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INFLUENCE OF VARIETIES AND TECHNOLOGY UPON THE YIELD OF SEVERAL BARLEY VARIETIES GROWN IN THE SOUTH EASTERN PART OF ROMANIA

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Abstract

Barley (Hordeum vulgare), unlike other cereals, is distinguished by a wider geographical spread, being the only cereal that reaches 70 degrees North altitude. Barley provides the human body a wide range of nutrients: vitamins (B1, B2, B3, B6), minerals (selenium, manganese, iron, magnesium, phosphorus, zinc, copper) and dietary fibre. These qualities as well as many others make this crop constantly in the structure of crops. That is why, the research aimed at improving the quality of this plant is constantly evolving. Study of the behaviour in crop was analyzed, under the same technological and land and climate conditions, four varieties of Hanzi, Alora, Amorosa and Finola barley. The research was carried out during the year 2018, in the Southeastern part of the Romanian Plain. After harvest, determinations were made regarding the protein content, hectolitre weight, MMB and efficiency per hectare for each variety. The best efficiency was made by Hanzi variety that exceeded the production of the control variety by 30%.

Key words**:** *barley, hectolitrre weight, protein, varieties, yield*

INTRODUCTION

In Romania, the barley is one of the basic plants for crop rotation, being among the most common autumn crops [1]. Observing the technological steps is, however, very important, because without a good harvest, the barley is valued at lower prices [3]. Unlike the other cereals, barely (Hordeum vulgare) is distinguished by a wider geographical spread[10] . It is the only cereal it reaches 70 degrees North altitude[6]. Barley provides a wide range of nutrients to the human body: vitamins (B type: B1, B2, B3, B6), minerals (selenium, manganese, iron, magnesium, phosphorus, zinc, copper), food fibers [12]. These qualities as well as many others make this crop to be constantly in the structure of crops[11]. The interest in this crop led to the development of research on improving its quality and efficiency [9].

The main objective of the programs for the improvement of the plants is generally the creation of varieties and hybrids with high biological potential for high and stable production, as well as other favourable agronomic properties[2,8]. The characteristics of the varieties grown (yield potential, tolerance to biotic and abiotic factors, plant morphology etc.) can influence crop technology [7].

Also, tillage system optimization is an issue that concerns research and agricultural practice, considering the implications of the technological, economic and environmental impact of these elements [4]. Soil tillage should simultaneously ensure the conditions required by crop plants for growth and soil conservation [5].

MATERIALS AND METHODS

The study of the four varieties concerned the behaviour in crop as regards the yield and some qualitative indices (protein content, hectolitre weight, mass of one thousand MMB grains), in the soil and climate conditions in

the South-eastern area of the Romanian Plain. The analyzes were made on the material obtained from the harvest of 2018. The researches were organized on four variants, each variant with three repetitions, each with a surface of 150 square meters (Table 1). As a control variant, Amorosa variety was established to compare the results. The soil specific to the area is cernoziomic, formed of loess, which has nutrients and has the highest natural fertility for the plant crop in our country. Cambic chernozem has good agrochemical properties and a neutral pH that ensures satisfactory harvests even under non-fertilising and non-irrigation conditions.

Due to the good physical properties, high humus content and reaction favour the development of rich biological activities, mineralization of organic nitrogen and nitrate formation under natural conditions reach good levels.

The phosphorus regime is favoured by the weakly neutral reaction which keeps the phosphorus in a good state of both soil and fertilizer application, and its absorption by the plants is made in good conditions. Also, the restoration of the slightly soluble phosphate reserve takes place easily from the natural reserve of soil, which requires the use of phosphate fertilizers with good efficiency, with an average production increase of 15.0%.

The technology used was in the scarification work followed by a disk work concomitantly with DAP type fertilizer work. Sowing took place on 10th October. Chemical formulations of NH4NO3 were also administered at a dose of 200 kg in March and 200 kg DAP in April. Phytosanitary treatments were carried out with Biscaya insecticide, Menara fungicide and Mustang herbicide.

