THE EFFECT OF THE AGROTECHNICAL FACTORS ON THE PRODUCTIVITY OF MAIZE

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Abstract

The biological bases, the selection of appropriate hybrids will be of greater importance in the future. The issue of the adaptability of hybrids will be considerably appreciated. Its good agronomical traits and stress bearing against climatic factors and agrotechnical elements (e.g. different types of herbicides) will be important. Our experiment was set on the experimental areas (in the Demonstration Garden and in Görbegáza) of the Centre for Agricultural and Applied Economic Sciences of the University of Debrecen, using 10 hybrids of different vegetation times, on lime-coated chernozem soil and meadow soil. Two different plant density was set on, the FAO 200-300s: 72 thousand/ha, the FAO 400-500s: 65 thousand/ha. The studied hybrids form genetic bases of good adaptability, stress bearing ability and productivity. The yield of the examined hybrids were different in the two experimental areas (7.19-11.45 t ha^{-1}).

Key words: weather, yield of maize, moisture loss dynamic, nutrition content

INTRODUCTION

The value of a produced variety is greatly determined by its agro-ecological and production technological adaptabilities, and crop safety (Marton et al., 2005). When the ecological and agrotechnical conditions are optimal, the amount of yield is determined by the differences between the hybrids; but in the case of unfavourable weather conditions or shortcomings in the agrotechnique, the most important factor is the adaptability of the hybrids (Gardner et al., 1990). For the reduction of yield fluctuation, the accordance between the ecological (weather and soil) and biological bases as well as the agrotechnical factors (crop rotation, nutrient supply, soil cultivation, sowing, plant care, irrigation, harvest, etc.) and to provide positive relation between them are of special significance (Sárvári and Bene 2012). Fundamental changes in the cultivation of maize in Hungary have been underway since the beginning of the 1990s. As a result of the financial and economic difficulties the quantity of inputs and the level of resources invested have decreased. An extremely disadvantageous factor is the reduction in the amount of organic fertiliser used, from 22-24 million tons per year^{-1} to 3-4 million tons per year^{-1} (Sárvári, 2013). Hungary has modern genetic background and as a result of the purposive breeding work, their productivity, water releasing, water and nutrient utilizing abilities continuously increase (Sárvári and El Hallof, 2005). Over the past decades climate change has increased the extremes in the weather. Between 1860 and 1900 the frequency of dry and wet years was equal (22.5%), and more than half of the years were characterised as having a typically average pattern (55%). In the period of 1980 and 2000s the frequency of dry years increased significantly (52.6%), at the expense of years with an average pattern (26.3%) (Szász G., Tőkei L., 1997).

MATERIAL AND METHOD

The experiments were set up the experimental areas (in the Demonstration Garden and in Görbeháza) of the Centre for Agricultural and Applied Economic Sciences of the University of Debrecen, using 10 hybrids of different vegetation times, on lime-coated chernozem soil and on meadow soil, in two different, with the application of uniform nutrient dose, divided for autumn and spring (N 120 kg ha^{-1}, P_2O_5 80 kg ha^{-1}, K_2O 110 kg ha^{-1}).

