

EVALUATION OF SOME CULTIVARS OF WINTER BARLEY FOR BEER (*HORDEUM VULGARE*) IN THE CLIMATIC CONDITIONS OF THE REPUBLIC OF KOSOVO

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Abstract

The object of study is the evaluation of cultivars of winter barley for beer (*Hordeum vulgare*) in the climatic conditions of the Republic of Kosovo. The assessment has been a total of 5 cultivars of barley: Bingo, Zlatko, Vanessa, Esterel, and Rex as comparative (standard). Evaluations are conducted in two regions agro-climatic of Kosovo (in Arbnes, in research farm of agricultural Institute of Kosovo, Peja Dukagjini Plain, and in Pestova – Kosovo Plain, private property company "Pestova"). In the evaluation, are tested yield (kg/ha), the weight (1000 grams of seed), hectoliter weight (kg), protein content (%), moisture (%), and starch. Agro-climatic and ecological data of Kosovo, compared to take our yields of winter barley culture show for not using genetic potential cultivars grown on us. For this reason should be applied to a modern agro-technical to exploit the genetic potential, and obtain higher yields. Obtained results regarding showed that there were significant differences statistically different levels for all cultivars investigated traits involved in the plot compared to the standard (Rex) and between localities

Keywords: Barley, hectoliters weight, yield, starch.

1. Introduction

Studies in the determination of new cultivars of interest in agricultural research. Barley is a plant in Europe occupies an important place in the structure of the cultivated plants. The main use of barley for brewing. In our country, the years of transition, there was a significant reduction of the area planted with barley. Kosovo currently planted about 2195 ha with barley districts, most of which is used for the production of beer. 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. This adaptability not only sees the impact of climatic conditions in different varieties manufacturing capabilities, but also on the impact of climatic factors in the qualitative barley beer production destination. Currently planting barley is mainly focused on two areas in the Republic of Kosovo. These areas are: Dukagjini Plain and Plain of Kosovo. 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 planted presently in Kosovo climatic conditions different ecological zones (Dukagjini Plain and Plain of Kosovo). 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. From various studies it appears that the main characteristics of manufacturing malt from barley seeds are protein content and their son ship energy. These features of seeds affected by growing conditions particularly in the grain formation stage. The impact of these conditions will be studied in two different climatic

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zones (Dukagjini Plain and Kosovo Plain) five different varieties of barley. The average yield achieved in recent years is about 2.5 t/ha. Agro-climatic and ecological of data, compared with the yields obtained in the culture of barley indicate that, potentially, the amount of barley stocks that can be produced are great. 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 is 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 Arbnes, 6 km from Peja. Soil type, soil brown lesivuar on reddish sediments and the altitude is 488 meters and the Plain of Kosovo (Pestova) where the nature of the soil is ammonic, and altitude is 560 feet assessments were made during 2010 and 2011. Before plating barley culture taken soil samples and analyzed. Planting the plot is made with experimental planter Hege 80.

- The specifics of the plot
- The length of the line10 m
- The width of the plot.....1.0 m
- The width of the line.....11 cm
- Number of rows.....6
- Depth.....3 cm

2.1. Phenological parameters (feno-stages)

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. These stages: germination phase, brotherhood phase, establishment phase, the phase of the report, blooming and maturation.

- Germination phase – it was found that the optimum temperature for the transcription of this phase of barley germination ranges from 15 – 20 °C
- Brotherhood phase – in conditions optimum climatic and agro-technical, when the values of daily temperatures range from 10 – 16 °C and optimum moisture, it begins 15 days after germination phase.
- Rising phase – in the raising phase, in optimal conditions ecological first begins to extend and further increase nods (node) of the first stem.
- Phase of the report – depending on the type, cultivar and agro-ecological seeds, in a region in which the cultivated barley, for a period of 25 – 45 days after completion of the previous raise, the initial phase of the report.
- Flowering phase – at this phase in optimal conditions of temperature of 17 – 26 °C and humidity is the maximum formation in the ear ears and optimal formation of flowers in ears.
- Maturation phase – after the process pollen 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 %.

Research carried out as follows:

1. Yield – is specified in each version of experimented through analytical measurement accuracy scales to 1 gr.
2. Weight hectoliter – defined by special scales bonerit.
3. Absolute weight – analytical scales
4. Proteins – Kejdahl’s method
5. Humidity – Brabender device for measuring moisture in digital.

