Scientific Papers. Series A. Agronomy, Vol. LXVII, No. 1, 2024
ISSN 2285-5785; ISSN CD-ROM 2285-5793; ISSN Online 2285-5807; ISSN-L 2285-5785

INFLUENCE OF THE TECHNOLOGICAL PRACTICES OPTIMIZATION ON THE YIELD COMPONENTS AT TWO-ROW BARLEY FOR BEER IN THE NORD-WESTERN CONDITIONS OF THE ROMANIAN PLAIN

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Abstract

Identification of the most valuable genotypes and the establishment of an optimal density per surface unit at the establishment of the crop are two of the technological links with a decisive role in the yield components in the two-row barley crop intended for the manufacture of beer. The results of this research highlighted the fact that, in the pedo-climatic conditions specific to the N-W area of the Romanian Plain, the Salamander variety behaved best in terms of productive capacity, achieving productions of over 7.500 kg of grains/ha under the conditions of using a density of over 250 g.g./m^2 while, from the point of view of grain quality, the highest values of the mass of 1.000 grains were obtained in the Salamandre and Tepee varieties, regardless of the sowing density established at the establishment of the crop.

Key words*: two-row barley for beer, genotype, plant density, yielding components, productivity.*

INTRODUCTION

Two rows barley for beer manufacturing (*Hordeum vulgare* conv. *distichon*) is a crop in full expansion at the moment due to the yields in grains per surface unit on the one hand, and on the other hand due to the quality of the grains as a raw material intended to obtain the malt used in the beer manufacture. Therefore, it is necessary to optimize agronomic practices in order to increase grain production, but especially in order to increase grain quality and obtain higher yields in the malt extraction process. Among the technological practices that must be optimized for this crop, cultivated genotypes, the season and the sowing scheme, the nitrogen doses recommended for the crop and the time of their administration, the tillage system etc., play an important role.

In a study carried out in the period 1995-1999 at A.R.S. Livada, a study in which the influence of the relationship between the genotype of cultivated barley and two rows barley and the environmental conditions was tested, the superiority of Orizont, Dana and Adi barley varieties and the variety of two rows barley Andra, which behaved best in the conditions specific to the N-W area of Romania, the genotypes mentioned above being very productive and well adapted to the soil-climatic conditions specific to the cultivation area (Bănăbeanu & Florica Moisa, 2022).

Research in which the productive capacity of an assortment of 13 genotypes of spring two rows barley originating from the germplasm collection of S.C.D.A. Turda was evaluated by cultivating them in a crop system at ultra-low density and in a non-competitive system reported very significant increases in production at the density of 600 germinating grains per m^2, and in terms of grain quality the genotypes Chonicle, Belgravia, Concerto and Sulilly showed the best stability of grain protein content (Russu, 2015).

Singh et al. (1974) reported that 2-rows barley varieties are preferred for malting as the main raw material in brewing because the grains are larger than those of 6-rows barley, a higher starch content and lower proteins so that a very good quality malt will be obtained compared to 6-rows barley grains.

A significantly increased number of differentiated tillers per plants in two rows barley cultivars BG 25 compared to cultivars C 138, BH 75 and BH 87 grown on a sandy-clay textured soil was reported by Munir & Shatanawi (2001). Also, they reported higher

number of grains per ear, significantly higher 1000 grain weight and higher grain yield per unit area achieved by BG 25 variety.

Following the research carried out by Darwinkel (1991) in a comparative study in which he tested the formation of productive elements in an assortment of 2- and 6-rows barley varieties, the Hasso barley variety differentiated the highest number of grains in the ear, but was quite modest in terms of the number of ears formed per surface unit and the weight of 1000 grains, while Flamenco and Marinka 2-rows barley varieties formed the highest number of ears, with a grain weight clearly superior to the barley variety on 6 rows Hasso.

In the Varanasi region, Singh (2005) reported that by increasing the N rate of beer two rows barley from 20 kg N/ha to 80 kg N/ha, the number of ears/m^2, the number of grains in the ear, grain weight and final grain and straw production increased significantly. Similar results were reported by Fathi et al. (1997) who highlighted the fact that the weight of 1000 grains and the yield in grains achieved in the crop of two rows barley for beer increased in direct proportion to the increase in the dose of nitrogen administered to the crop.

