# EXAMINATION YIELD AND GROWTH OF MAIZE HYBRIDS IN THE HAJDÚSÁG

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***Abstract***

*Our experiment was set up at the MÉK Látókép AGTC KIT research area of the University of Debrecen, Hungary on chernozem soil. The study focused on the yield and plant height of maize hybrid SY Afinity, SE4410 and PR37M81 at various nutrient treatments in 2012. We found out that nutrient level N150+PK was optimal for hybrid SY Afinity (14.105 kg ha$^{-1}$) and SE4410 (13.849 kg ha$^{-1}$), while hybrid PR37M81 preferred level N120+PK as the examined hybrids gave the best yield results at the above mentioned nutrient levels. Plant height records shown that SY Afinity's initial development phase was the strongest as at the time of the first record (18th May) this hybrid performed the best results at all nutrient levels. Hybrid SY Afinity and SE4410 reached its maximum height at N120+PK while hybrid PR37M81 at N150+PK.*

**Key words:** maize, yield, fertilization, nutrient level, plant height.

## INTRODUCTION

Nitrogen fertilization is one of the most important agrotechnical factors that determine corn yield growth (Berzsenyi et al., 2009). The amount of nutrients needed has to be determined based on the estimated yield and nutrient supply of the soil (Radics, 2003). Nutrient exploitation facility, reaction on fertilizer and vintage effect have to be taken into consideration at each grew hybrid (Nagy, 2007). The optimum dose of fertilizer is greatly determined by crop rotation (Pepó, 2008). Reasonable crop rotation and harmonized NPK supply play an outstanding part in corn production (Nagy, Huzsvai, 2005). The type-specific fertilization is a fundamental factor of nutrient management. The different genotypes have different agronomic and vegetal-physiological features (Pepó, 2001). According to Rácz and Nagy (2011) in the case of medium-good NPK supply chernozem soils, fertilizer doses with a N level higher than 120 kg ha$^{-1}$ did not economically increase yield, moreover, it did directly decrease it in dry periods. Berzsenyi (2008) came to the conclusion that N fertilization and hybrids considerably determined leaf area and plant height.

## MATERIAL AND METHOD

The research was set up on chernozem soil with lime patches at the Látókép AGTC MÉK research area of the University of Debrecen. The research area is located in Eastern-Hungary on the area of the aeolain loess

of the Hajdúság. Tilth of the research area is around 80 to 90 cm, is of good agricultural condition, medium hard and loamy with medium humus content. Features of water supply of the soil are favorable. The long-time experiment was set up in 1983.

In 2012 we used three maize hybrids (SY Afinity, SE 4410, and the PR 37M81) as a small parcel research in four repetitions. Our pre-crop was winter wheat. The fertilization covered six levels of treatments shown in Table 1. 50% of the nitrogen and 100% of phosphorus and potassium were applied in the autumn in the complex form of Kemira Optima 10:15:18. The residual 50% of nitrogen was applied during the spring in the form of a 34% ammonium nitrate on each parcel.

*Table 1*

Applied fertilizer doses (Debrecen, 2012)

| Kezelés | N | $P_2O_5$ | $K_2O$ |
|---|---|---|---|
| | kg $ha^{-1}$ | | |
| Ø | 0 | 0 | 0 |
| 1 | 60 | 45 | 53 |
| 2 | 120 | 90 | 106 |
| 3 | 150 | 112,5 | 132,5 |

*Table 2*

Some important meteorological data (Debrecen, 2012)

| **Precipitation (mm)** | **April** | **May** | **June** | **July** | **August** | **Total** |
|---|---|---|---|---|---|---|
| 2012. year | 20.7 | 71.9 | 91.7 | 65.3 | 4.1 | 253.7 |
| 30 year average | 42.4 | 58.8 | 79.5 | 65.7 | 60.7 | 307.1 |
| **Temperature (°C)** | **April** | **May** | **June** | **July** | **August** | **Average** |
| 2012. year | 11.7 | 16.4 | 20.9 | 23.3 | 22.5 | 19.0 |
| 30 year average | 10.7 | 15.8 | 18.7 | 20.3 | 19.6 | 17.0 |

The amount of precipitation in April 2012 was 20.7 mm, 21.7 mm less than the thirty-year average (42.4 mm). Precipitation in May was 13.1 mm more and in June 12.2 mm more compared to the long term average. The amount of precipitation in July (65.3 mm) was similar to the average of the past thirty years (65.7 mm). The amount of precipitation in August lagged behind the long term average (60.7 mm) as it was 4.1 mm. Values of the average temperature exceeded the long term monthly average during the crop year (Table 2).

