EFFECT OF PLANT DENSITY ON THE MAIN PHYSICAL AND CHEMICAL INDICATORS OF SOME MAIZE HYBRIDS CULTIVATED IN THE ARAD PLAIN

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Abstract: Of world production of corn about 6 to 10% is used in various industries. Thus maize is processed wet, dry and fermentative. By all these methods, from corn to obtain some basic products that are used to obtain more than 3500 products with uses in a man but also in animal nutrition. Variability of chemical composition of maize grain is given by the combined actions of the following factors: soil, climate, agricultural technique, local conditions of nutrition, conditioning and storage. The present study proposes to examine the production quality hybrid maize seeds from 6 to determine optimum sowing density. Experience was located on a typical mold soil in the territory Plain Arad, Şemlac. In terms of physical characteristics, soil that was placed experience, providing favorable conditions for growing the plant Zea mays. Bifactorial experience is that factor analysis, factor I is the biological material certified corn hybrids, Pioneer brand: Pr37M34, Pr36R10, Pr37N01, Florencia, Pr35F38, Pr35T06 - hybrids of groups FAO 450-500, and factor II is given sowing densities: 40,000 plants / ha, 55,000 plants / ha, 70,000 plants / ha. The main physico-chemical indicators of the 6 grains of corn hybrids were determined in laboratory discipline Plant Growing: “Testing of the seed and plant material”. Moisture, hecatoliter mass, mass of 1000 grains, the percentage content of protein, starch and oil of maize grains were determined with analyzers NIR, which is the optimal solution for precise and rapid analysis of whole cereal grains and oilseeds. Correlations were established between the physical evidence - chemical and density studied hybrids of maize plants. As the sowing density of three variants applied hybrids take the study as influencing indices of maize, but differently. Results of this study are part of a doctoral program, with the theme: “Research on the influence of sowing density on production and its quality from 6 corn hybrids, climatic conditions of Plain Arad” scholarship program funded by the European Social din Pilot Program Fund to support research doctoral scholars, under contract POSDRU/61.5/S/1.5/S/35067, USAMV Timisoara, under the distinguished University Professor Dr. Valeriu Tabară

Key words: corn hybrids, Plant density, Protein, fat content, starch, HM, Mas of 1,000 grains

INTRODUCTION
In Romania, maize covers the largest areas, particularly in peasant households. Knowing and applying ways of increasing maize crop yield is a constant important concern for cultivators. Maximum valorisation of the biological potential of maize hybrids asks for a study at different densities in optimal cultivation technologies to prevent negative effects. The goal of the present paper is to determine optimal plant density in six simple maize hybrids in order to obtain maximum crop yield per ha.

MATERIAL AND METHOD
The present study aims at disseminating experimental results of the doctoral cycle for a duration of three years. Experimental data are orientative, and they represent only the first experimental year, 2009.

In order to test Pioneer maize hybrids in the field, we set, in the Arad Plain – Şemlac area, a bi-factorial experiment in which experimental factors were: factor A – six Pioneer
maize hybrids: \( a_1 \) – Pr37M34, \( a_2 \) – Pr37N01, \( a_3 \) – Pr36R10, \( a_4 \) – Pr35F38, \( a_5 \) – Pr35T06, factor B – plant density in maize with three graduations: \( b_1 \) – 40,000 plants/ha, \( b_2 \) – 55,000 plants/ha, \( b_3 \) – 70,000 plants/ha. Harvesting of the maize hybrids crops was done upon technical maturity.

Research aim at establishing an optimal plant density meant to produce maximal crop yields. To do so, we monitored maize crop yield quality in the sic Pionerr maize hybrids.

Physical and chemical tests of the present study were done in the “Seed and vegetal material quality testing laboratory” using last-generation equipment: the number of seeds of the SC2 model to determine the mass of 1,000 grains, NIR analysers: Granomat Pfeuffer to determine moisture and OmegAnalyzer G – for an accurate and quick analysis of the entire grain from the point of view of protein, starch, and fat contents of the caryops. The laboratory is within the Department of Agricultural Technologies of the Faculty of Agriculture of the Banat University of Agricultural Science and Veterinary Medicine in Timișoara.

