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DOCTORAL THESIS

RESEARCH ON THE INFLUENCE OF FERTILIZATION AND SOWING THE DESENESS OF PRODUCTION AT SEVERAL VARIETIES OF TOW-ROW BARLEY IN TERMS OF ENVIRONMENTAL PLAIN BARAGAN

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SUMMARY

CAP. I. SIGNIFICANCE AND SPREAD BARLEY

Barley is grown primarily for its grain which is to be used widely in animal nutrition and in the beer industry. Feed value of barley grain is comparable to the amount of forage maize grain. Beer of the best quality is obtained from grains of barley. Barley is used in human nutrition and other areas where wheat is grown successfully in the form of barley and coffee substitute.

Barley straw is used in animal feed with higher nutritional value than wheat straw. Barley can be grown for green feed or pure culture, is associated with a bean (mash). In irrigated areas, as in other areas, barley is the main precursory successive crops. Groats (ground coarse grains) are used to prepare sauces and soups, bread flour to obtain, but the quality is not too good, being crumbly, undersized, hard digestible due to the to the lack of gluten, malt is used as a substituite for coffee, the preparation of baby foods, syrups, flakes, sweet.Autumn barley and two-row barley made the highest values agroproductive in terms of plant biomass and the amount of nutrients per unit area, per unit time. Barley for beer should have a low in protein (up to 12%), because it slows the clearing of beer, as well as a high starch content of which depends on extract brewing. In this improved quality meets barley.

Two-row barley for beer should have higher cariopse (MMB 40-48g), uniformity, energy germ germination capacity as high. Barley has a wide range of propagation. It is the only cereal that reaches 70 degrees north latitude (in Norway and the European part of the former Soviet Union). Grow in the Alps up to 1700 m altitude, in the Caucasus up to 2700 m in Tibet at 4700 m and up to 5 000 m. Pundjab barley cereal is an important and extremely hot regions, such as those in northern Africa, reaching the Sahara oases. In some European countries like Czech Republic, Slovakia, Germany, Austria, Denmark, Poland, Romania widespread one is two-row barley, raw material for beer production in these countries. Are among the oldest crop plants (with about 12 000 years ago) and was part of the sacred plant of the Chinese 5 (wheat, rice, soybeans, barley, millet).

In ancient Egypt was taken before the wheat crop. In Romania before 1940, 700 thousand hectares of cultivated barley and two-row barley, owning a share of spring barley. After the year 1945 were introduced varieties of barley walk, which may resemble the fall or spring. After 1950 increased the share of autumn barley, barley varieties that are more productive than spring. As a form of spring two-row barley is also grown in this spring. Generally grow about 54% of the surface of barley and 46% fall in autumn and spring two-row barley, mainly used for making malt for beer.

CAP. II. . CURRENT STATE OF KNOWLEDGE ON FERTILIZATION, SOWING AND TEXTURE OF BARLEY CULTIVARS. The harvested grain must avoid mixing with other cultures at the start of harvest is when the seed moisture is about 14%. Combinations must be constantly adjusted to avoid loss of grain or shatter, if interim storage farm insecticide action will be taken to space and to avoid mixing with other products. The barley has been found that with increasing salinity of the substrate, the process of germination was inhibited and extended. Different degrees of soil salination plant growth created adverse conditions.

So: the more the salt content was higher in the substrate, the more metabolism was suppressed glicofitelor. Some individuals from the same pot of vegetation, due to special properties of protoplasm cells showed a greater resistance to salt.

Twinning capacity, expressed by the total number of brothers from the plant and the number of fertile brothers, was also affected at a rate of 10.4% and 7.7%, between the two genotypes examined, the differences being much closer . Ear mainly in two-row barley was mildly affected, the length is reduced by 10.1% (0.8) and the only kind charm.

Reacted by reducing values: the number of grains and their weight to primary ear, which were smaller than normal, an average of 9.5 % and 8.3 %, which is actually 2.2 grains in the ear, with a weight of 0.1 g. Also the negative effect of climate stress was significantly marked in the number of grains to the plant and their weight. Determinations have shown that the size of these characters have been reduced on average by 16.4 grains / plant (14.6 %) and weight was a small plant with a gram, 19.3% respectively. Correspondingly, the 1000 grain weight was restricted to 4.6 g or 9.8 %. The differences between the varieties tested, about the effect of stress, the level of these latter characters were generaly low.