3. Results and Discussion

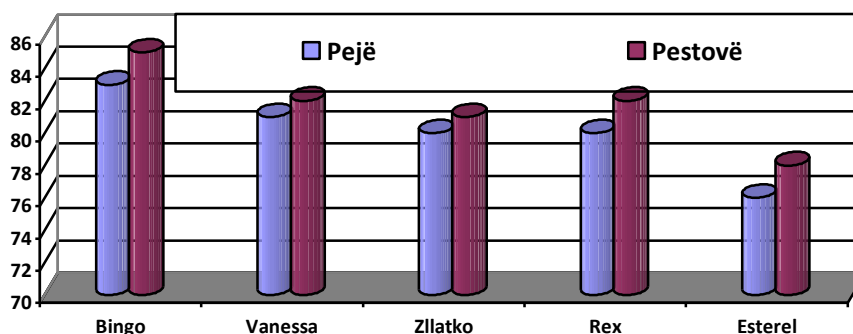
After planting barley in plots immediately started monitoring the parameters such as the density of plants in experimental fields. In the ten days after planting, which measurement results are present in Table 1. On the day of 10 (ten) after planting in all varieties of barley in plots has become the definition of plant density barley variety and cease it by counting three lines in length (3 x 1 meter), random system.

Cultivar	Peja		Pestova	
	Density on 1 m length (after day 10)		Density on 1 m length (after day 10)	
Bingo	83		85	
Vanessa	81		82	
Zlatko	80		81	
Rex	80		82	
Esterel	76		78	

Table 1. Plant density in plots on day 10 (ten) after plating

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 2. Show the varieties have similar density between them.

Graph 1. Plant density on day 10 (ten) after planting



Count brotherhood - In the second half of April (12.04.2011), the three lines for each line is numbered all the primary and secondary follicles in order to determine the level of brotherhood varieties for research. The results achieved have presented in Table 2. Where we have put the number of seedlings of three replication and brackets have decided averages of the three repetitions. From the table it is clear that all varieties have researched stalks

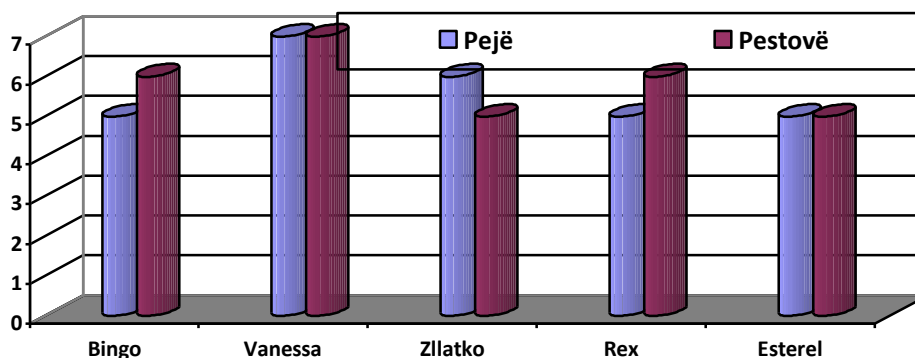
number closest to each other.

Cultivar	Peja		Pestova	
	Number of seedlings (stalks) Brotherhood		Number of seedlings (stalks) Brotherhood	
Bingo	5		6	
Vanessa	7		7	
Zlatko	6		5	
Rex	5		6	
Esterel	5		5	

Table 2. Number of seedlings (stalks) of barley varieties to investigate

Regarding the number of seedlings (stalks) of all tested cultivars of barley were found positive differences Barley cultivars greater number of seedlings (stalks) is found to cultivar Vanessa (7) in both regions the establishment of the experiment and lowest Esterel (5), while other varieties have been hanging somewhere in between.

Graph 2. Number of seedlings (stalks) of barley varieties to investigate



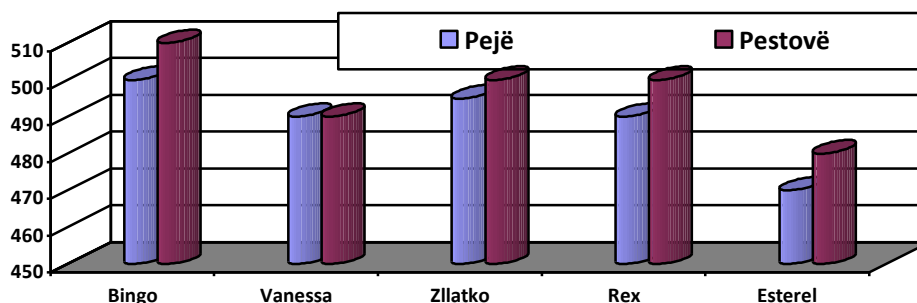
Cultivar	Peja		Pestova	
	Density (m ²)	The height of the stalk (cm)	Density (m ²)	The height of the stalk (cm)
Bingo	500	82	510	84
Vanessa	490	80	490	80
Zlatko	495	72	500	73
Rex	490	80	500	82
Esterel	470	85	480	86

