

THE EFFECT OF NUTRIENT SUPPLY ON THE YIELD AND QUALITY OF MAIZE HYBRIDS

Zoltán Futó

Szolnok College Faculty of Agricultural, Department of Crop Production, Mezőtúr

Introduction

Berzsenyi and Lap (2003) think, that averaged over the years 1970-2002 the maize grain yields in the different N treatments were as follows t ha⁻¹: N-0: 3.69, N-80: 6.97, N-160: 8.33, N-240: 8.34. The maize grain yield and yield stability were greatest at the 160 kg ha⁻¹ N rate. When the dry (12) and wet (21) years were compared, the yield surplus t ha⁻¹ in wet years in each N treatment were: N-0: 1.29, N-80: 1.96, N-160: 1.87, N-240: 1.65.

The first fertiliser level (40 kg ha⁻¹ N + PK) had the most pronounced effect on leaf area, which increased to 2.90-3.84 m² m⁻². The leaf area did not increase so sharply with further increases in the fertiliser rate, but the maximum LAI values of 3.08-3.92 m² m⁻² were reached at higher fertiliser levels. On the basis of regression analysis, it could be concluded that the effect of the leaf area index (LAI) on yield was very strong Futó (2003).

Under unfavourable growing conditions, the LAI-values were lower. LAI-values ranged between 3.32-3.95 m² m⁻², which resulted in a 2-3 t ha⁻¹ yield decrease dependent on weather conditions Jakab (2003).

Dobos and Nagy (1998) studied the effect of year and fertilisation on the dry matter production of the maize hybrid Volga SC was examined on a 5-year series of data in four replications, including two favourable and three unfavourable years, without fertilisation and with a fertiliser treatment involving 120 kg N ha⁻¹ + 90 kg ha⁻¹ P₂O₅ + 106 kg ha⁻¹ K₂O. In the unfertilised treatment there was a significant difference in the dry matter content of the maximum vegetative mass in the years examined. In the fertilised treatment higher values were recorded each year than in the control plots, the fertiliser effect being 17-19 % in 1991, 1993 and 1994 and 22-28 % in 1992 and 1995.

Sárvári and Szabó (1998) studied that, the productivity and nutrient response of maize hybrids are significantly different. Hybrids which are able to produce high yields and greater revenue per hectare at smaller fertiliser doses are more valuable. Considering the aspects of efficiency and environment protection, maize needs only N60-120, P45-90, K53-106 kg ha⁻¹ active agents. At N doses greater than N60-120 kg ha⁻¹ quantity of NO₃-N the 100-120 cm soil profile reaches 150-200 mg kg⁻¹, which could result in significant environment pollution.

Methods

We set the experiment on the plot of the Department of Plant Cultivation at the Szolnok College Faculty of Agricultural. The soil was calcareous meadow chernozem, the reaction of which was nearly neutral (pH_{KCL} 6.72). Before setting the experiment the soil analysis data showed that it had proper nitrogen, poor phosphor and good potassium content (Table 1.). The soil was hard to cultivate, with slow transformation of phosphor and potassium.

Table 1.

pH (H ₂ O)	CaCO ₃	P ₂ O ₅ (mg kg ⁻¹)	K ₂ O (mg kg ⁻¹)	Humus (%)	Soil plasticity value (Ka)
6,72	0,7	64	433	3,07	57

The weather was favourable on the whole for corn in the region of Mezőtúr in 2004. The weather in 2004 was more hostile than in 2003, there were significant rainfalls at the beginning of summer and just before harvesting. In general, yields were higher than average.

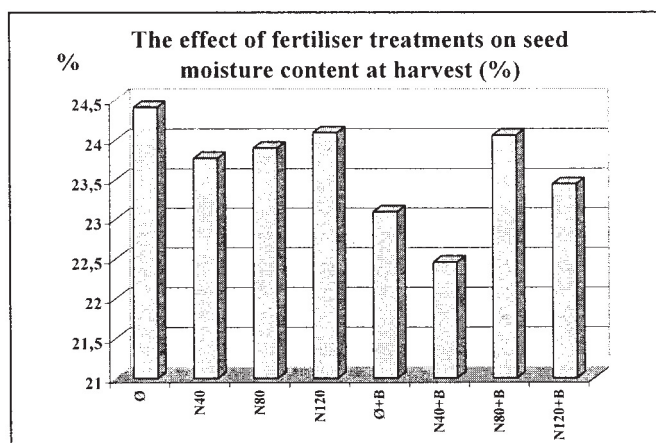
The experiment is a random block settling artificial fertilisation test carried out on small plots. In the experimental years (2004), three fertilisation levels were applied in three replications besides the control, where the lowest fertiliser dosage was 40 kg N; 30 kg P₂O₅; 35 kg K₂O and the highest was three times more, 120 kg N; 90 kg P₂O₅; 105 kg K₂O.

During the experiment we applied seven different fertilizer bacteria treatments (Micro soil), which we supplemented with a control plot.