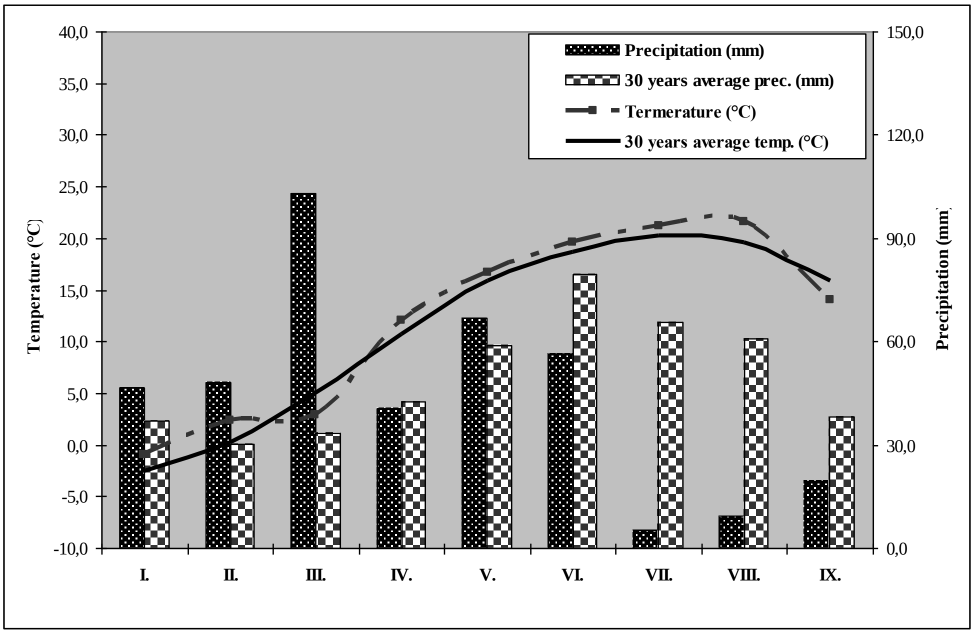

Fig. 1 The weather in Debrecen, 2014.

The weather of the year 2013 was unfavourable for maize production (Figure 1 and 2) in both experimental areas. In March, the treble of the 30-year average precipitation fell, and the temperature was also lower than the multi-year average.

In April, spring came abruptly, and the mean temperature exceeded the usual even during that time of the year. July and August were very droughty, accompanied by extremely high mean temperature. The unequal precipitation distribution was not favourable for the plants. No significant differences were observed in temperature on the two areas.

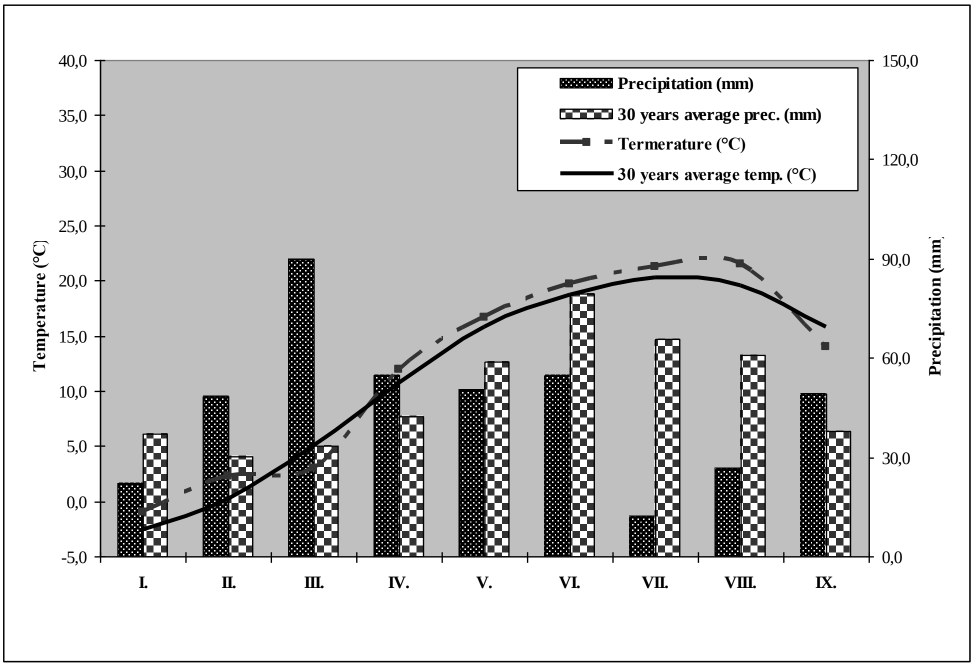

Fig. 2 The weather in Görbeháza, 2013.

RESULTS AND DISSCUSIONS

Figure 3 depicts the yield averages of hybrids in the average of replications. During the first half of the vegetation period (April to June), the studied stock showed favourable development, the hybrids grew high stalks, but for the time of flowering, fertilization and grain-filling, a considerable water shortage had to be expected. Despite these, out of the 10 hybrids, 3 produced yields above 12 t ha^{-1}. The studied hybrids form genetic bases of good adaptability, stress bearing ability and productivity. The lowest yield was performed by the hybrid Mv Koppány by 7.19 t ha^{-1} and the highest yield was performed by the hybrid P9578 by 8.81 t ha^{-1} in the Demonstration Garden. In Görbeháza was 8.18 t ha^{-1} the lowest yield by the hybrid Sarolta, the value of the highest yield was 12.76 t ha^{-1} by the hybrid P9578. Approximately 9.67 t ha^{-1} yield averages were measured in the case of the two different experimental areas.