CAP. III. NATURAL AND ENVIRONMENTAL CONDITIONS OF THE AREA IN WHICH EXPERIMENTAL The land is private property located 40 km from Braila in the system of geographical coordinates 44 0 53 '10 "north latitudes and 270 49' 04" east longitude. Topographical, land surface is characterized by a horizontal landscape. The slope of land is 0.5 - 1 ‰.. Wood vegetation is represented by low wood species such as white Popullus, Salix alba and others.

It noted that the annual average of 13 years is 10.65 ^{0}C. Monthly average temperature Absolute altitude is about 24 m above sea level. Groundwater is at depths ranging between 0.5s and 2 m in the main riverbed of the Danube, and terrace land there and even experienced was at a depth of 16 to 20 m. The vegetation is typical steppe zone and the conditions they offer e recorded in July was, on average, 21.9 ^{0}C in 13 years.

Absolute average temperature reached 40.5 ^{0}C in July 1943, and the absolute minimum-26.5 ^{0}C in January 1947, resulting in a thermal amplitude of 67.0 ^{0}C. Average temperatures above 15 ^{0} C are made between April 30 and September 15 in the period of 130-150 days, an amount totalizandu the temperatures of 2850 – 3180 ^{0}C (3000 ^{0}C average).

Potential evapotranspiration area is 723 mm annually, resulting in soil moisture deficit of 284 mm. Droughts are very common.

The most numerous periods of drought are between 10s and 20 days, with usually held in May-July. The snow is unevenly distributed, the steppe region, shattered by the wind is strong. Thick layer of snow, if ais uniformly distributed on the surface t the soil, is a protective coating against frost t crossing sites for the winter crops. Minimum temperature required to browse barley vegetation cycle is about 4 ^{0}C in May, 10 -11 ^{0}C in June, July 14 ^{0}C, 12 ^{0}C to 7 ^{0}C in August and September. During baking, barley requires minimum daily average temperature of 10 ^{0}C, the minimum temperature for germination of barley is 1-2 ^{0}C, rasarirea in optimal condition occurs at a temperature of 15- 20 ^{0}C.

Under our country come spring barley matures in 90 -150 days. The two-row barley, water consumption varies between 180 and 300 mm. Transpiration coefficient has values between 300-400. Critical periods of water are in phase formation to inspicare straw, when through the steps of organogenesis. Due to its short growing seasons, spring barley requirements against moisture in our country in most years covered by precipitation. Rainfall recorded during cold have exceeded the multiannual average, favoring the creation of a reserve of water in the soil.

Multiannual average rainfall over the months of March and April, have created favorable conditions for spring two-row barley. Wind regime is determined by the wind from the north and north-eastern sector known as' Crivat " Soil type that was placed experience is a typical mold (you Cz.). Generally, chernozems presents typical physical and chemical traits favorable, but because of poor treatment of the precipitate, crop water supply is reduced.

Addressing water supply in this area, you can not do than by irrigation. Also, chernozems typical soils are generally rich in humus, microbiologically active and well supplied in nutrients, but nevertheless, in view of higher production in conditions of irrigation, is required and application. Nitrogen and phosphorus fertilizer, and manure, in moderate doses.

CAP. IV. PURPOSE, OBJECTIVES, MATERIAL AND METHOD OF RESEARCH.

We plan to use in our studies and two-row barley varieties of barley and some technological links to make raw material corresponding to the breweries.

The purpose of this research was: optimization of soil fertilization on a Scientific Basis depending on environmental conditions and plant requirements through a laborious task of processing and interpretation of data and observations collected from the field, closely related to soil and plant analysis, introduction spring two-row barley varieties adapted to organic supply, taken to study the specific area of recovery and improvement of production techniques, influencing the chemical composition in different plant density and fertilization , reducing losses after harvest (storage, conditioning, malting, etc.) , using rational soil in the area, the cultivation of barley and barley. Biological material: * Variety CRISTAL; ** Variety PRESTIGE; *** Variety JERSEY

CAP. V. RESULTS OWN RESEARCH AND THEIR INTERPRETATION , THE PRODUCTION OF CARIOPSE Analyzing the influence of fertilization on the production of two-row barley in 2006, is noted as the largest production of 2792 kg / ha was recorded in the variant fertilized with $N_{120}P_{120}$, followed by the variant fertilized with $N_{80}P_{80}$, in whom a production of 2348 kg / ha . In the variant fertilized with poultry litter production achieved (2210 kg / ha) near the variant fertilized with $N_{40}P_{40}$ (2224 kg / ha).

