RESEARCH CONCERNING PRODUCTIVITY IN SIX MAIZE HYBRIDS BY APPLYING CERTAIN CULTIVATION TECHNOLOGIES IN THE ARADULUI PLAIN (ŞEMLAC, ARAD COUNTY) IN 2009

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Abstract: *Maize ranges, world wide, 3rd from the point of view of the areas cultivated, after wheat and rice (Muntean et al., 2001; Cristea, 2004) and 1st from the point of view of the production (TROYER, 2006). The area under study is part of the Aradului Plain and is characterised by very good vegetation conditions for maize and is also part of the very favourable cultivation area in Romania. This position, in terms of agriculture, is motivated by a number of features, such as: have a large production capacity by about 50% higher compared to other cereals, has a high ecological plasticity (MUNTEAN et al., 2001) is a plant hoes, good run for most crops, monoculture supports many years, has a high coefficient of multiplication (150-400), with a later planting in the spring, allowing a better staging of the agricultural work, culture is 100% mechanized, harvesting is done without danger of shaking, after the early run can be cultivated as second crop, which provides an additional crop of green mass, silage, or grain, is resistant to drought and falling, is* less attacked by *diseases and pests can be grown on soil and climate conditions very different (CAMPEANU S., 2009). The general goal of the research aims at analysing the behaviour of an assortment of maize hybrids developed by the Pioneer Company from the point of view of the production levels. In general, production per unit of area responds to density changes. To get maximum yields per unit of area, optimal cultivation density differs from one hybrid to another. The present research aims at determining optimal density with impact on production is six Pioneer hybrids in the soil and climate conditions of the Aradului Plain (Şemlac, Arad County). 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/6/1.5/2 USAMVB Timisoara, under the distinguished University Professor Dr. Valeriu Tabără.*

Key words**:** *yield, fertilization, maize hybrids, density*

INTRODUCTION

Hybrid maize generates high yields, increased value and reduced production costs. The plants are bigger, stronger and more vigorous. This hybrid vigor, or heterosis, occurs when crossing two genetically unrelated inbred parents to create a hybrid.

Corn hybrids respond differently to high plant density (PHIPPS and WELLER, 1979; PINTER et al., 1994). NAFZIGER (1994) suggested that newer hybrids have greater grain yield at higher plant densities than older hybrids. The negative relationship between plant density and corn quality makes it difficult to recommend plant density. The objectives of this study were to deter mine the effect of plant density on high- and low-quality corn hybrids and (ii) to describe the economic trade off between plant density and forage yield and quality.

MATERIAL AND METHODS

Maize seed used in the experiment described below has a high cultural potential, according to present standards. Maize seed tested in the 3 experimental years is part of the

same lot. Studied maize hybrids are: Pr37M34, Pr36R10, Pr37N01, Florencia, Pr35F38, and Pr35T06, maize medium hybrids for southern and western Romania, group 400-500, i.e. FAO 450, FAO 470, and FAO 500.

Testing the Pioneer maize hybrids to determine production was established along three production cycles (3 years),without interruption and including the 3rd year.

The agricultural experiment is bi-factorial: factor A was represented by six Pioneer maize hybrids, while factor B was represenetd by maize plants density with three garduations: 40.000 plants/hectar, 55.000 plants/hectar, and 70.000 plants/hectar.

RESULTS AND DISCUSSION

Due to its geographical location, the study area is characetrised by a moderate continental climate with ocean influences.

