SUSTAINABLE SWEETCORN PRODUCTION THROUGH THE USE OF ORGANIC FERTILISERS OR RESIDUES AND EFFECTIVE MICRO-ORGANISMS

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Keywords: corn, organic fertilizer, organic residue, effective microorganisms, sustainable production.

Introduction

Corn has recently become an important crop due to the demand for sweetcorn as snacks and graincorn for poultry feed. Up till now, corn cultivation in Malaysia has depended mainly on chemical fertilisers. For sustainable crop production, the fertility of the soil need to be sustained and the environment need to be protected from pollutants and contaminants. Thus, chemical fertiliser application should be minimised. The few studies on organic fertilisation of maize have concentrated yield responses and alleviation of aluminium toxicity. Understanding the effect of organic residue/ fertiliser applications on dynamics of soil organic matter and availability of nutrients, particularly, nitrogen is greatly lacking. Some microorganisms, called effective microorganisms (EM), are claimed to enhance organic matter decomposition and nutrient availability. Thus, this study was established to investigate the extent of the benefits of organic fertiliser or soil amendments (crop residues) in corn cultivation.

Materials and Methods

A field experiment was set up in the UPM Puchong experimental farm to study the effects of crop residue and organic fertiliser (chicken dung) applications on corn in a rotation crop system with groundnut. Three treatments were laid out with 4 replications, i.e. recommended chemical fertiliser rates without crop residues (T1), recommended fertiliser rates with crop residues (T2) and combination of chicken dung and chemical fertilisers with crop residue (T3). For corn in T1 and T2, the fertiliser rates were 150 kg N/ha, 90 kg P/ha and 90 kg K/ha, and for T3, 10 tonnes/ha chicken dung combined with chemical fertilisers: 75 kg N/ha, 90 kg P/ha and 90 kg K/ha. Fertilisation for groundnut was 30 kg N/ha, 90 kg P/ha and 90 kg K/ha for T1, T2 and T3. Crop residues were returned to the respective plots after each harvest. Besides yield recording, soil and plant samples were taken for analysis of soil organic matter and nutrient uptake.

Another experiment was also set-up in minilysimeters using the same soil (Bungor series) to study the effect of EM on nutrient availability from sewage sludge and chicken dung application to corn (monocrop).

Results and Discussion

The main field experiment was set up in April 1997 and to-date, 4 crops had been grown (2 corn and 2 groundnut crops). The effect of treatments was investigated after the first crop, i.e. after the application of the crop residue. Up to the third crop, the mean crop yield values showed higher yield of maize cobs in T3 than T2, and T2 higher than T1 (control), i.e. 4.25, 3.54 and 2.65 kg/ha, respectively, but the differences were not statistically significant This suggests that there were no significant effects of the crop residue and chicken dung application probably because the variability in yield between the replicates was still high. Therefore treatments should be studied in the long-term, i.e. after several crop residue and organic fertiliser applications. on the contrary, the total N uptake by the third crop of maize in T3 plots (chicken dung + chemical fertiliser + residue) was significantly ($P<0.05$) higher than N uptake in T2 plots. The potassium uptake by the third crop was also higher in the plots with crop residue application (T1 and T3) than the T2 plots (without crop residue), i.e. 120, 82 and 48 kg K/ha in the T3, T1 and T2, respectively. The soil analyses also indicated highest input of P, K, Ca and Mg from T3 treatment. The decomposition study in the field showed that 50% dry matter weight loss of the maize residue was attained 5.4 weeks after application (WAP) compared to 3.5 WAP of groundnut residue, under the Malaysian tropical climate. Thus, fallow periods between cropping season should be short (4-6 weeks) in order to utilise the nutrient released by decomposing crop residues. This experiment will continue for at least 5 years. Results of the minilysimeter experiment showed t no effect of the EM until the third crop of maize. There was maximum uptake of nitrogen in the sewage sludge with EM but not with chicken dung treatment. This means that EM is more effective in making nutrients more available in higher C/N ratio organic fertiliser than with low C/N ratio organic fertiliser.

Conclusions

The effect of crop residue application on crop yields could not be conclusively observed in the third crop. It would require several more cropping seasons. Similarly, the lysimeter experiment showed no effect of the EM.

Supported by IRPA Grant 01-02-04-0067