Production increases were 164 kg / ha in variant fertilized with poultry litter, 178 kg / ha in variant fertilized with $N_{40}P_{40}$, increases close to those of poultry litter. Largest increases were obtained with higher doses of fertilizer: 302 kg / ha and 746 kg version $N_{80}P_{80}$ / ha in variant with $N_{120}P_{120}$. Growth produced by manure can cause use of poultry manure around plants, avoiding poluoarea environment.

Production increases achieved in 2007 were relatively high doses of fertilizer ($N_{120}P_{120}$). Productions obtained in 2008 ranged from 3118 kg / ha in variant $N_{120}P_{120}$ and fertilized with 2254 kg / ha in unfertilized control variant, followed by variant $N_{80}P_{80}$, with 2749 kg / ha and the variant fertilized with poultry litter, which has made 2691 kg / ha. It can be seen as variants had high doses of fertilizer obtained the highest yield.

In 2008 production increases from 315 kg / ha in variant fertilized with $N_{40}P_{40}$ at 864 kg / ha in variant $N_{120}P_{120}$ were very significant. On average those three years (2006 - 2008) the biggest production to obtain cariopse variant fertilized with $N_{120}P_{120}$, production being 2810 kg / ha, 747 kg / ha higher than in version control, fertilized, the difference being very significant. Ranked second was located $N_{80}P_{80}$ with a production version of 2407 kg / ha and a difference compared to unfertilized witnessed very significant of 344 kg / ha.

The third was located fertlizata version with chicken manure 20 t / ha, which was done in a Armadia production of 2305 kg / ha, with 16.6 % more than version control and 242 kg / ha more than in variant fertlizata with N_0P_0. The fertilizer 1 kg of active substance were obtained in 3.112 kilograms grain version $N_{120}P_{120}$ and 2, 500 pounds in $N_{40}P_{40}$ version.

At 1 t poultry litter were obtained 12.100 kilograms grain. Influence of variety on the production of two-row barley in 2006 was materialized through the production most of the variety Jersey (2457 kg / ha) but was very close and production variety Prestige (2453 kg / ha). The two varieties have made very significant differences for production of 396 kg and 393 kg compared to the control variety crystal, which won only 2061 kg / ha grain. In 2007, dry year and more heat than the multiannual average, the highest production was obtained from the variety Jersey, with 2128 kg / ha, 15, 9% higher than the production version control, variety crystal, which only made 1835 kg / ha. Prestige Variety has made production more than a variety Cristalia with 263 kg / ha, the difference being very significant. The year 2008 was favorable spring orzoaicei obtaining the production of grain that have varied between 2429 kg / ha to 2829 kg and variety witnesses Cristalia / ha in the Jersey variety. Growth produced by the variety Jersey was 465 kg / ha, very significantly, by 19.1% higher than production Cristalia variety taken as controls. Average production of three years of experimentation varied between 2108 kg / ha in variety Cristália and 2493 kg / ha in variety jacket. Increase production of 385 kg / ha achieved Jersey variety, ie 18.3%, compared to control crystal was very significant. Prestige Variety ranked second with an average production of three years 2419 kg / ha with 14.7% more production than Cristalia variety taken as controls. The planting density of 600 bg/m^2 has made production more than a density of 400 bg/m^2. The difference in production of 304.8 kg / ha was very significant. The sowing density of 600 bg/m^2 also obtain a density greater than the number of ears in which the production was made greater by 304.8 kilograms per hectare compared to the density of 400 bg / m^2. In 2007, more drought, all the higher density (600 bg / m^2) was higher obtnut production, but with a difference smaller than in the previous year, more favorable orzoaicei spring. In 2008, favorable spring orzoaicei to productta largest ever obtained in the variant with 600 bg / m^2, the difference in production compared to the control (400 bg / m^2) by 105 kg / ha, very significant. On average those three years, the biggest production of 2453 kg / ha was obtained with 600 bg / m^2, the difference of 10.3% compared to the 400 bg / m^2 is very significant.