Table 3. Plant density and height of the stalk of winter barley

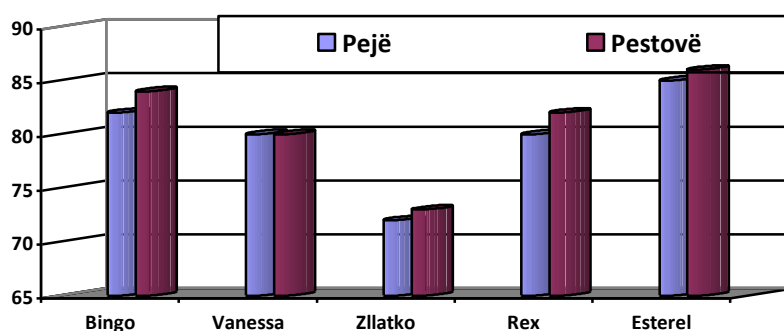
Regarding the stem height of all cultivars of barley tested were found positive differences in relation to the cultivars. Barley cultivars greater height of the stalk is found to cultivar Esterel (86 cm respectively 85 cm) in both regions of the experiment, whereas the lowest setting Zlatko (72 cm respectively 73 cm), while other varieties have

been hanging some where in between.

Graph 3. Plant density m²



Graph 4. The height of the stalk of winter barley varieties



Laboratory research – In vitro of barley cultivars were investigated following parameters: Weight of 1000 seeds, hectoliter weight and yield (Table 4.).

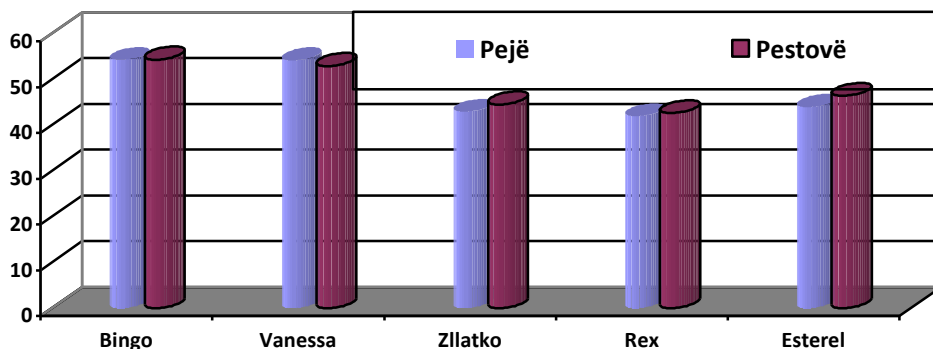
Cultivar	locality	Weight of 1000 seeds	Hectoliter weight	yield
Bingo	Pejë	54.20	58.85	5280
	Pestovë	54.30	59.90	5420
Vanessa	Pejë	54.10	61.30	5350
	Pestovë	52.90	61.90	5850
Zlatko	Pejë	42.90	60.10	5200
	Pestovë	44.50	61.20	5400
Rex	Pejë	41.90	64.56	4800
	Pestovë	42.60	65.42	5000
Esterell	Pejë	43.90	55.50	5100
	Pestovë	46.39	56.85	5150