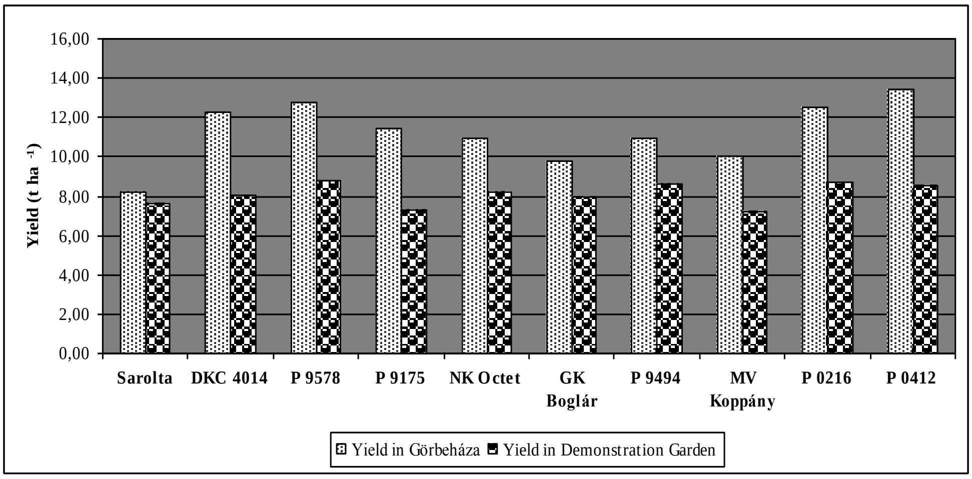

Fig. 3 The yields of the examined hybrids in the experimental areas, 2013.

Four hybrids were choosen for the examination of the dinamic of the moisture loss (Figure 4 and 5). The dates of measure were determined on a weekly basis. Our measurements were equable in the Demostartion Garden, the hybrids were harvested with optimal moisture content.

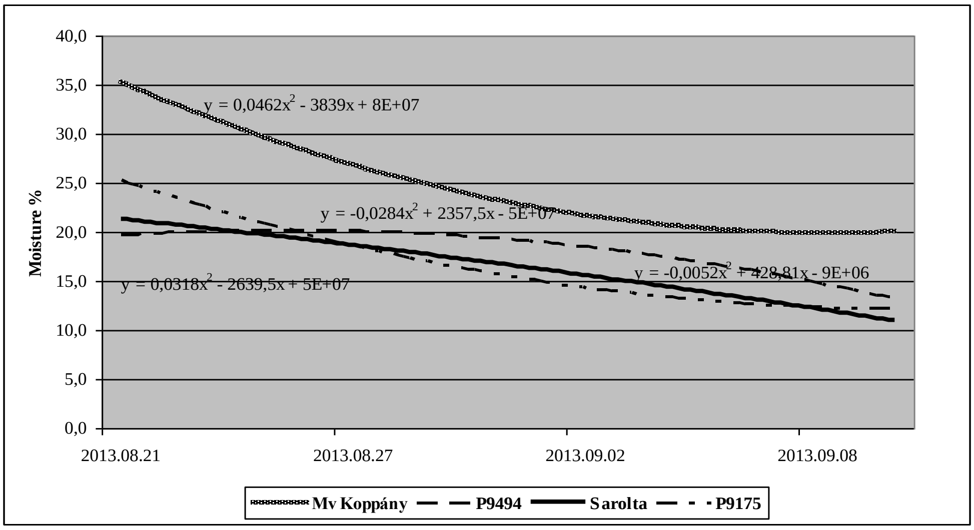

Fig. 4 The dynamics of the moisture loss in the Demonstartion Garden, 2013.