In this context, the researches that formed the basis of this paper focused on the management of some technological crop practices of beer barley, highlighting the influence of the sowing scheme and the genotypes taken in the crop on the differentiation of productivity elements and the grain yield achieved at the unit of surface in specific soil and climate conditions characteristic of the N-W area of the Romanian Plain.

MATERIALS AND METHODS

The purpose of the research. The purpose proposed in the research was to analyze the behavior, from the point of view of the formation of productivity elements, of three new varieties of two row barley grown in the Experimental Field of Moara Domnească Farm during the agricultural year 2021-2022 characterized by an extremely deficient pluviometric regime, compared to the multiannual average values recorded at the research location, respectively 324.7 mm precipitations throughout the year.

Research objectives. The objectives of the research aimed to evaluate the influence of different technological practices (sowing density and cultivated genotype) on the productive capacity of new two row barley genotypes for beer of foreign origin introduced into crop in the Romanian Plain.

The experimental methodology used in the research. In order to evaluate the productive behavior of the new two row barley genotypes for beer taken in the study, a bifactorial experiment was designed located in the Experimental Field of the Moara Domnească Farm according to the method of subdivided plots, in three repetitions, the experimental factors tested being the following:

Factor A - Two row barley variety cultivated, with 3 graduations:

a_1 - Tepee variety;

a_2 - Bosut variety;

a_3 - Salamandre variety.

Factor B - Sowing density, with 3 graduations:

b_1 - 250 germinating grains (g.g.)/m^2;

b_2 - 350 germinating grains (g.g.)/m^2;

b_3 - 450 germinating grains (g.g.)/m^2.

Following the combination of the two experimental factors, 9 experimental variants resulted, the total area of the experience being 3000 m^2. The control of the beer barley experiment was represented by the average of the experience.

Phytotechnical itinerary practiced in research. The preceding crop of two row barley for beer manufacture was the *Camelina sativa* (L.) Crantz. crop. Prior to the design of the field experience, the basic soil tillage was carried out which consisted of plowing with a reversible 3-body plow on September 24, 2021 year, at a tillage depth of 25 cm.

The plowing was maintained with harrowing works with the GD-3,2 disc harrow, making 2 passes with the harrow, perpendicular to the direction of the plowing (the first work with the harrow was carried out on October 10, 2021, and the 2nd pass in the day before sowing), the tillage depth being 10-15 cm.

The preparation of the germinal bed was carried out on the day of sowing, using for this purpose a combiner that worked on the diagonal of the sowing direction.

In order to establish the two row barley experiment, the seed was treated with the Austral Plus (Syngenta) insectofungicide, an insectofungicide containing as active substances: 40 g/l tefluthrin+10 g/l fludioxonil, the recommended dose for treating the seed being 5 liters/t seed. The weed control consisted of a crop herbicide work carried out on April 15, 2022 with the herbicide Sekator (Active substance: amidosulfuron 100 g/l + iodosulfuron-methyl-Na 25 g/l+mefenpyr diethyl 250 g/l (safener) and a phytosanitary treatment to prevent the attack of pathogens with the fungicide Evolus (Active substance: 4% proquinazid + 16% tebuconazole + 32% prochloraz) in combination with the contact insecticide Cyclone in order to combat harmful insects specific to the beer barley crop. The experiment harvest was carried out on June 6, 2022.

Observations and determinations made during the research. During the entire research period, phenological observations and biometric determinations were carried out in the experimental field, which aimed at:

- plants density at emergence, at the beginning of winter, at the end of spring, at harvest (tillers/m^2);
- plants height when harvesting the crop, by measuring the height of the plants (cm);
- plant biomass, by weighing the plants (g).

In order to determine the main productivity elements of the new two row barley varieties for beer tested in the experiment after the emergence of the crop, control points were delimited on the diagonal of each experimental variant (5 control points for each experimental variant), points from which destructive samples were taken of plants, plants brought to the laboratory where the production components were determined, respectively:

- number of ears/m^2, by counting;
- length of the ears (cm), by measurement;
- number of grains/ear, by counting;
- mass of grains/ear (g), by weighing;
- mass of 1000 grains (g), by the method of two repetitions of 500 grains;
- moisture content of the grains at harvest and after their drying (%), with the help of the electronic moisture analyser.

To determine the main elements of productivity, after establishing the proportion of large, medium and small ears, because 60% large ears, 30% medium ears and 10% small ears were identified, 10 ears (6 large ears, 3 medium ears, respectively 1 small ear) were taken from each previously established control point and, after the laboratory determinations, the arithmetic mean of the results was made recorded, separately for each individual experimental variant.

