley plant density higher during the three-year research cultivar Zllatko while the greatest height of the stalk is found to cultivar Vanessa (98cm respectively 94 cm) in both regions of the establishment of the experiment and the lowest Estereli (76 cm 79 cm respectively), while other varieties have been hanging somewhere in between. In Table 4 we have the results of three years of research productivity where higher

value is cultivar Vanesa and Zllatko. In vitro of barley cultivars were investigated following parameters: weight of 1000 seeds, hektolitare weight and productivity (Tab.5) and Graph 5.6. Also from the above table shows that there were differences between autumn barley cultivars tested in relation to standard cultivars. Autumn barley cultivars ma high weight of 1000 seeds is found to cultivar Bingo (54.3 g) while my low weight of 1000 seeds is found to cultivar Zllatko (40 733 g and 41.95 g). Weight hektolitare highest cultivar Vanesa 61.30. In Table 6. are given the results of% moisture, protein, and starch percent. Higher protein presents cultivar Rex 13.73%.

#### 4. Conclusions

On the basis of the results obtained in research plots in 2010, 2011, and 2012 to the culture of barley in the field of Dukagjinit (Arëbnesh-Peja) and in the field of Kosovo (Pestova) can conclude the following:

- Higher yields over the years in research have Vanesa plots and Zllatko in plain area of Kosovo (Pestova).
- In the area of Kosovo (Pestova) Vanessa and Zllatko has high yield 6972 kg / ha and 6117 kg / ha, other varieties are also shown positive results, so my high yields generally given plane Kosovo
- Fenostages the development of barley varieties in the research we can conclude that approximately are approximate.
- agro-ecological conditions and production sites are researched very suitable for the cultivation of barley, but always taking into account the application of an agro and high care and

The agro-technical measures, in which special attention should be paid especially:

- To explore cultivars with high potential manufacturer
- Planting performed in optimal time
- Soil analysis previously performed in terms of nutrient contents of major elements (N,P,K)
- Use adequate and balanced nutrient fertilizers according to the content of nutrient elements in the earth, and planned yield
- respected herbal circulation to eliminate the possibility of wintering potential attacks Harmful Biological Agents (ADB)
- Application of Integrated Protection of barley culture but also the first culture
- Using modern mechanist

Table 1. Plant density in plots on day 10 (ten) after planting in two areas of 5 cultivars

	Peja: Bingo, Vanesa, Zllatko, Rex, Esterel,					Pestova: Bingo, Vanesa, Zllatko, Rex, Esterel				
2010	82	80	83	80	79	84	81	84	82	79
2011	83	81	80	80	76	85	82	81	82	78
2012	79	83	85	81	81	78	82	83	80	79

Table 2. Number of seedlings (stalks) in two areas of 5 cultivars

	Peja: Bingo, Vanesa, Zllatko, Rex, Esterel,					Pestova: Bingo, Vanesa, Zllatko, Rex, Esterel				
2010	6	8	7	6	6	5	7	8	6	6
2011	5	7	6	5	5	6	7	5	6	5
2012	5	7	8	6	6	5	7	7	5	5

Table 3. Plants density and height of the stalk in two areas of 5 cultivars

	Density (m <sup>2</sup> )									
	Peja: Bingo, Vanesa, Zllatko, Rex, Esterel,					Pestova: Bingo, Vanesa, Zllatko, Rex, Esterel				
2010	500	485	510	482	480	510	492	500	500	475
2011	500	490	495	490	470	510	490	500	500	480
2012	480	500	510	485	480	475	492	500	480	475
	Height stalk (cm)									
2010	97	98	89	97	86	96	100	84	98	82
2011	82	80	72	80	85	84	80	73	82	86
2012	79	80	85	83	78	78	79	82	81	77