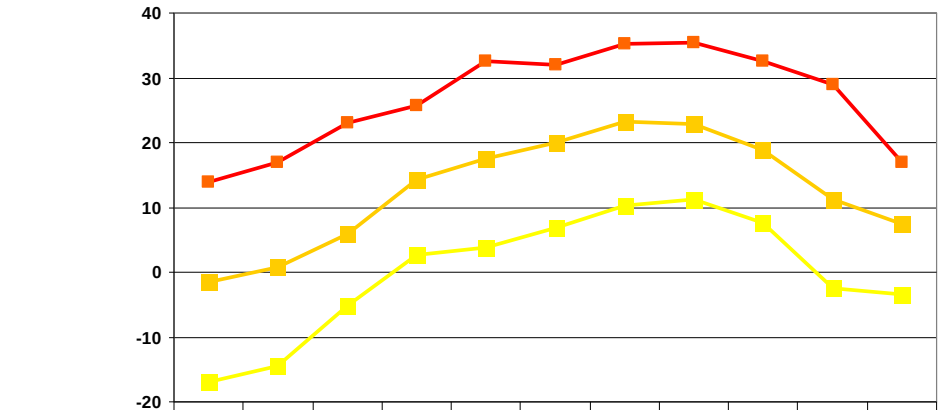
Thermal regime

Maize is a crop with high temperature requirements. Thus, minimum germination temperature in maize is 8-10^{0}C (BÎLTEANU, 2003).

Under favourable moisture conditions, at 21^{0}C, maize sprouts in only 5-6 days. At a temperature of 15.5-18^{0}C maize sprouts in 8-10 days. The sum of effective degrees (biological threshold 8^{0}C) for sprouting is 80^{0}C (BÎLTEANU, 2003).

Temperature conditions in 2009 on the experimental field at Şemlac (Arad County) made 75% Pioneer maize hybrids sowed on April 14, 2009, sprout on April 28.2009, i.e. 13 days after sowing.

Temperature conditions recorded allow us to draw the conclusion that at this phenological stage – from ripening to full maturity – maize relied on a dry climate, with high temperatures, ensuring maize plants maturity in the best conditions.



	Ian.	Febr.	Mar.	Apr.	Mai	Iun.	Iul.	Aug.	Sept.	Oct.	Noi.
Media lunară	-1,6	0,7	5,9	14,3	17,6	20	23,2	22,9	18,9	11,2	7,5
Max.lunară	13,9	17	23	25,7	32,6	32	35,2	35,4	32,6	28,9	16,9
Min.lunară	-16,9	-14,5	-5,2	2,7	3,8	6,8	10,2	11,3	7,6	-2,5	-3,5

Figure 1. Monthly means of temperature in 2009: annual maximum and minimum values (Source: Stația meteorologică Arad, cod sinoptic: 15200, Lat.: 46^0 08', Long.: 21^0 21', Alt.: 116 Hb: 117)

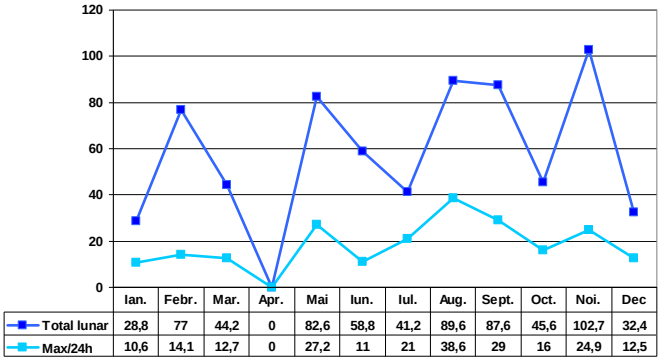
Precipitations regime

Maize is a drought-resistant crop. This feature is ensured by a low water consumption, by a very well develope and deep root system, particularly in the case of maize hybrids, and by

the plant's ability of adapting to drought conditions by diminishing its transpiration surface (BÎLTEANU, 2003).

For the agricultural year 2009, after we analysed the conditions of the monthly precipitation regime (Figure 2), we can say that the total monthly precipitations in May reached 82.6 mm, which corresponds to the optimum monthly amount of precipitations for this May 60-80 mm). The year 2009 had favourable conditions for maize. Temperatures during the period of vegetation (April – October) met the vegetation phenophases.

From the point of view of physical and chemical features of the soil on the experimental field at Şemlac (Arad County) provides favourable cultivation conditions for the species *Zea Mays*.



	Ian.	Febr.	Mar.	Apr.	Mai	Iun.	Iul.	Aug.	Sept.	Oct.	Noi.	Dec
Total lunar	28,8	77	44,2	0	82,6	58,8	41,2	89,6	87,6	45,6	102,7	32,4
Max/24h	10,6	14,1	12,7	0	27,2	11	21	38,6	29	16	24,9	12,5

Figure 2. Monthly mean precipitations in 2009: annual maximum and minimum values
(Source: Stația meteorologică Arad, cod sinoptic: 15200, Lat.: 46^0 08', Long.: 21^0 21', Alt.: 116 Hb: 117)

RESULTS AND DISCUSSION

Maize ripening takes place towards the end of the vegetation period and it starts with the full development of the kernels that gradually turn hard (SĂVULESCU, 1957).