After determining the production components, the assessment of the probable production achievable per surface unit was carried out.

Statistical analysis and interpretation of research results. All the experimental results obtained from the determinations carried out both in the experimental field and in the laboratory were analyzed and interpreted from a statistical point of view by the method of analysis of variance, according to the method of bifactorial experiments, placed in subdivided plots, with three repetitions.

RESULTS AND DISCUSSIONS

Results and discussion on the influence of genotype and sowing density on plant density per unit area. The experimental results obtained following the determination of the density achieved per surface unit of the three varieties of two row barley taken in the study varied within fairly wide limits under the influence of the two experimental factors tested within the experience.

Analyzing the results recorded following the determination of the density per surface unit, it is observed that this biometric indicator after the emergence of the two row barley plants recorded values between 203 and 434 plants/m^2, of the three varieties studied, the Salamander variety sown at a density of 450 grains germinables/m^2 registering the highest emergence capacity (434 plants/m^2) closely followed by the Bosut variety where, at the same sowing density, the plant density was 410 plants/m^2. These two varieties registered very significant differences (xxx) from a statistical point of view, compared to the rest of the experimental variants (Table 1).

Table 1. Plant density per unit area

Experimental Variant	Density at emergence (plants/m^2)	Difference (plants/m^2)	Significance degrees	Density at harvest (tillers/m^2)	Difference (tillers/m^2)	Significance degrees
V1-Tepee-250 g.g.	203	-103.9	ooo	573	-218.4	ooo
V2-Tepee-350 g.g.	246	-60.9	oo	753	-38.4	-
V3-Tepee-450 g.g.	323	16.1	-	789	-2.4	-
V4-Bosut-250 g.g.	238	-68.9	oo	946	154.6	xxx
V5-Bosut-350 g.g.	339	32.1	x	787	-4.4	-
V6-Bosut-450 g.g.	410	103.1	xxx	876	84.6	x
V7-Salamandre-250 g.g.	227	-79.9	oo	612	-179.4	ooo
V8-Salamandre-350 g.g.	342	35.1	x	869	77.6	x
V9-Salamandre-450 g.g.	434	127.1	xxx	918	126.6	xxx
Experimental average (Control)	306.9	Control	Control	791.4	Control	Control
	$DL_{5\%} = 27.32$; $DL_{1\%} = 49.12$; $DL_{0.1\%} = 87.81$			$DL_{5\%} = 58.96$; $DL_{1\%} = 94.64$; $DL_{0.1\%} = 105.42$		

Due to the tillering capacity specific to each variety of two row barley tested in the experiment, the determinations related to plant density revealed a great variability between the experimental variants taken into the study, the tillering capacity specific to each variety of two row barley leading to the differentiation of a large number of tillers per square meter, respectively between 573 tillers/m^2 (V_1-Tepee variety, sown at a density of 250 g.g./m^2) and 946 tillers/ m^2 (V_4 - Bosut variety, sown at a density of 250 g.g./m^2), the latter variety being the most valuable of point of view of the tillering capacity of plants. Compared to the average of the experience (791 tillers/m^2), variants V_4 and V_9 differed significantly (xxx), variants V_6 and V8 registered significant differences (x), in variants V_1 and V_7 the differences were very significantly negative (ooo), the rest of the experimental variants being insignificant (-) in terms of density per surface unit.

Results and discussion on the influence of genotype and seeding density on the tillering ability of plants. From the data resulting from the determination of the number of tillers formed on the two row barley plants, we can see that this parameter was influenced especially by the two row barley genotype cultivated and less by the density used to establish the crop, the specific genetic dowry to each variety cultivated in the experience determining the final number of differentiated tillers per plant. Thus, the number of tillers formed on two row barley plants varied between 2.12 tillers/plant, in the Salamandre variety at a sowing density of 450 g.g./m^2, up to 3.06 tillers/plant in the Tepee variety with a sowing density of 350 g.g./m^2, the variety that showed the highest tillering capacity, with very significant (xxx) differences compared to the control (experience average) in the sowing variants at densities of 250 g.g./m^2 and 350 g.g./m^2 (Table 2).