Table 4. Yield (kg) in two areas of the 5 cultivars

	Peja: Bingo, Vanesa, Zllatko, Rex, Esterel, Pestova: Bingo, Vanesa, Zllatko, Rex, Esterel									
2010	5.400	5.280	5.900	5.100	5.500	5.800	5.420	5.300	5.200	5.100
2011	5.280	5.350	5.200	4.800	5.100	5.420	5.850	5.400	5.000	5.150
2012	5.798	6.117	6.972	5.798	5.702	5.220	5.450	5.485	5.388	5.225

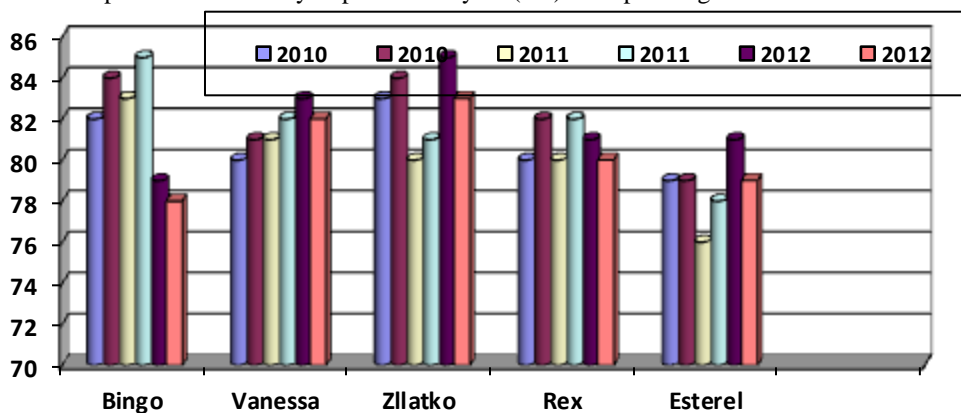
Table 5. Weight 1000 seeds, weight hektolitare in two areas of the 5 cultivars

Weight 1000 seeds %										
Peja: Bingo, Vanesa, Zllatko, Rex, Esterel, Pestova:					Bingo, Vanesa, Zllatko, Rex, Esterel					
2010	51.4	54.20	43.233	43.1	42.91	51.0	54.30	41.95	42.4	43.1
2011	54.20	54.10	42.90	41.90	43.90	54.30	52.90	44.50	42.60	46.39
2012	42.9	48.167	40.733	43.467	45.733	49.9	43.9	50.95	50.4	44.7
Weight hectoliter %										
2010	57.8	58.85	59.3	57.2	59.55	57.6	59.90	59.90	59.3	57.2
2011	58.85	61.30	60.10	64.56	55.50	59.90	61.90	61.20	65.42	56.85
2012	59.683	58.017	59.633	59.767	59.55	55.1	58.45	57.075	57.3	58.25

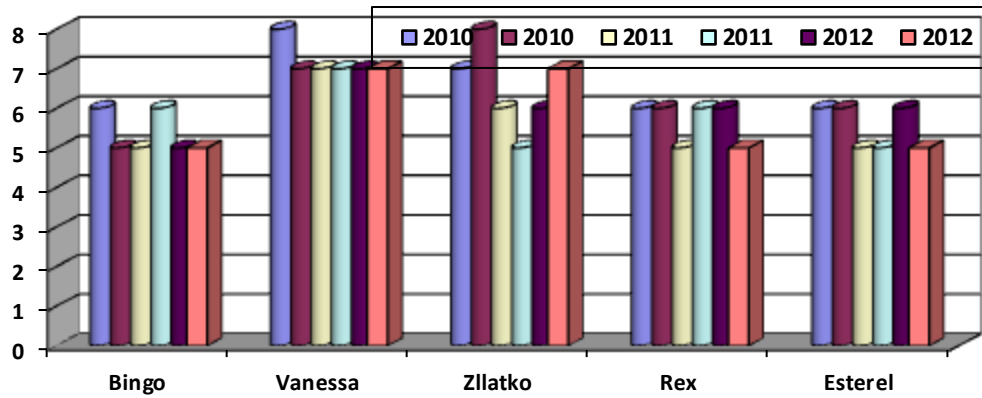
Table 6. Presentation of the results of Moisture % protein % and Starch % in two areas of the 5 cultivars