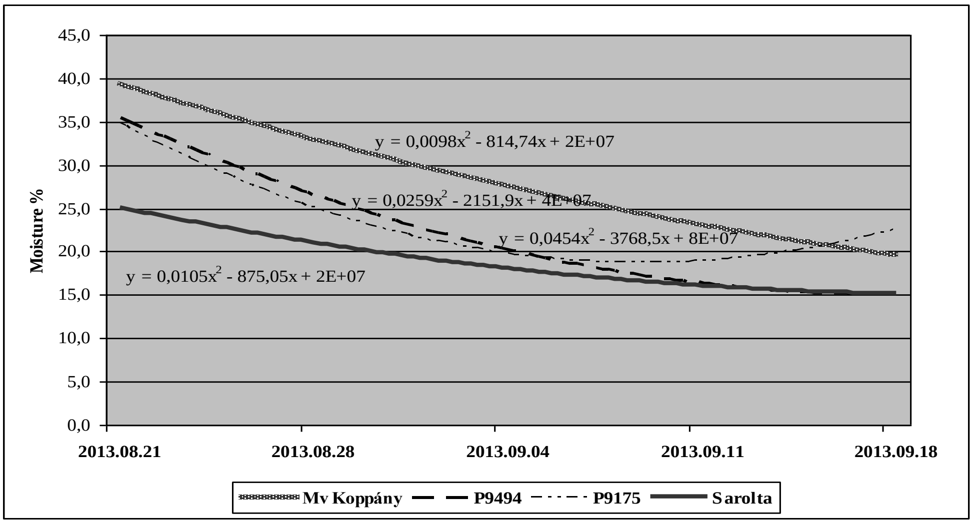

Fig. 5 The dynamics of the moisture loss in Görbeháza, 2013.

The weather was colder and more precicitation fell in September in Görbeháza. The rainy weather caused the rising of the grain moisture content of the examined hybrids. We measured in the case of three hybrids (Sarolta, P9175, P9494) higher values in the last date of measure in Görbeháza (Figure 5).

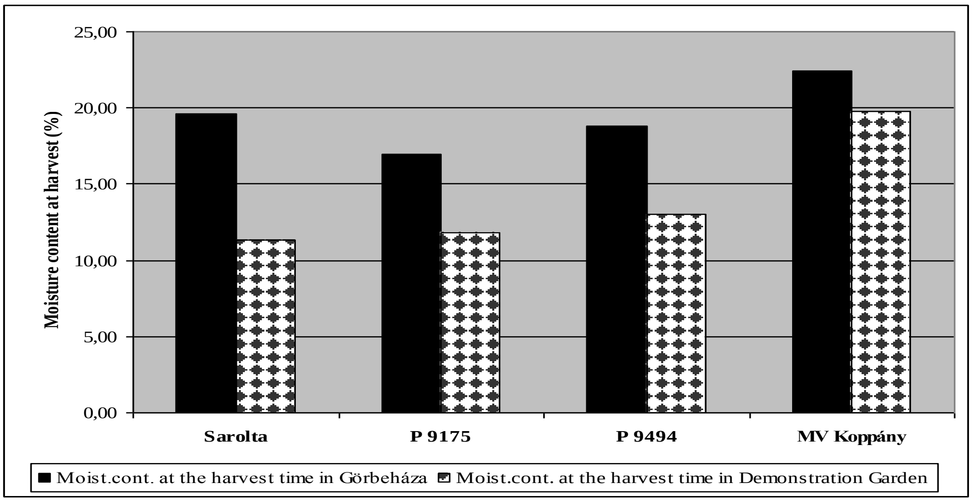

Fig. 6 Moisture content at harvest in the different areas, 2013.

Depending of the vegetation time and the experimental area, the moisture content at harvest changed between 11.3% (Sarolta) and 19.8% (Mv Koppány) in the Demonstration Garden. The hybrid P9175 produced the lowest value (17%) and we measures by the hybrid Mv Koppány (22.4%) the highest value in Görbeháza.

CONCLUSIONS

The experiment showed the good adaptability of the examined hybrids. The climatic conditions of the recent cropyear were extreme due to the unequal distribution of precipitation and the high mean temperatures of summer. The study of dynamic of the moisture loss was equable in the case of some hybrids. The rainy and colder beginning of fall 2013 caused a change in the grain moisture content of the hybrids in Görbeháza so the yield had to dry to archieve the optimal moisture content.

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