Table 2. Tillering capacity in the two row barley cultivars studied

Experimental Variant	Tillers/plant (No.)	Difference (tillers/plant)	Significance degrees
V1-Tepee-250 g.g.	2.82	0.14	xxx
V2-Tepee-350 g.g.	3.06	0.38	xxx
V3-Tepee-450 g.g.	2.44	-0.24	ooo
V4-Bosut-250 g.g.	3.97	1.29	xxx
V5-Bosut-350 g.g.	2.32	-0.36	ooo
V6-Bosut-450 g.g.	2.14	-0.54	ooo
V7-Salamandre-250 g.g.	2.69	0.01	-
V8-Salamandre-350 g.g.	2.54	-0.14	ooo
V9-Salamandre-450 g.g.	2.12	-0.56	ooo
Experimental average (Control)	2.68	Control	Control
	$DL_{5\%} = 0.03$; $DL_{1\%} = 0.07$; $DL_{0.1\%} = 0.12$		

In the other varieties of two row barley tested in the experience, the number of tillers differentiated on the plants decreased in direct proportion to the decrease of the nutrition space in front of the plants, the differences compared to the average of the experience being very significantly negative (ooo) both in the case of

practicing a sowing density of 350 g.g./m^2, as well as in the case of the density of 450 g.g./m^2.

Results and discussion on the influence of genotype and seeding density on plant height and epigeous biomass. The height of the two row barley plants for beer manufacture determined before harvesting ranged between 52.3 cm at V_1 (Tepee-250 g.g./m^2) and 65.4 cm at V_3 (Tepee-450 g.g./m^2), the height of the plants registering statistically assured values from very significantly negative (ooo) in variants V_1, V_7 and V_8, to very significantly positive (xxx) in variants V_2, V_3, V_4 and V_6, the varieties Tepee and Bosut showing the greatest vigor of growth and vegetative development (Table 3).

Table 3. The behavior of two row barley varieties in terms of plant height and biomass

Experimental Variant	Plant height (cm)	Difference (cm)	Significance degrees	Plant biomass/m^2 (g)	Difference (g)	Significance degrees
V1-Tepee-250 g.g.	52.3	-7.6	ooo	1720.50	-497.55	ooo
V2-Tepee-350 g.g	64.1	4.2	xxx	1929.25	-288.80	ooo
V3-Tepee-450 g.g.	65.4	5.5	xxx	3017.37	799.32	xxx
V4-Bosut-250 g.g.	64.0	4.1	xxx	2723.58	505.53	xxx
V5-Bosut-350 g.g.	60.2	0.3	-	1874.99	-343.06	ooo
V6-Bosut-450 g.g.	63.5	3.6	xxx	2352.57	134.52	x
V7-Salamandre-250 g.g.	53.8	-6.1	ooo	2101.46	-116.59	o
V8-Salamandre-350 g.g.	56.5	-3.4	ooo	2101.30	-116.75	o
V9-Salamandre-450 g.g.	59.2	-0.7	o	2141.45	-76.60	-
Experimental average (Control)	59.9	Control	Control	2218.05	Control	Control
	$DL_{5\%}$ = 0.66; $DL_{1\%}$ = 0.93; $DL_{0.1\%}$ = 1.42			$DL_{5\%}$ = 91.96; $DL_{1\%}$ = 178.64; $DL_{0.1\%}$=235.42		

Regarding the plant biomass determined at the time of crop harvesting, it was highlighted that the values of this biometric parameter were not directly correlated with the plant height. Thus, although the plants belonging to the Bosut variety reached their maximum height, the weight of the dry plants recorded very significantly negative values (ooo) of 1720.5 g/m^2, at the sowing density of 250 g.g./m^2, respectively 1929.25 g/m^2 at the sowing density of 350 g.g./m^2 (Table 3).

The highest productions of dry biomass were achieved with the Tepee and Salamander varieties under the conditions of using a density of 450 g.g./m^2 (V_3) and 250 g.g./m^2 (V_4) at sowing, respectively, with very significantly positive statistical assurance (xxx) against the average of experience.

Results and discussion regarding the influence of genotype and sowing density on the formation of productivity elements. Following the determination of the main elements of productivity in barley for beer, quite large variations were observed between the 9 experimental variants tested in the experiment, variations that were influenced both by the varieties of barley cultivated and by the densities taken into account in the design field experience (Table 4).

The total number of ears per unit area ranged between 567 ears/m^2 and 912 ears/m^2, with an average of experience of 741 ears/m^2, the lowest number of ears, with highly significant negative statistical assurance (ooo) being harvested from the variants in which a density of 250 g.g./m^2 was used at the establishment of crops, regardless of the cultivar of two row barley cultivated (V_1, V_4 and V_7).