**RESULTS AND DISCUSSION**

Maize grain moisture should not be above 14(12)-16%; otherwise, during perservation, there are biochemical processes related to respiration acceleration, followed by enzymatic processes that lead to the alteration of the grain maize mass (Figure 1).

![Figure 1: Assessing maize quality depending on the maize hybrid and on plant density for the quality indicator “MOISTURE”](image)

In the laboratory, we determined the main physical features that play a determining role on crop yield (mass of 1,000 grains) and quality (hectolitric mass). Both features are influenced by the etchnology applied and by soil and climate conditions of the crop.

The values of the mass of 1,000 grains and of hectolitric mass we studied under the impact of plant density are shown in Figures 2 and 3. Analysing the values of the mass of 1,000 grains we can see that it varied widely. The highest value of the mass of 1,000 grains depending on the maize hybrid and on the number of plants epr ha is in the simple semi-late maize hybrid Pr37M34 (Ribeira): 331.06 g for a plant density of 40,000 plants/ha, followed by the simple semi-late maize hybrid Pr36R10: 307.67 g for a plant density of 40,000 plants/ha, and the simple semi-late maize hybrid Pr37N01: 296.96 g.

Hectolitric mass is of some importance for milling productivity and is strongly influenced by the technology applied and by soil and climate conditions. The value of hectolitric mass is negatively influenced by unfavourable environmental conditions. The value
of hectolitric mass depends on grain moisture at the time the former is determined. High grain moisture determines a reduction of the hectolitric mass. Measurements of the mass of 1,000 grains and of hectolitric mass in the six maize hybrids were made when maize grain moisture was below 10%.

Fig. 2: Assessing maize quality depending on the maize hybrid and on plant density for the quality indicator “MASS OF 1,000 GRAINS”

High moisture in the soil and air results in starch-rich, low-protein grains and vice-versa. When maize is sowed more often, then the soil water reserve is sooner depleted: the
results are the similar to those due to low moisture, leading to a decrease of starch content percentiles, to an increase of the protein content and to a slight increase of fat content (Velican 1957).

For the maize hybrids we studied in the soil and climate conditions of the Arad Plain in 2009, it is worth noting the higher protein content for a plant density of 70,000 plants/ha: an average of 11.37% compared to the average of the protein content of 11.30% for a plant density of 55,000 plants/ha, i.e. an average of the protein content of 10.85% for a plant density of 40,000 plants/ha (Figure 4).

The highest starch content is in the maize hybrid Pr35F38: 71.6% for a plant density of 40,000 plants/ha, followed by the maize hybrid Pr36R10 with a starch content: 71.5% for a plant density of 70,000 plants/ha; and 71.3% for a plant density of 40,000 plants/ha. To note that there are very small differences between the values of starch content depending on maize hybrid and starch content depending on plant density, the limits of variation of starch content depending on plant density being: 69.9% (in the maize hybrid Pr36R10 for a plant density of 55,000 plants/ha) – 71.6% (Figure 5).
High soil moisture in the soil and air determines the formation of grains that are poorer in fat and vice-versa. With the diminution of the distance, there is also a decrease of the protein content and (less regularly) a decrease of the fat content (Ioniţă & Sluşanschi, cited by Săvulescu & Velican 1957).

Fat content in the six Pioneer maize hybrids with three graduations of plant density per ha also avried within very low limits: 3.3% in the maize hybrid Pr37N01 for a plant density of 70,000 plants/ha and 3.8% in the maize hybrid Pr35F38 for plant densities of 40,000 plants/ha and 55,000 plants/ha.

![Fat content in maize hybrids](image)

**Fig.6:** Assessing maize quality depending on the maize hybrid and on plant density for the quality indicator “FAT”

**CONCLUSIONS**

Plant density in the cultivation technology of maize is one of the most dynamic crop yield factors.

Optimal plant density for maximum grain maize crop yield per area unit differs from one hybrid to another because of the significant interaction between hybrid and different plant densities.

The viability of the maize grain chemical composition is due to the combined actions of several factors: soil, climate, agricultural technique, local nutrition conditions, position of cob on the maize plant, fertilisers, conditioning and preservation (Farnham 2001; Widdicombe & Thelen 2002; Tokatlidis et al. 2005).

**BIBLIOGRAPHY**