Table 4. Weight of 1000 seeds, hectoliter weight and yield

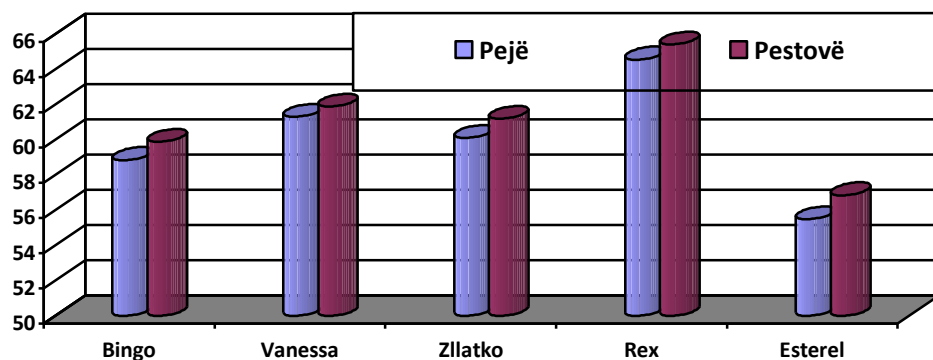
Also from the above table shows that there were differences between winter barley cultivars tested in relation to standard cultivars. Winter barley cultivars with high weight of 1000 seeds is found to cultivar Vanessa (54.10 gr)

and my low weight of 1000 seeds is found to cultivar Rex (41.90 gr and 42.60 gr).

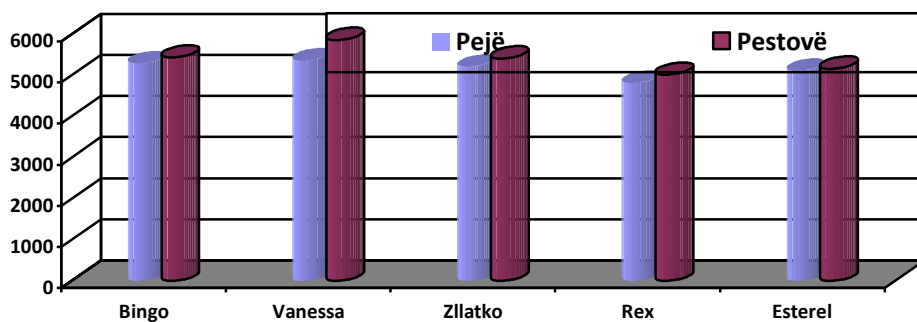
Graph 5. Weight of 1000 seeds



Graph 6. Hectoliter weight



Graph 7. Yield



Cultivar	Peja	Peja	Peja	Pestova	Pestova	Pestova
	Humidity %	Protein %	Starch %	Humidity %	Protein %	Starch %
Bingo	11.6	13.4	60.10	12.6	13.9	60.20
Vanessa	12.1	12.7	60.10	12.6	13.8	60.15
Zllatko	11.1	13.2	60.10	11.4	13.4	60.40
Rex	10.8	13.2	60.20	11.2	13.8	60.35
Esterel	11.4	12.9	60.30	11.8	13.2	60.10

Table 5. Presentation of results Humidity %, Protein %, and starch %

Feno stages of development in days							
Cultivar	Locality	Planting	Sprung	Rise	Charges	Flourishing	annealing
Bingo	Pejë	15.11.2010	10	157	168	175	230
	Pestovë	19.11.2010	11	160	170	177	232
Vanessa	Pejë	15.11.2010	10	162	171	178	233
	Pestovë	19.11.2010	11	165	173	180	235
Zllatko	Pejë	15.11.2010	10	155	165	172	230
	Pestovë	19.11.2010	10	157	166	174	234
Rex	Pejë	15.11.2010	11	160	170	177	234
	Pestovë	19.11.2010	11	162	172	178	236
Esterel	Pejë	15.11.2010	11	162	172	179	235
	Pestovë	19.11.2010	12	164	173	180	240

Table 6. Submission of feno stages of development in days

4. Conclusions

On the basis of the results obtained in research plots of barley culture in the plane of Dukagjini (Arbnesh - Peja) and in the plane of Kosovo (Pestova) can conclude the following:

- Higher yields this year we surveyed plots in the plane of Kosovo (Pestova)
- In the area of Kosovo (Pestova) Vanessa gave higher yield 5850 kg/ha compared to the level of Dukagjini (Arbnesh) 5350 kg/ha other varieties are also shown positive results, so generally gave high yields of the plane Kosovo
- Feno stage of development of barley varieties in the research, we can conclude that they are roughly similar
- Agro-ecological conditions and production locations to researched are very suitable for the cultivation of barley, but always taking into account the application of an agro technical and high care Agro technical measures, in which special attention should be paid especially:
 - 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 soil and planned performance
 - Herbal turnover to be respected in order to avoid the possibility of attacks by potential wintering Harmful Biological Agents (ADB)

- Integrated Protection application to the culture of barley, but also the first cultures
- Using modern mechanism

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