The best in terms of the number of harvestable ears per surface unit were the Bosut varieties at the density of 450 g.g./m^2 (V_6) with 870 ears/m^2 and Salamander under the conditions of sowing 350 ears/m^2 (V_8), respectively 450 g.g./m^2 (V_9), in these experimental variants the results have very significant statistical assurance (xxx).

The situation is similar when we analyze the number of fertile ears harvested per surface unit, the same experimental variants being superior to the other variants taken into the study.

The lowest number of sterile ears was determined in the Tepee variety, regardless of the tested sowing density, the results recorded after determining this parameter being very significantly negative (ooo), compared to the rest of the experimental variants and the average of the experience.

Table 4. The behavior of two row barley varieties in terms of the formation of production components

Experimental Variant	Ears number/m^2 (No)	Diff. (No)	Significance degrees	Fertile ears/m^2 (No)	Diff. (No)	Significance degrees	Sterile ears/m^2 (No)	Diff. (No)	Significance degrees
V1-Tepee-250 g.g.	567	-174	ooo	563	-165.6	ooo	4	-8.4	ooo
V2-Tepee-350 g.g.	745	4	-	735	6.4	-	10	-2.4	ooo
V3-Tepee-450 g.g.	785	44	-	781	52.4	x	4	-8.4	ooo
V4-Bosut-250 g.g.	546	-195	ooo	530	-198.6	ooo	16	3.6	xxx
V5-Bosut-350 g.g.	777	36	-	757	28.4	-	20	7.6	xxx
V6-Bosut-450 g.g.	870	129	xxx	856	127.4	xxx	14	1.6	xx
V7-Salamandre-250 g.g.	606	-135	ooo	595	-133.6	ooo	11	-1.4	oo
V8-Salamandre-350 g.g.	861	120	xxx	843	114.4	xxx	18	5.6	xxx
V9-Salamandre-450 g.g.	912	171	xxx	897	168.4	xxx	15	2.6	xxx
Experimental average (Control)	741.0	Control	Control	728.6	Control	Control	12.4	Control	Control
	$DL_{5\%}$ = 72.16; $DL_{1\%}$ = 93.23; $DL_{0.1\%}$ = 107.41			$DL_{5\%}$ = 51.08; $DL_{1\%}$ =82.72; $DL_{0.1\%}$ = 99.11			$DL_{5\%}$ = 0.24; $DL_{1\%}$ = 1.13; $DL_{0.1\%}$ = 2.33		

Results and discussion on the influence of genotype and sowing density on ear length and number of grains per ear. The length of the ears did not show very big differences between the experimental variants, the varieties of two row barley tested producing ears between 7.5 cm and 9.7 cm in length, the length of the ears being influenced in particular by the nutrition space that the plants benefited from, as a result under the conditions in which 250 g.g./m^2 were used for sowing, obtaining ears with maximum lengths (xxx), regardless of the orzoa variety studied (Table 5).

Table 5. The behavior of two row barley varieties in terms of ear length and the number of grains in the ear

Experimental Variant	Ears length (cm)	Difference (cm)	Significance degrees	Grains/ear (No)	Difference (No)	Significance degrees
V1-Tepee-250 g.g.	9.7	0.68	xxx	29	0.11	-
V2-Tepee-350 g.g.	8.7	-0.32	ooo	27	-1.89	ooo
V3-Tepee-450 g.g.	9.3	0.28	xx	31	2.11	xxx
V4-Bosut-250 g.g.	9.5	0.48	xxx	48	19.11	xxx
V5-Bosut-350 g.g.	9.0	-0.02	-	23	-5.89	ooo
V6-Bosut-450 g.g.	9.2	0.18	x	27	-1.89	ooo
V7-Salamandre-250 g.g.	9.5	0.48	xxx	26	-2.89	ooo
V8-Salamandre-350 g.g.	7.5	-1.52	ooo	24	-4.89	ooo
V9-Salamandre-450 g.g.	8.8	-0.22	o	25	-3.89	ooo
Experimental average (Control)	9.02	Control	Control	28.89	Control	Control
	$DL_{5\%}$ = 0.16; $DL_{1\%}$ = 0.23; $DL_{0.1\%}$ = 0.32			$DL_{5\%}$ = 0.69; $DL_{1\%}$ = 1.03; $DL_{0.1\%}$ = 1.62		

Surprising were the experimental results recorded after determining the number of grains formed in the ear, where it was demonstrated that in the case of the Tepee variety, although the nutrition station was reduced as a result of using the density of 450 g.g./m^2 (V_3), the highest number was obtained of grains in the ear (48 grains/ear), with very significant insurance (xxx), compared to the average of the experience (Table 5).