Production increases above confirm the opinion of many researchers are applying manure increases water retention capacity of approx. 20%, increasing yield in dry years what has happened in terms years 2007.

Considering that in manure nitrogen and phosphorus 5.63%, to 20 tonnes of poultry litter was added to 112.6 kilograms of nitrogen + P $_2O_5$ is used in the first year, about 30%, ie 337 kg N + P $_2O_5$, realized - is 2, 430 kg grain for 1 kg of manure fertilizer.

On average those three years of experimentation, production cariopse to differentiate between two-row barley Spring 3201 kg / ha in the interaction N $_{120}$P $_{120}$ x Jersey x 600 bg / m2

with a very significant difference of 1370 kg / ha compared to the control of production the smallest (N $_0P_0$ x Cristalia x 400 bg / m^2), of 1831 kg / ha.

Ranked second was situated interaction N $_{120}P_{120}$ x Prestige x 600 bg / m^2 with a difference compared to control production of 1199 kg / hectare, very significant Production increases to the manure were located approximately the same level of fertilizationincreases to N $_{80}P_{80}$, being approx. 100 kg / ha smaller productions obtained with poultry litter.

The interaction N $_{40}P_{40}$ x Jersey x 600 bg / m^2 saw a production increase of 9 650 kg fertilizer cariopse 1 kg of active substance, followed by interaction N $_{40}P_{40}$ x Prestige x 600 bg / m^2 with 9.0 kilograms cariopse 1 fertilizer kg active substance. The manure, the interaction of Jersey x 600 bg / m^2 were obtained at 42.200 kilograms cariopse a ton garbage. Achieving in three years averange of tow-row barley spring productions exceeding 3000 kg/ha, in terms of Baragan, one year as the drought in the three testing, leading to the conclusion that we needed for the manufacture of two-row barley malt for beer is suitable to grow in this climate area.

CAP. VI. RESULTS ON THE INFLUENCE FACTORS ON QUALITY PRODUCTION CARIOPSE RESEARCHERS . On average those three years (2006 - 2008), the experimentation, the 1000 grain weight was influenced by the factors investigated, varying from 45.1 g in the interaction between variety Prestige x 600 bg / m^2 x N $_{120}P_{120}$, 20, 5 % higher compared to the control (Cristalia x 400 bg / m^2 x N $_0P_0$). Interaction between variety x density x fertilization with chicken manure increased the weight of 1000 grains, with distinct differences and very significant.

Hectoliter mass increased from 60.8 kg / hl to interaction Prestige x 400 bg / m^2 x N $_{40}P_{40}$, up to 80.4 kg / hl to interaction Cristalia x 600 bg / m^2 x N $_{80}P_{80}$. Hectoliter mass was greater in variety crystal, the fertilization with higher doses of fertilizer and density of 600 bg / m^2. Analyzing separately investigated the influence factors on the mass of 1000 grains (MMB) and hectoliter mass (MH), presented results that no significant differences between varieties at MMB while the hectoliter mass difference is very significant.

Thus, varieties prestige and Jersey have made hectoliter mass smaller than Cristalia variety taken as witness, with 8.99 kilograms / ha and 7, 78 kg / hl, very significant in the minus.

Analyzing the influence of fertilization resulted in increased 1000 grain weight and hectoliter mass with higher doses of fertilizer. At fertilization $N_{80}P_{80}$ and $N_{120}P_{120}$ differences compared to the control (N_0P_0) were 3.83 and 4, 5 g, very significant. At the same variables hectoliter mass is 3, 85 and 2, 28 kg / hl higher, highly significant and distinct that significant. Sowing density not significantly different from the 1000 grain weight and hectoliter weight, values are close in size. Content and starch production in the spring two-row barley. Media 2006 – 2008.

When testing are differences between the order climate, the average years may be important recommendation of the technological factors. Data on production of starch content and average those three years of experimentation (2006 - 2008), emphasizes the influence of fertilization, variety and planting density on both the contents and production of starch.

Influence of fertilization, occurred both on the starch content, especially given the production of starch. The largest content of starch was obtained from fertilization $N_{80}P_{80}$ by 61.74 %, but the largest starch production has been achieved in the variant fertilized with $N_{120}P_{120}$, to 1727.3 kilograms per hectare, influenced the production cariopse May high in this variable.