Plant height was measured seven times in four repetitions for five average plants.

**RESULTS AND DISCUSSION**

Yield results were studied in 2012. Maize hybrids produced the least yield during the non-fertilized treatments. As for the control treatment, hybrid SY Afinity performed the best results (10.768 kg $ha^{-1}$) while the weakest values were recorded in the case of hybrid PR37M81 (10.012 kg $ha^{-1}$). Maximum yield results were measured at level $N_{150}$+PK for hybrid SY Afinity (14.105 kg $ha^{-1}$) and hybrid SE4410 (13.849 kg $ha^{-1}$) while hybrid PR37M81 reached its maximum yield at level $N_{120}$+PK (12.760 kg $ha^{-1}$). As an overall winner, hybrid SY Afinity produced the most yield at all nutrient levels while hybrid PR37M81 was the weakest one. We found significant relationship between hybrid SY Afinity and PR37M81 at level $N_{60}$+PK, $N_{120}$+PK and $N_{150}$+PK and between hybrid SE4410 and PR37M81 at level $N_{150}$+PK. Furthermore, there was a considerable relationship between the control treatment and other examined nutrient levels and between level $N_{60}$+PK and $N_{150}$+PK.

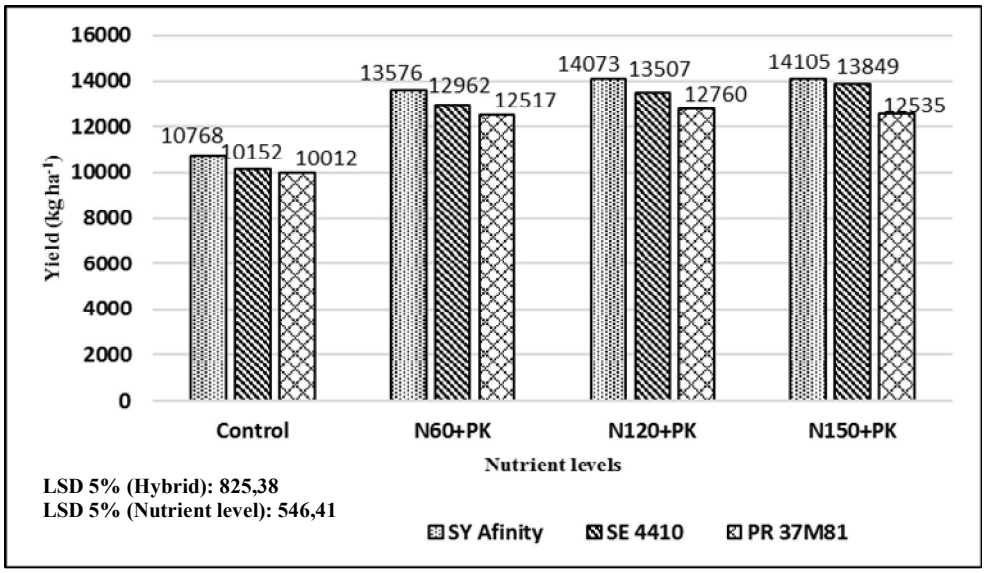


Fig. 1. Yields of examined maize hybrids in different nutrient treatments (Debrecen, 2012)

