

THE EFFECT OF PLANT DENSITY ON THE YIELD OF MAIZE HYBRIDS

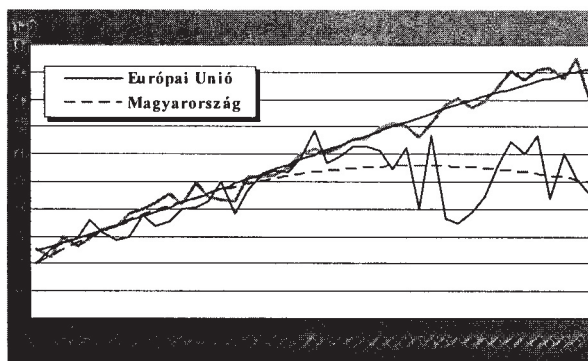
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Introduction

Maize is a cultivated plant grown on the third biggest area in the world. With our increasing agricultural intensity, maize yields, just like wheat yields, have increased at the fastest rate. Hungarian ecological conditions are suitable for growing cereals on 60% of tilled areas. In the past 100 years, as a result of modern technological and biological bases, the yields of maize have increased threefold compared to yields in the 1960's. (*1. figure*)

Figure 1: Maize yields in EU-15s and Hungary, their fluctuations between 1961-2004.



According to SÁRVÁRI – ZSOLDOS (1997) plant density is responsible for the volume of yield. SÁRVÁRI (1995) claims that, plant density is a genetically determined quality. SÁRVÁRI (1997) highlights for farmers that the degree of hybrid supplies in our country are satisfactory; nevertheless, the proper selection of hybrids suitable for ecological conditions is significant. According to SZÉLL – MAKHAJDA (2000), the productivity of hybrids can be efficient if these are cultivated with habitat specific plant density.

Methods

The soil of the experimental plot was hard to cultivate, P absorption was considerable, N could be hardly diagnosed in spring; the effects of N fertilizer were weaker than the average, whereas that of P and K were good..

In 2002 the volume and dispersion of precipitation was uneven. The volume of precipitation was less than the 30 years' average by 61,7 mm until April. The upper layer of the soil was too dry at the time of plant emergence, which resulted in a somewhat insufficient rate of emergence.

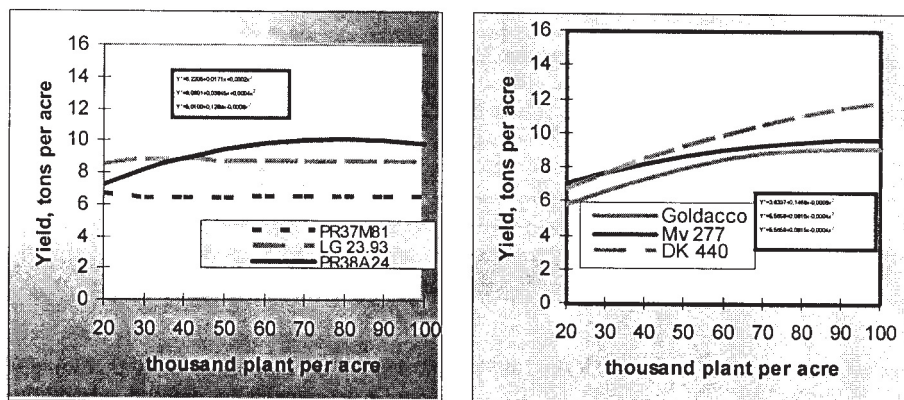
In 2003 weather conditions were unfavourable in the area of Hajduböszörmény. This year the quantity and dispersion of precipitation were also unfavourable. The lack of precipitation was further increased by the daily average temperature, which was higher than the average in several years. There were 47 hot days. Atmospheric droughts occurred several times.

In 2004 weather conditions were generally favourable. The temperature between January and November was lower than the 30 years' average by 0,3 degree. As a result of this and the high amount of precipitation, the crop-year was two weeks longer than in average years.