The climate conditions were characterized by precipitation below the multiannual average in the first six months of 2018, with a surplus of 124.3 l/square meter in July compared to a 77.8 mm multiannual monthly average. Also, the amount of precipitations in the years 2018-298.1 mm - was well below the values recorded in the previous years, but also compared to the average of the years 2012-2018 (512 mm).

During the sowing period, in October, there was 10.8 mm, well below the multiannual monthly average of 43.5 mm.

Table 1. Experimental variants

Variant	Variety
V1	ALORA
V2	AMOROSA- Mt
V3	HANZI
V4	FINOLA

Source: Own determination.

Alora variety is a modern variety of autumn barley, that was created especially for the climatic conditions of the dry regions of Eastern Europe, especially for our country. Alora variety ensures an early average baking and excellent production stability.

Amorosa variety is an early autumn barley variety with good stability in time, resistant to brown rust and septoriosis.

Hanzi variety is an autumn variety, suitable for well structured soils with high humus content and organic matter, ensuring high productivity. It shows good tolerance to rust.

Finola variety is a new, genetical Probstdorfer Saatzucht, highly productive, with superior quality indices.

RESULTS AND DISCUSSIONS

The varieties studied were analyzed from the efficiency point of view, both regarding the quality indicators and the productivity factors, such as the twinning degree and the number of spices per square meter.

Regarding the twinning degree, the varieties did not show significant differences (Table 2), the number of twins on the plant ranging from 6-7, a number of 6 twins being present in the control variety, Amorosa.

Table 2. Influence of varieties on twinning degree

Variety	No of twins/pl
AMOROSA-Mt	6
ALORA	7
HANZI	7
FINOLA	7

Source: Own calculation.

The determinations made regarding the density of spices per square meter revealed that all four varieties exceeded 650 spice / sq

m, the lowest number being registered at the control variant, 668 spice/sq m. The highest density was registered for Hanzi and Finola varieties, 685 and 686 spice / sq m respectively. Except for the control variant, all the other variants exceeded the average of 680 spice/sq m. The density differences were between 13-18 spice/square meter, as shown in Table 3 and Figure1.

Table 3. Influence of varieties on spices density

Variety	No of spices /sq m	Difference compared to control
AMOROSA-Mt	668.0	-
ALORA	681.0	13
HANZI	685.0	17
FINOLA	686.0	18
AVERAGE	680.0	12

Source : Own calculation

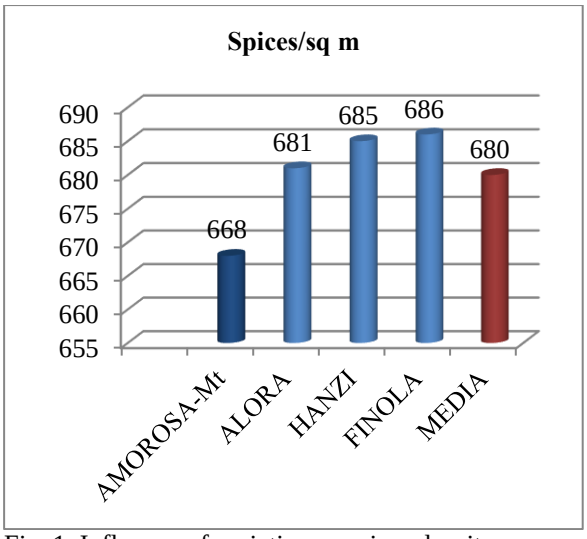

Fig. 1. Influence of varieties on spices density
Source: Own calculation

Analyzing the production obtained by the four varieties studied, from the point of view of the protein content, it was observed that the highest content in the protein was made by Amorosa variety, 15.0%. Being the variety established as control, we can conclude that all other varieties registered inferior results, the biggest difference being registered in Alora variety (-2.6%). Amorosa variety gained 1.4% and the average of the four varieties, 13.6%. Compared to the average value on experience, Alora and Hanzi varieties registered lower values of over 1.0%.