Results and discussion on the influence of genotype and seeding density on grain weight. The weight of the grains per ear varied between 0.67 g and 0.93 g, the heaviest ears being harvested from the experimental variants in which the density of 350 g.g./m^2 was practiced, for all three varieties of two row barley tested, the results having statistical assurance distinctly significant (xx) in the Tepee variety and very significant (xxx) in the Bosut and Salamandre varieties (Table 6).

Relating the weight of the grains to the surface unit, it can be observed that the most valuable in terms of productivity were the Bosut and Salamandre varieties in which, by using the sowing densities of 350 g.g./m^2 and 450 g.g./m^2, the weight of the grains reached values between 659.12 g and 783.99 g, significantly higher values (xxx) than the other experimental variants.

Table 6. Grain weight of the varieties of two row barley tasted in the study

Experimental Variant	Grains mass/ear (g)	Difference (g)	Significance degrees	Grains mass/m^2 (g)	Difference (g)	Significance degrees
V1-Tepee-250 g.g.	0.70	-0.12	ooo	394.10	-204.22	ooo
V2-Tepee-350 g.g.	0.86	0.04	xx	632.10	33.78	xx
V3-Tepee-450 g.g.	0.67	-0.15	ooo	523.27	-75.05	ooo
V4-Bosut-250 g.g.	0.79	-0.03	o	418.70	-179.62	ooo
V5-Bosut-350 g.g.	0.92	0.10	xxx	696.44	98.12	xxx
V6-Bosut-450 g.g.	0.77	-0.05	oo	659.12	60.80	xxx
V7-Salamandre-250 g.g.	0.85	0.03	x	505.75	-92.57	ooo
V8-Salamandre-350 g.g.	0.93	0.11	xxx	783.99	185.67	xxx
V9-Salamandre-450 g.g.	0.86	0.04	xx	771.42	173.10	xxx
Experimental average (Control)	0.82	Control	Control	598.32	Control	Control
	$DL_{5\%} = 0.01$; $DL_{1\%} = 0.04$; $DL_{0.1\%} = 0.09$			$DL_{5\%} = 11.32$; $DL_{1\%} = 21.94$; $DL_{0.1\%} = 47.83$		

Results and discussion on the influence of genotype and seeding density on moisture and 1000 grains weight. Grain moisture at harvest and 1000 grains mass, physical parameters that are taken into account in order to evaluate the probable grain yield achieved per unit area, were influenced by both experimental factors.

If after determining the moisture content of the grains there were no great differences between the experimental variants, the moisture values of the grains at harvest being between 15.1% and 15.8%, the results recorded after determining the mass of 1000 grains varied quite a lot (Table 7).

Table 7. The physical indicators needed in the evaluation of the grain production at two row barley

Experimental Variant	Moisture (%)	Difference (%)	Significance degrees	1000 grains mass (g)	Difference (g)	Significance degrees
V1-Tepee-250 g.g.	15.1	-0.3	ooo	49	1.11	xxx
V2-Tepee-350 g.g.	15.6	0.2	xxx	49	1.11	xxx
V3-Tepee-450 g.g.	15.7	0.3	xxx	48	0.11	-
V4-Bosut-250 g.g.	15.6	0.2	xxx	45	-2.89	ooo
V5-Bosut-350 g.g.	15.4	0.0	xxx	45	-2.89	ooo
V6-Bosut-450 g.g.	15.2	-0.2	ooo	47	-0.89	oo
V7-Salamandre-250 g.g.	15.1	-0.3	ooo	49	1.11	xxx
V8-Salamandre-350 g.g.	15.3	-0.1	ooo	50	2.11	xxx
V9-Salamandre-450 g.g.	15.8	0.4	xxx	49	1.11	xxx
Experimental average (Control)	15.4	Control	Control	47.89	Control	Control
	$DL_{5\%} = 0.003$; $DL_{1\%} = 0.009$; $DL_{0.1\%} = 0.01$			$DL_{5\%} = 0.99$; $DL_{1\%} = 0.61$; $DL_{0.1\%} = 1.06$		

The weakest in terms of the weight of 1000 grains was the Bosut variety where this parameter values were between 45 g and 48 g with statistical assurance from distinctly significantly negative (oo), respectively very significantly negative (ooo).

