THE EFFECT OF ANNUAL WEATHER ON DIFFERENT GENOTYPE OF MAIZE (ZEA MAYS L.) IN YIELD

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Abstract

Maize has high productivity and produces hudge vegetative and generative phytomass, but maize is very sensitive to agroecological (mainly to climatic, partly to pedological conditions) and agrotechnical circumstances. In Hungary maize is grown on 1,1-1,2 million hectars, the national average yields vary between 4-7 t ha-1 depending on the year and the intensity of production technology. The long-term experiment was set up in 2015-2016 on chernozem soil in the Hajdúság (eastern Hungary). The plots were set up in 75 thousand ha-1 plant density. We examined some mainly use hybrids of Hungary. The yield was measured buy a special plot harvester - the Sampo Rosenlew 2010 – what measured the weight of the harvested plot and also took a sample from it. After it we calculated the yield (t/ha) of each plot at 14% of moisture content to compare them. We evaluated the data using Microsoft Excel 2015.

Key words: maize, agrotechnical elements, yield

INTRODUCTION

Maize has high productivity, but it is very sensitive to the agroecological and agrotechnical conditions. In Hungary, maize is grown on 1.1-1.2 million hectares, the national average yield varies between 4 and 7 t ha^{-1} depending on the year and the intensity of production technology (Pepó et al. 2006). The impacts of weather factors (Huzsvai and Nagy 2005, Pepó et al. 2005), and global climate change on maize yields are of special importance (Várallyay 2007). The effect of agrotechnical elements is exerted in a complex way in the soil-plant system (Németh 2006). The effects of nutrient supply (Kovačevic et al. 2006, Izsáki 2007), plant density (Berzsenyi and Lap 2006) and irrigation (Ruzsányi 1992, Berényi et al. 2007) on the yield stability of maize are especially important. These agrotechnical factors exert their effect via interactions and not independently (Pepó et al. 2007).

MATERIAL AND METHOD

The long-term experiment was set up in 1983 on chernozem soil in the Hajdúság (eastern Hungary). Regarding the physical characteristics of the soil, the area can be classified as loam and has a nearly neutral pH value (pH_{KCl}=6.46). It has a medium-level humus content (2.8%) and a humus depth of about 80 cm. Its supply of phosphorous is medium and its supply of potassium can be considered good. Water supplies of the soil are

favorable. Examined hybrids were DKC4943, GK Kenéz, P9074, P9486, SY Arioso, SY Octavius. The experiment was set in 75 thousand plants ha-[1] plant density. We use three sowing date. Early sowing date: Beginning of April, Average: Middle of April , Late sowing: Beginning of May. These was set up in four replications. The results were presented in the average of the replications. The fore crop was winter wheat. The experiment was set in one nutrient level. The fertilizer was dispensed in spring. The amount of N was 108 kg ha-[1] (in Pétisó). We harvest the plot with a SAMPO plot harvester. The meteorological factors are shown in *Table 1*.

Table 1

The amount of meteorological parameters in the examined crop years

Months		Apr	May	June	July	Aug	Sept	Oct	Total/ Average
Precipitation (mm)	30 year's average	42.4	58.8	79.5	65.7	60.7	38.0	31.8	**376.9**
	2015	21.9	52.9	60.5	35.6	84.0	48.9	86.6	**390.4**
	2016	14.4	69.2	146.3	84.6	71.7	63.4	52.6	**502.2**
	2017	50.4	31.9	62.3	71.6	47.5	68.4	40.4	**372.5**
Temperature (°C)	30 year's average	10.7	15.8	18.8	20.3	19.6	15.8	10.3	**15.9**
	2015	10.1	15.8	19.9	22.9	23.3	17.8	11.2	**17.3**
	2016	12.5	15.7	20.1	22.9	19.8	17.2	15.2	**17.5**
	2017	10.1	16.3	20.9	21	22.1	17	11.1	**16.9**

RESULTS AND DISSCUSIONS

In the 2015 -2016 crop year we examined six hybrid with different genetically background. The SY Arioso (FAO 300), P9074 (FAO 310), P9486 (FAO 360), SY Octavius (FAO 400), GK Kenéz (FAO 410), DKC 4943 (FAO 410). After the sowing dates reach the optimal water content we harvested the parcels with the Sampo Rosenlew 2010 plot harvester. We measure the final water content of each plot and measure the amount of yield. After we calculate the yield on equal water content what is 14%. All in all the average sowing date has the highest amount of yield. The early sowing was the second and the late sowing produced the worst yield. 2015. It produced the second highest amount of yield. The average sowing date produce the highest amount of yield. The late sowing produced the lowest amount of yield.