Results of maize production depending on the factor "maize plant density". Figure 3 presents the results of maize production depending on the factor "maize plant density" in which factor A, plant density, has three graduations: A_1 – 40,000 plants, A_2 – 55,000 plants, A_3 – 70,000 plants.

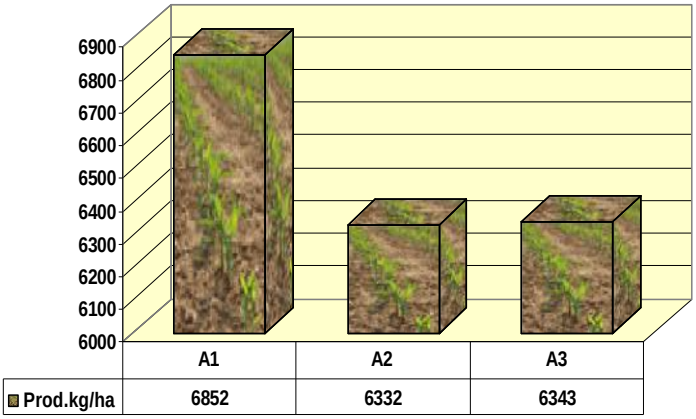


Figure 3. Results of maize production depending on the factor "maize plant density"

In our agricultural experiment, in 2009, set at Şemlac (Arad County), the productions of the Pioneer maize hybrids had the following features.

For a density of 4,000 maize plants, production reached 6,852 kg/ha. For densities of 55,000 and of 70,000 maize plants, the differences in production were not very high, i.e. 12 kg/ha: the productions for the two densities were 6,332 kg/ha (55,000 plants) and 6,344 kg/ha (70,000 plants). This means that when planted at a plant density of 70,000 plants/ha, maize production is higher than when planted at a plant density of 55,000 plants/ha.

Results of maize production depending on the factor "maize hybrid"

Figure 4 presents the results of maize production in 2009 at Şemlac (Arad County) depending on the factor "maize hybrid". The factor "maize hybrid" was represented by 6 garduations, so that the highest production was in the maize hybrid Pr37M34, i.e. 7,619 kg/ha, followed by the productions of the maize hybrids Pr35F38 – 7562 kg/ha, Pr37N01 – 6666 kg/ha, and Pr36R10 – 5819 kg/ha.

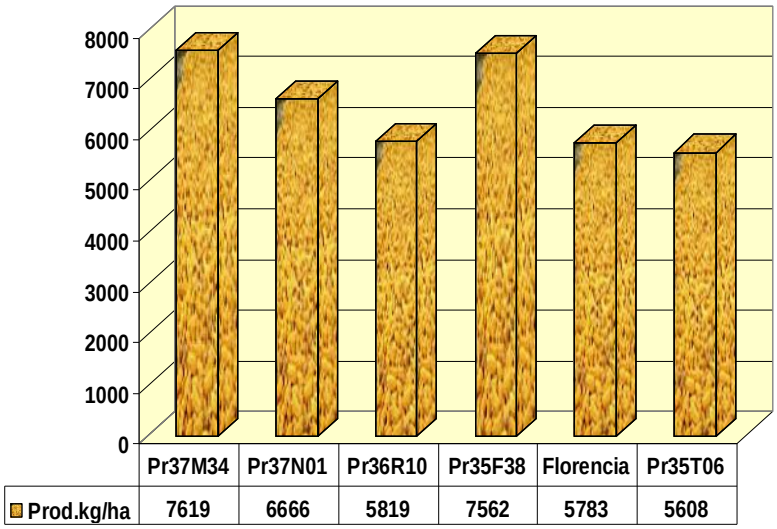


Figure 4. Results of maize production depending on the factor "maize hybrid"

It is not by chance that this hybrid is named by Pioneer „The Champion/Ribiera". The maize hybrid Pr37M34 is a semi-early hybrid with a high production caapcity in areas with medium and good conditions; according to the studies of the Pioneer Company, this hybrid yields the best productions.

