

Plant Science: Effect of tillage systems and fertilizer treatments on yield of maize hybrids -Karamchand Bramdeo - University of Debrecen, Hungary

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Abstract

Statement of the Problem: Maize (*Zea mays* L.), is major grain crop in Hungary, cultivated on approximately one million hectares. Besides being an excellent feed source, maize is also a cheap source of energy and raw material for industry. Annual production over the last decade ranged from 4.8 to 9.3 million tons, with significant fluctuation in yield. Optimizing and sustaining yield requires proper harmonization of the agroecological, biological and agrotechnical factors. This research is therefore aimed at identifying the best combination of tillage systems and fertilizer dosage which will optimize yield of maize hybrids.

The effect of three tillage systems (Moldboard plowing-MT, Strip tillage-ST, Rip tillage-RT) and three levels of fertilizer treatments (N0 kg ha⁻¹, N80 kg ha⁻¹, N160 kg ha⁻¹) on the yield of maize hybrids (Armagnac- FAO 490 & Loupiac-FAO 380) were evaluated over a two-year period (2015-2016). The findings revealed RT produced the highest yield of 10.37 t ha⁻¹, followed by MT and ST with 10.22 and 9.60 t ha⁻¹ respectively. There was no significant difference ($p>0.05$) in yield between the RT and MT treatments. However, both the RT and MT were found to be statistically significant ($p<0.05$) when compared to ST treatment. In 2015, a relatively dry year, ST yield was almost on par with MT and RT. A positive interaction between tillage and fertilization was evident, with higher yield variation (CV=40.07) in the non-fertilized (N0) tillage plots, compared to those which received the N80 and N160 kg ha⁻¹ treatments (CV=22.42).

Fertilizer application greatly increased the yield of maize and accounted for 43 % of yield variances. The highest yield (11.88 t ha⁻¹) was obtained with N160 kg ha⁻¹ treatment, followed by N80 kg ha⁻¹ (10.83 t ha⁻¹), while the lowest yield (7.48 t ha⁻¹) was recorded in the nonfertilised plots(N0 kg ha⁻¹). Crop year interaction was highly significant with vast variation in yield between the two years, ranging from 8.36 t ha⁻¹ in 2015 to 12.43 t ha⁻¹ in 2016 for the same set of agro technical inputs.

In 2016, higher yield was obtained with increase fertilizer dosage due to favorable growing conditions which allowed for better fertilizer utilization.

However, with 2015 being a relatively dry crop year there was no yield increasing effect with higher fertilizer dosage (N160 kg ha⁻¹).

FAO 380 was the better performing of the two hybrids, with a yield of 11.09 t ha⁻¹ compared to FAO 490 with 10.60 t ha⁻¹.

A positive correlation exists between fertilizer dosage and water supply. Lower dosage of fertilizer produced optimum results in the drier year with limited water supply. Ripper tillage and strip tillage can be suitable alternatives for the conventional mouldboard tillage, especially in drier conditions.

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