Table 8. Assessment of probable production to two row barley varieties

Experimental Variant	Physical production (kg/ha)	Difference (kg/ha)	Significance degrees	Relative production (%)
V1-Tepee-250 g.g.	3941.0	-2042.2	ooo	66
V2-Tepee-350 g.g.	6321.0	337.8	xx	106
V3-Tepee-450 g.g.	5232.7	-750.5	ooo	87
V4-Bosut-250 g.g.	4187.0	-1796.2	ooo	70
V5-Bosut-350 g.g.	6964.4	981.2	xxx	116
V6-Bosut-450 g.g.	6591.2	608.0	xx	110
V7-Salamandre-250 g.g.	5057.5	-925.7	ooo	85
V8-Salamandre-350 g.g.	7839.9	1856.7	xxx	131
V9-Salamandre-450 g.g.	7714.2	1731.0	xxx	129
Experimental average (Control)	5983.2	Control	Control	100
	$DL_{5\%} = 96.4$; $DL_{1\%} = 287.9$; $DL_{0.1\%} = 673.4$			

Results and discussion on the influence of genotype and seeding density on grain yield.
Grain production per surface unit in the experimental variants studied was between 3941 kg/ha (V_1) and 7839.9 kg/ha (V_8), the highest production increases being recorded in the Bosut variety (increase of 981.2 kg/ha) with a sowing density of 350 g.g./m^2 (V_5) and in the Salamander variety under the conditions of practicing sowing densities of 350 g.g./m^2 (V_8- increase of 1856.7 kg/ha) and 450 g.g./m^2 (V_9- increase of 1731 kg/ha), very statistically significant increases (xxx).
By practicing the sowing density of 250 g.g./m^2 in all three varieties of two row barley analyzed, there were decreases in grain production per surface unit, with very significantly negative differences (ooo) compared to the average of the experience taken as a control (Table 8).

CONCLUSIONS

Based on the results obtained in the experience with barley for beer in the 2021-2022 agricultural year, the following conclusions can be drawn:
The density of plants per surface unit was influenced especially by the specific genetic endowment of each cultivated two row barley genotype, the highest densities at harvest being obtained in the varieties Bosut (946 tillers/m^2) and Salamandre (918 tillers/m^2).
Among the varieties of barley for beer tested in the experience, the Bosut variety showed the highest tillering capacity of plants, with an average of 3.97 tillers/plant under the conditions of using a sowing density of 250 g.g./m^2.
The highest vigor of plant growth and vegetative development was observed in the Tepee cultivar, which, although the plant nutrient space was reduced, had the highest plant height and the highest dry biomass production per unit of surface (V_3).
The highest number of fertile ears was determined under the conditions of using a sowing density of 450 g.g./m^2 for the establishment of the beer sorghum crop, the three varieties taken in the study forming over 780 harvestable ears/m^2.
Salamandre variety proved to be the most valuable in terms of grain weight per surface unit, the grain mass exceeding 738 g/m^2 under the conditions of using a density of 350 g.g./m^2 (V_8), respectively 450 g.g./m^2 (V_9).
The varieties Tepee and Salamandre were superior to the variety Bosut in terms of grain quality, the mass of 1000 grains (1000 grains mass) exceeding 49 g, regardless of the sowing density practiced at the establishment of the crop.
The highest yield in grains obtained per surface unit was registered with the Salamandre variety, the variety in which the grain production was over 7700 kg/ha under the conditions of using a density of over 250 g.g./m^2 for sowing, with increments of production between 1731 kg/ha (V_9), respectively 1856.7 kg/ha (V_8).
We can say, after testing the behavior of the three varieties of two row barley for beer manufacture, that the selection of the most valuable genotypes and the establishment of an optimal density at the establishment of the crop guarantee the success of this crop in the North-Western area of the Romanian Plain.

ACKNOWLEDGEMENTS

This research work was carried out with the support of the Doctoral School - Plant and Animal Resource Engineering and Management, Agronomy Field, from Faculty of Agricrop at the University of Agronomic Sciences and Veterinary Medicine of Bucharest.

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