Results and discussion

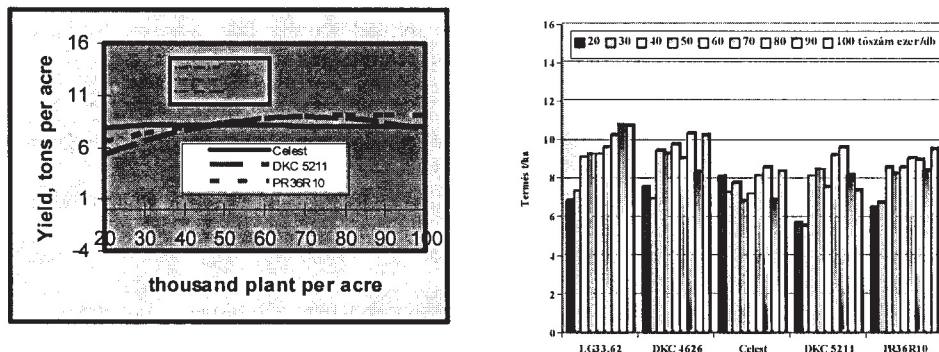
Investigating the data in 2002 we can conclude that most of the hybrids increased their yields as a result of increased plant density. For example, the plant density of PR38A24 hybrid was excellent, it yielded 11 tons at the plant density of 20.000 plants per acre, and reached its maximum yield at the plant density of 80.000 plants per acre. The maximum yield of DK 440 hybrid was 11 tons on 90.000 plants per acre. DK 537 hybrid is worth mentioning as its plant density could be increased well. At the plant density of 20.000 plants per acre, the yield was 8 tons per acre and the maximum yield was 12 tons per acre at 100.000 plants/acre. Celest hybrid showed uniquely excellent performance. As a result of increased plant density, the yield per acre did not fluctuate significantly . (2. figure)

Figure 2.: Connection between plant density and maize hybrids.



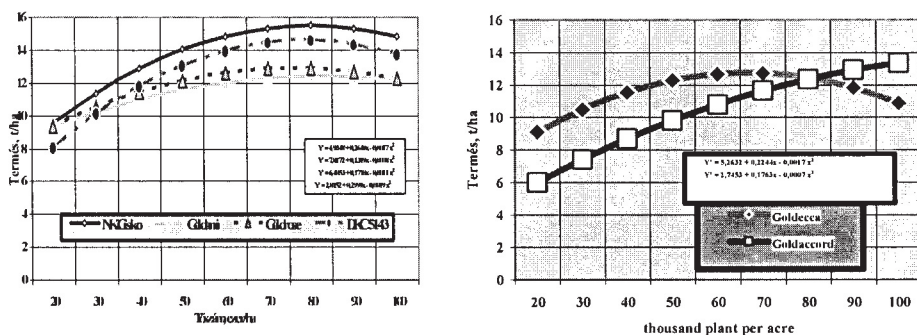
The year of 2003 was extremely droughty. In spite of this, there were hybrids, whose plant density could be increased and as a result, their yield increased even under unfavourable weather conditions. For example, the yield of LG.33.62 hybrid was the maximum of up to 10 tons per acre at the plant density of 80.000 plants/hectare. Celest, as we saw in 2002, also produced 8 tons per acre in 2003 as a result of increased plant density. This hybrid has excellent individual performance, tends to grow several ears, therefore it is capable of safe crop production at a relatively low density. DKC 5211 also had very good density tolerance. The maximum yield at the plant population of 80.000 plants/acre was 10 tons per acre. (Figure 3.)

Figure 3.: Connection between plant density and maize hybrids.



The weather conditions in the year of 2004 were favourable, and as a result, the reactions of hybrids to increased plant density were very good. The best hybrid in 2004 was NK Cisko, whose yield was 8 tons per acre at the density of 20.000 plants/acre and the maximum yield was almost 16 tons per acre at 90.000 plants/acre. Having investigating the other hybrids, our conclusions proved to be the same. The maximum yield of PR38B85 hybrid was more then 14 tons at 90.000 plants/acre. Goldecca was sensitive to increased plant density. The maximum yield was 13 tons at 40.000 plants/acre. Last but not least, I analyzed LG.33.62 hybrid. The yield of this hybrid was similarly 14 tons at 60.000plants/acre and at 80.000 plants/acre as well. (4. figure.)

Table 4.: Connection between plant density and maize hybrids.



Conclusions

After evaluating our findings we can conclude that most hybrids showed a significant correlation between increased plant density and the volume of yields. On the basis of the experiments we divided the hybrids into four groups: the first group included the hybrids suitable for increased plant density with a wide range of optimal density values; the second group included hybrids, which did not require high plant density, were capable of good individual performance and tended to grow several ears; the third group included flexible corn types, which grew longer ears in favourable years, thus yielded more; and the fourth group

included the hybrids, which were sensitive to increased plant density and which showed a narrow range of optimal density values. Finally, plant density determines the yield; we have to consider optimal plant density intervals as well as optimal plant density, and we also have to place a high emphasis on the use of hybrid-specific technologies.

References

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