In variants fertilized with poultry litter $N_{40}P_{40}$ and 20 tons per hectare production of starch were similar in size, to 1381.8 kg / ha respectively and 1393.1 kilograms per hectare, increases were significantly distinct. Influence variety materialized average those three years, in very significant increases in starch production by 14.9 % to 18.6 % in variety and variety Prestige Jersey, compared with control variety crystal. Influence of sowing density, was manifested by increased production of starch with 10.4 % at seeding with 600 bg/m^2 compared to the control, density of 400 bg/m^2.

Pw those three years on average, the interaction of three factors caused the greatest production of starch interactions $N_{120}P_{120}$ x Jersey x 600 bg/m^2 with starch 1987.2 kilograms per hectare, with a very significant difference of 851.1 kilograms / ha compared to controls.

Ranked second was situated interaction $N_{120}P_{120}$ x Prestige x 600 bg/m^2, with a very significant increase of 721.9 kilograms of starch per hectare. Manure resulted in very significant increases from 325.3 to 483.3 kg starch per hectare. Highest content of starch, averaged over the three years, was the interaction $N_{80}P_{80}$ x Jersey x 600 bg/m^2, with 62.37% starch.Content and protein production in the spring two-row barley. Media 2006 - 2008 .

Analyzing the influence of the interaction between fertilization x density at sowing that the small production of protein variants were obtained in unfertilized or frtilizate with low doses of nitrogen and phosphorus per hectare the density of 600 and 400 bg/m^2. In the variant with $N_{120}P_{120}$ and density of 600 bg/m^2 get the biggest production of protein (392.8 kg / ha) while the same dose of fertilization, but with 400 bg/m^2, production was 40 kg / ha smaller, but the interactions between fertilization $N_{80}P_{80}$, $N_{40}P_{40}$ and poultry litter, productions are relatively small protein and grains can be used to obtain malt and beer in the end. Interaction between the three factors investigated by field experiments show that doses $N_{120}P_{120}$, regardless of density of planting is not conducive to two-row barley intended for the manufacture of beer, the friendly dose $N_{80}P_{80}$, $N_{40}P_{40}$ and manure.

In 2006, in variants fertilized, economic efficiency expressed by the profit rate varied between 23 % to interaction N_0P_0 Cristália x 400 x 67.6 % bg/m^2 and interactions N_0P_0 x Jersey x 600 bg/m^2. Some variants fertilized with chemical fertilizers, except $N_{120}P_{120}$ dose, the highest rate of profit obtained for the interaction $N_{40}P_{40}$ x Prestige x 600 bg/m^2 with 40.7 %. $N_{80}P_{80}$ fertilization of the biggest profit rate of 15.7 % in Jersey variety. Manure resulted in the biggest profit rate, by 48.5% to interaction with bg/m2 Jersey x 600 higher than the best variant fertilized. In 2007, more dry than the previous year, the profit rate was higher than the previous year, particularly with poultry litter fertilization. Variants were fertili zed with non $N_{120}P_{120}$ this year. The chemically fertilized variants detaches $N_{40}P_{40}$ x Jersey x 600 bg/m^2, with 54.8% rate of profit and $N_{80}P_{80}$ x Jersey x 600 bg/m^2, with 28.8 % profit rate. Some variants fertilized with 20 t / ha chicken manure, the highest profit rate was achieved in the interaction with the variety Jersey x 600 bg/m^2, having provided 68.9 % profit rate. In 2008 it achieved economic efficiency and $N_{120}P_{120}$ fertilization, but with low (4.9 to 27.5 %). In other variants fertilized with chemical fertilizers highest profit rate was recorded in the interaction $N_{40}P_{40}$ x Jersey x 600 bg/m^2, with 83.9% and 50.4 % profit rate on the interaction $N_{80}P_{80}$ x Jersey x 600 bg/m^2. Fertilization with 20 t / ha chicken manure resulted in a gross profit rate of 107.7 % from interacting with bg/m^2 Jersey x 600, the lowest profit rate being 59.0 % in poultry litter interaction x Cristália x 400 bg/m^2.

The conclusion the emerges di economic efficiency analysis is the fertilization with poultry litter is effective for all years, regardless of climatic conditions, as $N_{40}P_{40}$ fertilization and $N_{80}P_{80}$ while $N_{120}P_{120}$ fertilization is not economical.