3. Results and discussion

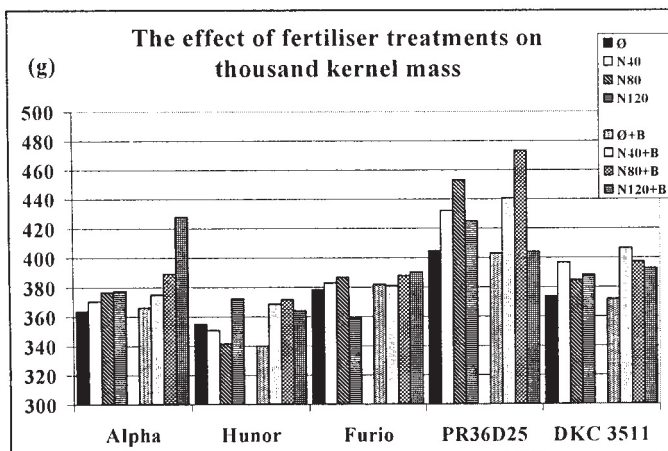
We have stated that the grain moisture content was the highest during the control treatment (*Figure 1.*). The reason probably is that under control conditions the nutrient supply of maize is not optimal. Improving the nutrient supply the decrease of moisture content can be observed. We have found significant differences only among hybrids.

Figure 1.



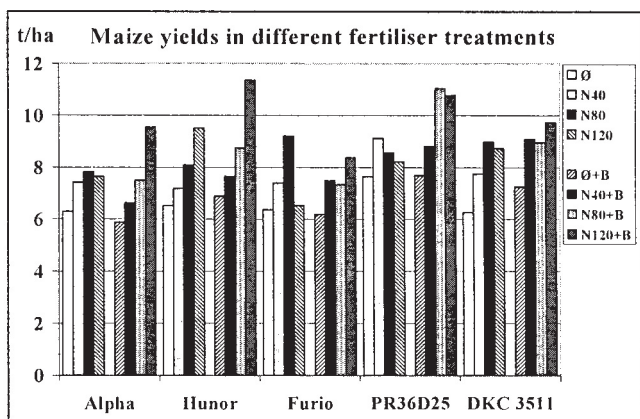
On the basis of the measured data in the experiment we have stated that improving the nutrient supply the thousand kernel mass will increase and the results on the plots of soil bacteria treatment are also better (*Figure 2.*).

Figure 2.



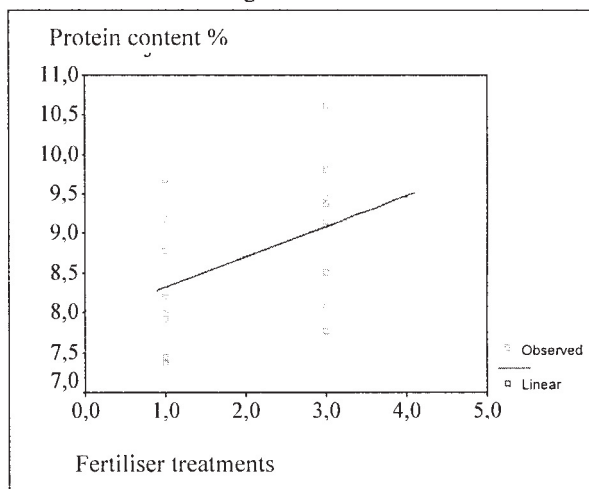
The control plots had the lowest average yield, but these were between 6,25 and 7,6 t ha⁻¹, too. We can claim that improving the nutrient supply the crop results were higher. Without the bacteria treatment the crop results were between 7,8 and 9,5 t ha⁻¹ (Figure 3.). The most favourable results occurred in case of 40-80 kg/ha N treatment. Under the influence of soil bacteria treatments in many cases the average yields were better, which obviously proves the nutriment transformation ability of the bacteria. With bacteria treatments the result was 9,7 – 11,3 t ha⁻¹, so owing to this we registered 0,5 – 1 t ha⁻¹ extra yield.

Figure 3.



The crude protein content of maize hybrids considerably grew under the influence of fertilizing compared to the control conditions (Figure 4.). The change of crude fat content depended on the hybrids. We saw little change, but the scale of decrease or increase is genetically determined in all cases. Increasing the quantity of fertilizer the starch content decreased. The scale of decrease strongly changed depending on the hybrid and soil bacteria treatment.

Figure 4.



4. Conclusions

We concluded that between the yield of maize and fertilization as well as between protein content and fertilisation were positive correlation in 2004.

5. References

- Berzsenyi Z, Lap DQ: Effect of N fertilisation on the grain yield and N fertiliser response of maize (*Zea mays* L.) hybrids in a long-term experiment. *Növénytermelés* Tom. 52. No. 3-4. p. 389-408. 2003.
- Dobos A, Nagy J: Effect of year and fertilisation on the dry matter production of maize (*Zea mays* L.). *Növénytermelés*. Tom. 47. No. 5. p. 513-524. 1998.
- Futó Z: Effect of leaf area on the yield of maize in a fertilization experiment. *Növénytermelés*. Tom. 52. No. 3-4. p. 317-328. 2003.
- Jakab P: A tápanyagellátás szerepe a hibridspecifikus kukoricatermesztésben. Ph.D. értekezés. 2003. Debrecen.
- Sárvári M, Szabó P: Effect of crop production factors on maize yields. *Növénytermelés*. Tom. 47. No. 2. p. 213-221. 1998.