Table 2

The amount of yield in each year (t/ha)

Sowing date	Hybrid	2015	2016	2017
Early	1	13.4	10.8	11.3
	2	11.2	10.0	12.0
	3	13.6	12.2	14.9
	4	11.4	10.3	13.6
	5	14.8	11.9	15.6
	6	11.8	10.3	12.8
Average	1	13.1	11.0	13.5
	2	12.2	10.5	13.0
	3	13.8	12.7	14.0
	4	11.0	10.9	13.8
	5	12.7	13.2	15.0
	6	10.8	10.9	13.7
Late	1	12.8	11.6	14.1
	2	11.4	10.8	13.0
	3	11.3	13.1	14.0
	4	9.9	11.8	12.6
	5	12.4	14.6	14.1
	6	9.8	13.6	16.5

On the *table 2* we can see the yield of the plots in each year.
The name of the hybrids is the following:

1 SY Arioso
2 P9074
3 P9486
4 SY Octavius
5 Kenéz
6 DKC 4943

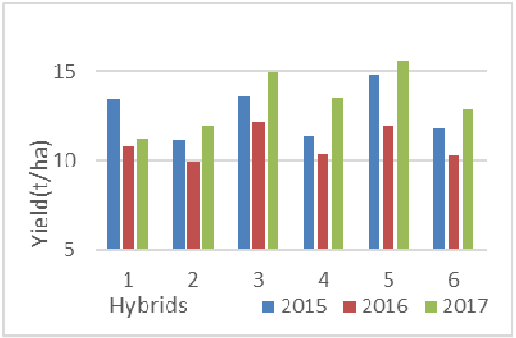

Fig. 1. The amount of yield in each year at early sowing (t/ha)

On the Figure 1 we can see that in the early sowing date yield. In this sowing the GK Kenéz produced the highest amount of yield in 2015 and 2017. In 2016 the top yield was produced by the P9486

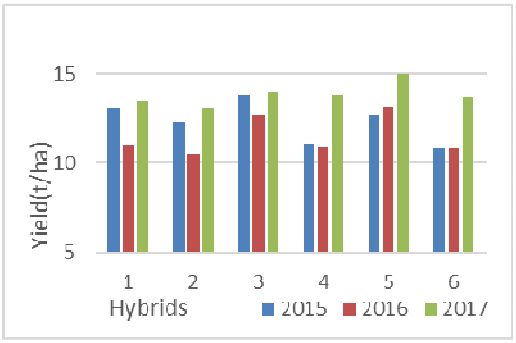

Fig. 2. The amount of yield in each year at average sowing (t/ha)

On the Figure 2 we can see that in the average sowing date yield. In this sowing the GK Kenéz produced the highest amount of yield in 2016 and 2017. In 2015 the top yield was produced by the P9486

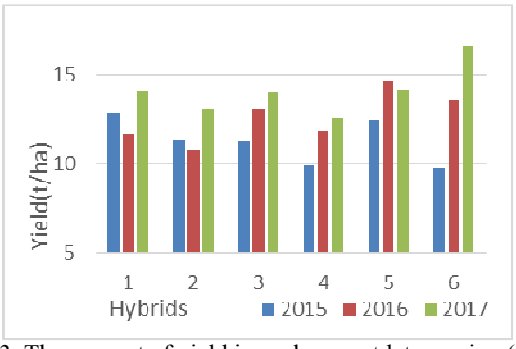

Fig. 3. The amount of yield in each year at late sowing (t/ha)

On the Figure 3 we can see that in the late sowing date yield. In this the SY Arioso produced the highest amount of yield in 2015 and the GK Kenéz produced the highest in 2016. In 2017 the top yield was produced by the DKC 4943

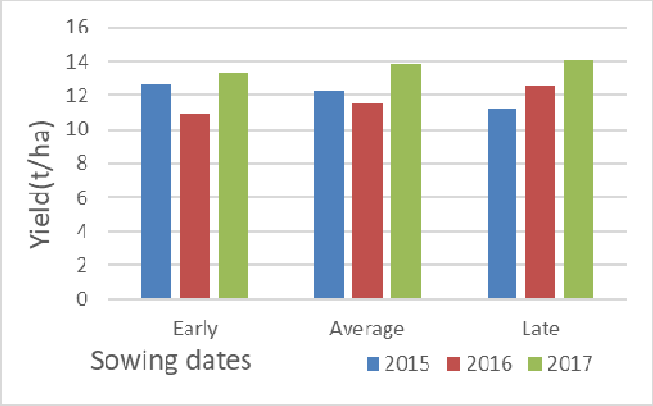

Fig. 4. The amount of yield in each (t/ha)

On the Figure 4 we can see that in a 2015 the early sowing date produced the highest amount of yield. Than the average sowing and the less yield was produced in the late sowing. In 2016 the weather was much hotter than in the other 2 year. In this year the late sowing produce the biggest yield because at the early sowing there was less precipitation. And in the second half of the crop year it rained much more. Therefore the average sowing was the second best in this year. And the early sowing produced the less amount of yield. In 2017 the weather was close to the 30 year's average therefore this year produced the highest amount of yield. In 2017 the distribution of precipitation was more even than in previous years. The temperature was high but it was not as high a day as in the previous years. In this year the three sowing dates yield were close to each other because every plant from each sowing date get enough precipitation and heat grow fast.

CONCLUSIONS

The long-term experiment was set up in 2015-2016-2017 on chernozem soil in the Hajdúság .The plots were set up in 75 thousand ha-1 plant density. At the early sowing date the GK Kenéz produced the highest amount of yield in 2015 and 2017. In 2016 the top yield was produced by the P948.In the average sowing the GK Kenéz produced the highest amount of yield in 2016 and 2017. In 2015 the top yield was produced by the P9486. In the late sowing date the SY Arioso produced the highest amount of yield in 2015 and the GK Kenéz produced the highest in 2016. In 2017 the top yield was produced by the DKC 4943. All in all if there is f there is enough rainfall in the first third of the year, then the early sowing time is best to avoid the state of atmospheric drought stress of maize. The second

best sowing date is the average sowing. Late sowing of maize should be avoided in all case.

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