The maize hybrid Pr35F38 („Cel mai stabil"), rank 2 from the point of view of maize production, is a simple, semi-late maize hybrid with high production potential. It is a hybrid that has the advantage of growing very quickly during the first vegetation phases and of loosign water at a very alert rate.

The maize hybrid Pr37N01 is a semi-late simple hybrid with a very good yielding capacity in condition of semi-aridity and a very good resistance to breaking. The maize hybrid Pr37N01 resisted very well to the storms of the summer of 2009; it ranks as a maize hybrid with an exceptional yielding capacity when extensive culti vation technologies are used.

The maize hybrid Pr36R10 is a hybrid well-known for its high adaptability as a simple, semi-late maize hybrid. It has a high yield in droughty years. Due to the fact that it keeps green until maturity, it can also be cultivated for silage.

Synthesis of production results in maize under the impact of plant density and maize hybrid at Şemlac (Arad County) in 2009

Yield results depending on the maize hybrid and on plant density obtained on the experimental field at Şemlac (Arad County) in 2009 are presented in Table 1.

Table 1

Yield results depending on the maize hybrid and on plant density obtained on the experimental field at Şemlac (Arad County) in 2009

Factor A - Plant density	Factor B – Maize hybrid						Crop (kg/ha)	%	Difference (kg/ha)	Significance
	Florencia	Pr37M34	Pr34N01	Pr36R10	Pr35F38	Pr35T06				
40,000	6,295	8,091	6,623	6,371	7,806	5,926	6,852	100		
55,000	5,721	7,384	6,524	5,474	7,614	5,272	6,332	92	-520	ooo
70,000	5,325	7,382	6,851	5,611	7,265	5,625	6,343	93	-509	ooo

DL 5% = 222 kg/ha, DL 1% = 314 kg/ha , DL 0.1% = 437 kg/ha

Crop (kg/ha)	5,780	7,619	6,666	5,819	7,562	5,608
%	100	132	115	101	131	97
Difference (kg/ha)		1839	885	38	1782	-172
Significance		xxx	xxx		xxx	0

DL 5% = 88 kg/ha, DL 1% = 119 kg/ha, DL 0.1% = 162 kg/ha

In the climate conditions of 2009, when in April the total amount of precipitations on the experimental field was 0, and when in June there were only 41 l/m^2, maize crops ranged between 5.272 kg/ha for a plant density of 55,000 plants/ha in the maize hybrid Pr35T06 and 8,091 kg/ha for a plant density of 40,000 plants/ha in the maize hybrid Pr37M34.

The highest yield was in the variant planted with 40,000 plants/hectare, i.e. 6,852 kg/ha, 7% higher than the crop obtained for a plant density of 70,000 plants/ha (6,343 kg/ha) and 8% higher than the crop obtained for a plant density of 55,000 plants/ha (6,332 kg/ha).

As for the maize hybrids behaviour, of the 6 experimental hybrids, 2 yielded above 7,500 kg/ha (Pr37M34 – 7,619 kg/ha and Pr35F38 – 7,562 kg/ha), the maize hybrid Pr34N01 yielded a mean crop of 6,666 kg/ha; in the other 3 maize hybrids, yields were above 5,500 kg/ha standard kernels (5,608 kg/ha in the Pr35T06 maize hybrid, 5,780 kg/ha in the Florencia maize hybrid, and 5,819 kg/ha in the Pr36R10 maize hybrid).

Compared to the Florencia maize hybrid, in three maize hybrids were ensured statistically as very significant

CONCLUSIONS

Results obtained in the experimental year 2009 at Şemlac (Arad County) concerning the behaviour of 6 assortments of Pioneer maize hybrids cultivated at different plant densities show the evry good production potential of the area for maize crops and the particular value of maize hybrids.

Standard maize kernel production when fertilised with N 120kg /ha a.s., P 90 kg/ha a.s., and K 90 kg/ha a.s. was around 7,000-7,500 kg/ha.

Research will be completed with data from the experimental years 2010 and 2011.

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