During the first measurement (18th May) the shortest hybrid turned out to be SE4410 at level $N_{150}$+PK (13.3 cm) while the tallest hybrid measured was SY Afinity at level $N_{120}$+PK (15.8 cm). The strongest initial development was observed in the case of SY Afinity as this hybrid performed the best results at all nutrient levels (control:14.8 cm, $N_{60}$+PK: 15.2 cm, $N_{120}$+PK: 15.8 cm, $N_{150}$+PK: 14.9 cm). When comparing the hybrids by largest average plant height, hybrid SE4410 was found to show the largest average plant height at $N_{150}$+PK (326.7 cm), while the weakest

average plant height results were recorded in the case of PR37M81 at $N_{150}$+PK and of SY Afinity at $N_{120}$+PK (313.7 cm). Largest average plant height was recorded for hybrid SE4410 at all four nutrient levels (control: 322.5 cm, $N_{60}$+PK: 324.2 cm, $N_{120}$+PK: 326.7 cm, $N_{150}$+PK: 322.6 cm) (Fig. 2, Fig. 3, Fig 4).

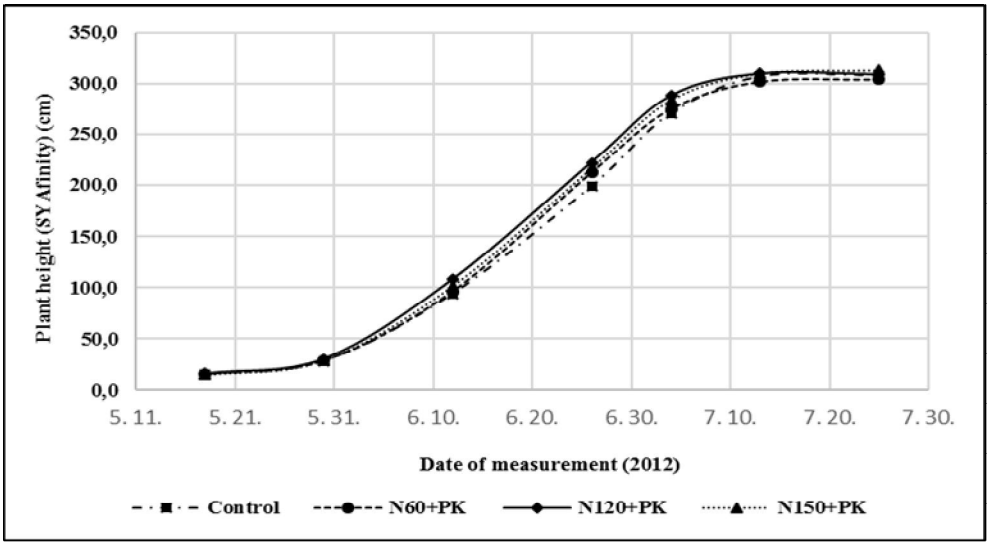


Fig. 2. The height of the SY Afinity on the different fertilizer levels

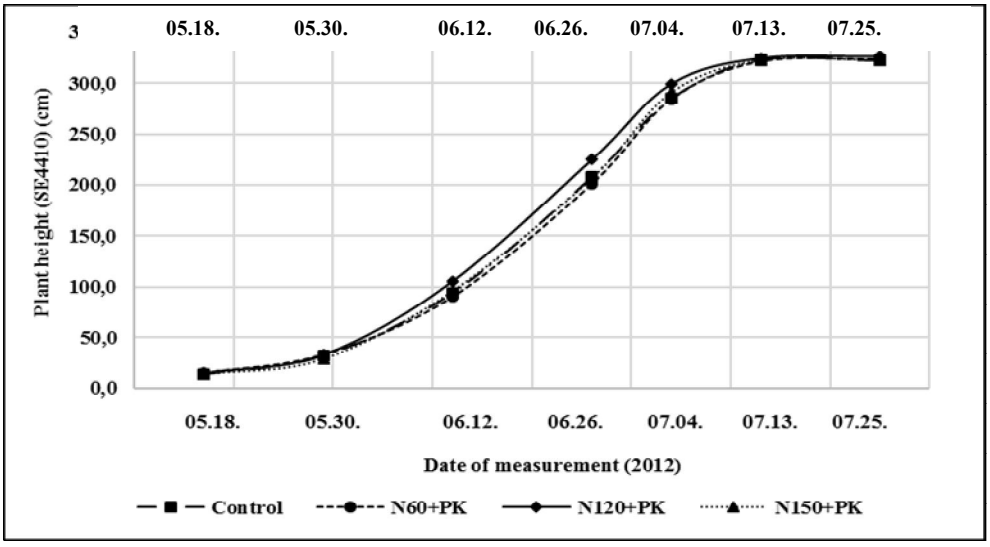


Fig. 3. The height of the SE4410 on the different fertilizer levels

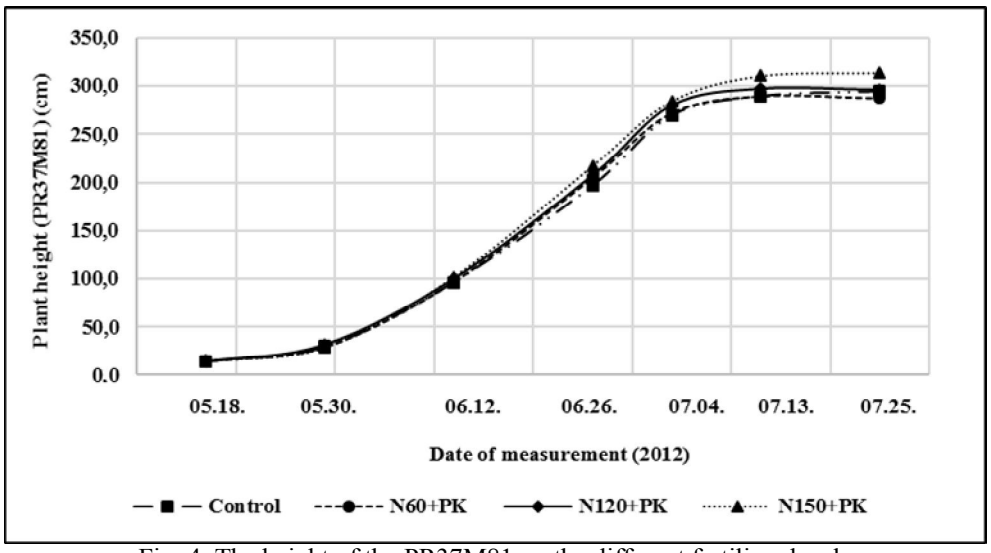

Fig. 4. The height of the PR37M81 on the different fertilizer levels