Humidity %										
Peja: Bingo, Vanesa, Zllatko, Rex, Esterel, Pestova:					Bingo, Vanesa, Zllatko, Rex, Esterel					
2010	10.6	11.6	10.9	11.2	11.82	13.6	11.1	11.0	11.3	11.6
2011	11.6	12.1	11.1	10.8	11.4	12.6	12.6	11.4	11.2	11.8
2012	10	11.1	10.2	10	11.26	10.4	10.5	10.3	10.45	11.05
Protein %										
2010	13.4	12.5	13.20	13.6	13.4	13.4	12.6	13.25	13.8	13.1
2011	13.4	12.7	13.2	13.2	12.9	13.9	13.8	13.4	13.8	13.2
2012	13.73	12.9	13.35	13.73	13.4	13.35	12.9	13.35	13.73	13.4
Starch %										
2010	60.2	60.2	60.4	60.4	60.5	60.35	60.35	60.55	60.45	60.2
2011	60.1	60.1	60.1	60.2	60.3	60.2	60.15	60.4	60.35	60.1
2012	62.5	63.6	62.6	62.5	61.4	60.85	62.15	60.85	61.55	61.2

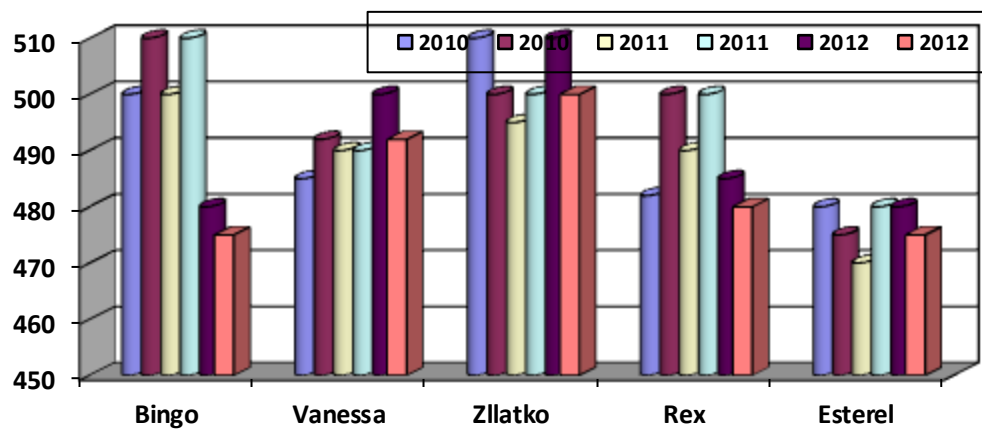
Graph 1. Plant density in plots on day 10 (ten) after planting in two areas of the 5 cultivars



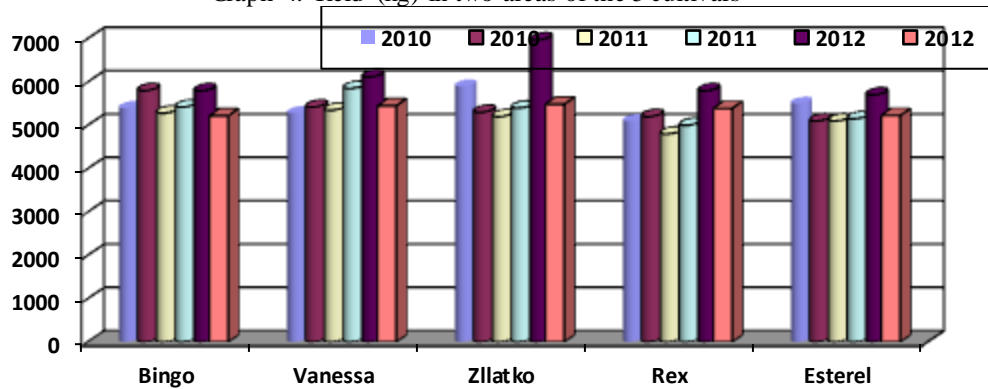
Graph 2. Number of seedlings (stalks) in two areas of the 5 cultivars