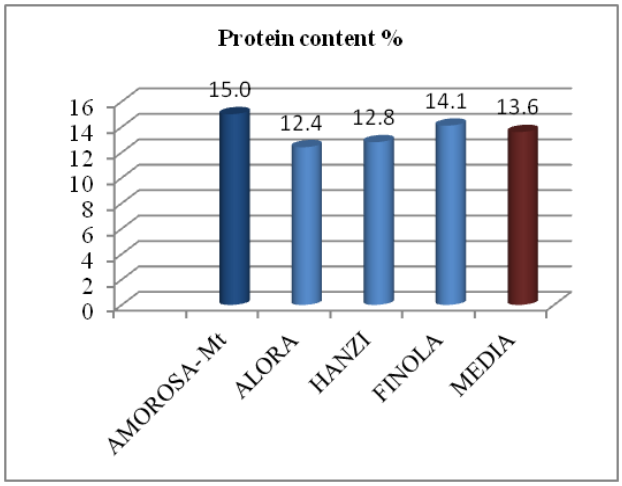

Fig. 2. Influence of varieties on the protein content
Source: Own calculation.

In conclusion, Amorosa variety has the highest protein content of the four studied varieties, 15.0%, followed by Finola variety by 14.1% (Figure 2). The lowest percentage was registered in Alora variety, 12.4% (Table 4).

Table 4. Influence of varieties on the protein content

Variety	Protein content %	Difference compared to control	Difference compared to average %
AMOROSA-Mt	15.0	Mt	-1.4
ALORA	12.4	-2.6	-1.2
HANZI	12.8	-2.2	-0.8
FINOLA	14.1	-0.9	+0.5
AVERAGE	13.6	-1.4	

Source: Own calculation.

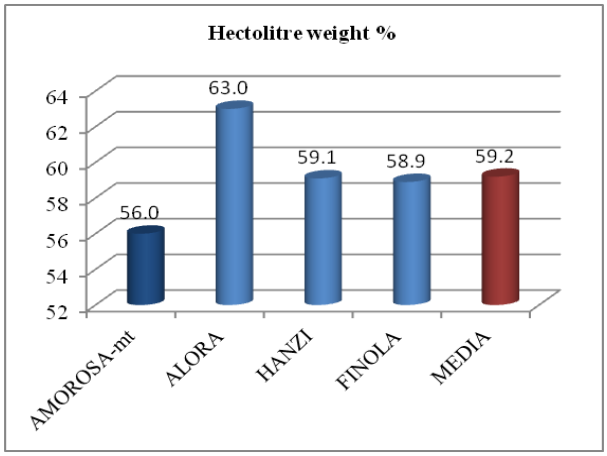

Fig. 3. Influence of varieties on hectolitre weight
Source: Own calculation

According to the Table 5, all studied varieties registered values of hectolitre weight above

the control value, 56.0%, with the highest addition to Alora variety, 7.0%.
The average value (59.2%) was exceeded by Alora and Hanzi varieties, which registered values of 63.0% and respectively, 59.1% (Figure 3).The lowest value was obtained in the control variety, Amorosa, 56.0%.

Table 5. Influence of varieties on hectolitre weight

Variety	Hectolitre weight %	Difference compared to control %	Difference compared to average %
AMOROSA Mt	56.0	Mt	-3.2
ALORA	63.0	+7.0	+3.8
HANZI	59.1	+3.1	-0.1
FINOLA	58.9	+2.9	-0.3
MEDIA	59.2	+3.2	

Source: Own calculation

The mass of one thousand grains registered values between 40.72 and 51.38 g. The highest value was observed in Finola variety (51.38 g) and the lowest in Amorosa variety (40.72 g). Compared to control, the highest difference was made by Finola variety, followed by Alora variety, 9.44%. The lowest result was obtained in Hanzi variety, 46.88 g and a difference of 6.16% compared to control (Table 6).
Compared to the average value of MMB, of the 4 varieties, the highest increase was registered in Finola variety, over 8.0% and the lowest in the control variety.
The soil efficiency results of the varieties revealed harvest differences. The highest production was registered in Hanzi variety, 7,664.8 kg.