**CONCLUSIONS**

Yield and plant height of hybrid SY Afinity, SE4410 and PR37M81 were examined on chernozem soil with lime patches in the Hajdúság within a small parcel long-term research under different nutrient supply. Results show that yield production was between 10.012 kg $ha^{-1}$ and 10.768 kg $ha^{-1}$ in the control parcel, between 12.517 kg $ha^{-1}$ and 13.576 kg $ha^{-1}$ at level $N_{60}$+PK, between 12.760 kg $ha^{-1}$ and 14.073 kg $ha^{-1}$ at level $N_{120}$+PK and between 12.535 kg $ha^{-1}$ and 14.105 kg $ha^{-1}$ at level $N_{150}$+PK. Best yield results were recorded in the case of hybrid SY Afinity at all nutrient levels, while PR37M81 was the weakest regarding yield production. Results of the plant height measurements proved that SY Afinity's initial plant development was better than the other two hybrids examined as this particular Afinity hybrid reached the tallest plant height at the time of the first measurement. We also found that the highest plant height values were recorded at level $N_{120}$+PK for hybrid SY Afinity and SE44110 and at $N_{150}$+PK for hybrid PR37M81. The largest average plant height values were recorded for hybrid SE4410. In 25 July, 2013 average plant height values varied between 322.5 cm and 326.7 cm under different fertilization treatments.

**Acknowledgments**

This research was supported by the **European Union** and the **State of Hungary, co-financed by the European Social Fund** in the framework of TÁMOP 4.2.4. A/2-11-1-2012-0001 'National Excellence Program'.

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