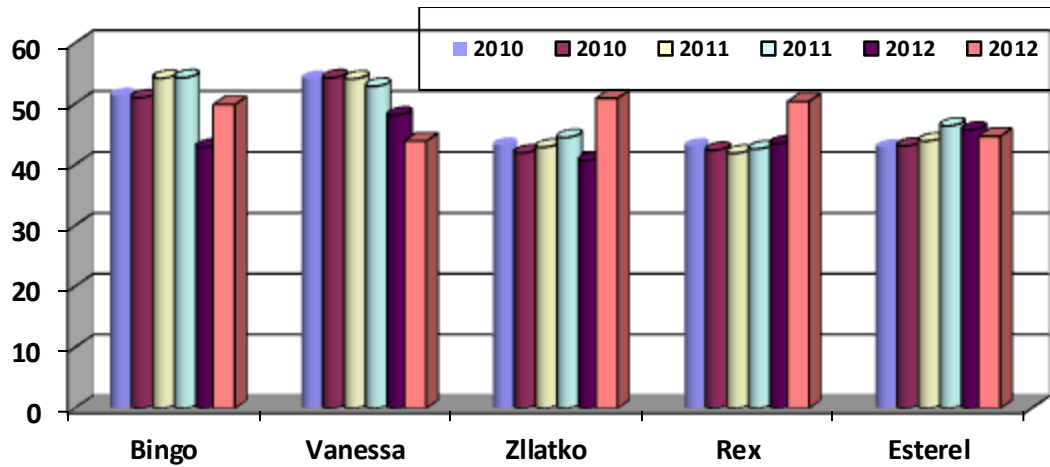
Graph 3. Plant density m<sup>2</sup> in two areas of the 5 cultivars



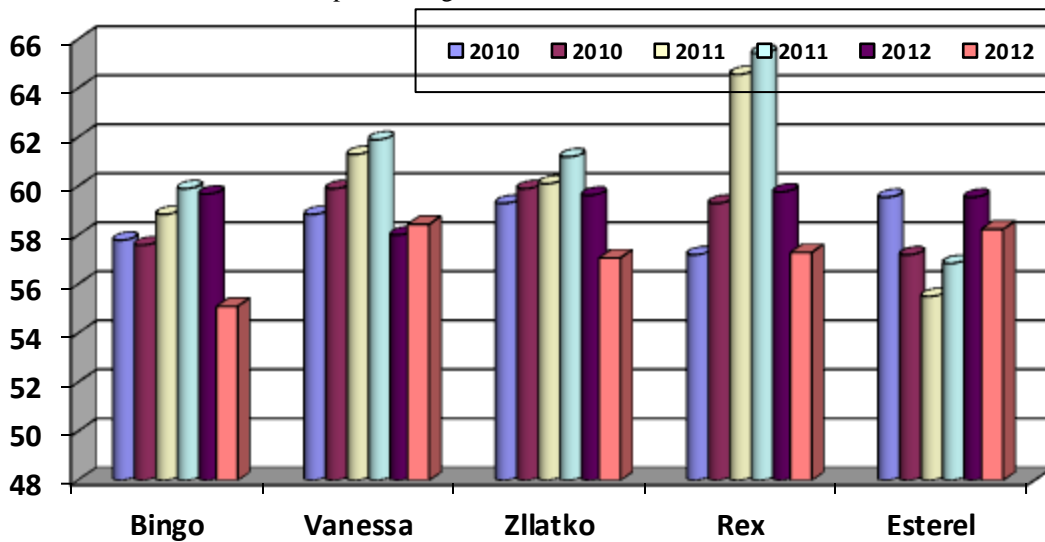
Graph 4. Yield (kg) in two areas of the 5 cultivars



Graph 5. Weight 1000 seeds in two areas of the 5 cultivars



Graph 6. Weight hectoliter in two areas of the 5 cultivars



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