Table 6. Influence of varieties on MMB

Variety	MMb g	Difference compared to control g	Difference compared to control %	Difference compared to average g	Difference compared to average %
AMOROSA-Mt	40.72	Mt	Mt	-6.58	-13.91
ALORA	50.16	+9.44	23.18	+2.86	+6.04
HANZI	46.88	+6.16	15.13	-0.42	-0.89
FINOLA	51.38	+10.66	26.18	+4.08	+8.63
MEDIA	47.30	+6.58			

Source: own calculation

The lowest efficiency was achieved in the control variety, 5,891.3 kg. The differences obtained compared to the control production were over 1,000 kg, statistically ensured as very significant, the biggest differences are those registered in Hanzi variety, 1,773.5 kg and Finola variety, 1,676.3 kg.
Compared to the average registered production, the differences were 564.4 kg for Hanzi variety, 467.2 kg for Finola variety and 177.6 kg for the Alora variety (Table 7).
Amorosa variety was the only one that did not exceed the efficiency made by the other varieties and their average production, the difference being very significant, 1,209.1 kg, which represents, in relative values, about 17% (Figure 4).

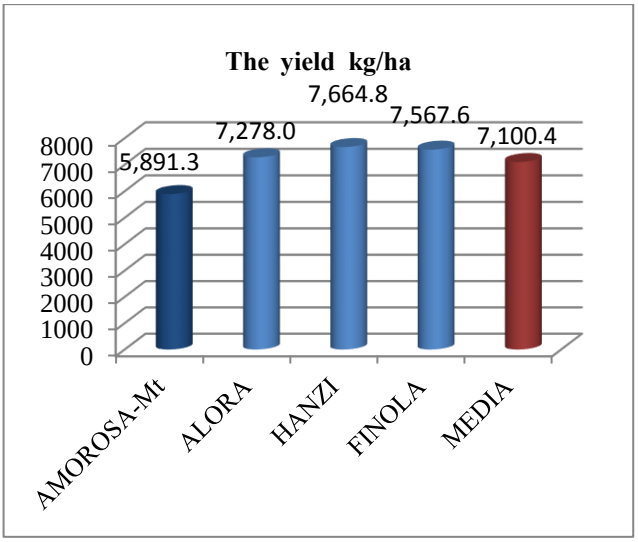

Fig. 4. Influence of varieties upon the yield
Source: Own calculation.

Table 7. Influence of varieties upon the yield

Variety	Prod Kg/ha	Difference compared to Mt kg	Difference Mt %	Significance	Difference average kg	Difference average %	Significance
AMOROSA-Mt	5,891.3	Mt	Mt	-	-1,209.1	-17.03	-
ALORA	7,278.0	+1,386.7	+23.54	***	+177.6	+2.5	*
HANZI	7,664.8	+1,773.5	+30.10	***	+564.4	+7.95	***
FINOLA	7,567.6	+1,676.3	+28.45	***	+467.2	+6.58	***
MEDIA	7,100.4	+1,209.1					

Dl 5%=171.0 kg/ha Dl 1%= 258.9 kg/ha Dl 0.1 %= 416.0 kg/ha
Source: Own calculation.

CONCLUSIONS

Analyzing the results obtained, it was found that, regarding the protein content, the highest was registered in Amorosa variety, 15.0 % and the lowest in Alora variety, 12.4 %. The difference from the control was -2.6 %.

Regarding the hectolitre weight, the most hectolitre-weighed variety is Alora, 63.0%, and the lowest-grain hectolitre is Amorosa 56.0 %. The difference between them was 7% and the lowest difference was 2.9 %, between control and Finola variety.

The mass of one thousand grains registered maximum in Finola variety, 51.38 g, and the lowest value was obtained in Amorosa variety, 40.72 g, the difference being 10.66 g. The lowest difference was 6.16 g made between control variety and Hanzi variety.

Regarding the efficiency obtained, it is directly proportional to MMB. As a result, the highest efficiency was registered in Hanzi variety, 7,664.8 kg followed by Finola variety with 7,567.6 kg. The lowest efficiency was achieved by Amorosa variety, 5,891.3 kg. The highest difference was registered between the control

variety and Hanzi variety, 1,773.5 kg. The lowest production difference was 1,386.7 kg registered between the control variety and Alora variety.

The production differences between the varieties compared to the control variant were in all cases very significant, which means that under the same technological conditions, the variety manifests its production capacity differently. Once again, the importance of improving and genetics for varieties and hybrids that show a high production potential, is confirmed.

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