IMPROVEMENT OF PINEAAPLE PRODUCTION THROUGH MECHANISATION: I. AGRONOMIC ASPECT OF PINEAPPLE PRODUCTION ON TROPICAL PEAT IN MALAYSIA

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Introduction

Pineapples are grown mainly on peat soil in Malaysia and the fruits are used solely by the canning industry. A Spanish group cultivar known as Gandul is grown principally for the canning industry and covers maximum land areas in the estates (Selamat and Ramlah, 1993). Despite its large acreage, detailed information regarding the nutritional requirements of the cultivar on tropical peat is limited. As a result, inappropriate application of chemical fertilisers causes nutritional imbalance in the soil and consequently the yield of pineapple is declining at an alarming magnitude (Razzaque et al. 1998) To solve the problems, various investigations were carried out in the field, glasshouse and laboratory during June 1996 to July 1998. The objectives were: (1) To evaluate the role of nutrients (N, P, K, Ca, Mg, and Cu) on growth and yield of pineapple; and (2) to estimate the nutrients leaching losses in the field conditions.

Materials and Methods

Field experiments were carried out at two sites of Peninsula Plantation Estate, Simpang Rengam, Johor. The main features of the two sites are that site 1 has been under continuous pineapple cultivation for last 24 years and that of site 2 for 42 years. Six levels of nutrient elements were used separately. These were nitrogen (0–1000 kg N/ha), phosphorus (0–120 kg P_2O_5/ha), potassium (0–1330 kg K_2O/ha), calcium (0–60 kg CaO/ha), magnesium (0–48 kg MgO/ha), and copper (0– 4.8 kg CuO/ha) from urea, China phosphate rock, muriate of potash, calcium sulphate, magnesium sulphate, and copper sulphate, respectively. The following parameters, such as plant height, number of leaves per plant, fresh fruit yield, fruit length and diameter, fruit acidity, fruit sugar, concentration of nutrients in leaves, and their uptake by plants were measured at various growing stages and at harvest. Leaching losses of the added nutrients were studied in the laboratory using disturbed soil columns. The levels of nutrients added were 0 and 600 kg N/ha, 0 and 72 kg P_2O_5/ha, 0 and 800 kg K_2O/ha, 0 and 30 kg CaO/ha, 0 and 25 kg MgO/ha, and 0 and 3.2 kg CuO/ha. The soil columns were subjected leaching with an amount of water equivalent to the rainfall of 2,352 mm for 28 to 30 days.

Results and Discussion

At both sites, fruit length and diameter increased with increasing levels of N addition up to 800 kg N/ha and declined. The biggest fruit size was obtained at 1000 kg N/ha; for site 1 (1.18 kg) and for site 2 (1.07 kg). Nitrogen uptake increased with increasing levels of N addition and the highest was obtained at 267 kg/ha for both sites. Phosphorus concentrations in the leaves were very high at all ages particularly at site 2. The largest fruit length and diameter were achieved at 24 kg P/ha. The sugar content increased with increasing P addition and the maximum concentration was achieved at 120 kg P/ha for site 1 and 96 kg P/ha for site 2. Conceivable effect of K was observed for number of leaves and fruit diameter for site 1 and fruit length and fruit weight at site 2. Potassium accumulation in leaves was very high for both sites. Fruit with the largest sizes were 1.26 and 1.09 kg obtained with 532 kg K_2O/ha (site 1) and with 266 kg K_2O (site 2). None of the crop character was significantly affected by application of Ca except for fruit length at site 2. Whereas the number of leaves per plant and fruit acidity were affected by Mg addition at site 2. There was no significant effect of Cu addition on the growth characteristics of pineapple on both sites. Nitrogen, P, Ca, and Mg were readily leached from the site 1 but occurred gradually at site 2. Nearly 70-80% of the total amounts of nutrients leached occurred within 3-4 days for site 1 in contrast that the same amounts were leached in more than 7 days for site 2. Leaching of K occurred more or less gradually from both sites. A gradual leaching of Cu was observed for both soils. About 51 and 83.3% of added N was lost from the soils at sites 1 and 2, respectively during leaching 28 days of leaching. In contrast, P incurred a very high loss from both sites. However, significantly higher amount of P was retained in the surface layer of soil column. The loss of K was relatively low with the value of 10.3 and 9.1% of the added K from sites 1 and 2, respectively. Nearly 15% of the added Ca was lost for site 1 and about 26 and 22% of the added Mg were leached for sites 1 and 2, respectively. Relatively, a small amount of Cu (5% of the added Cu) was lost through leaching. A majority of Cu was retained in the layer of soil column. This is attributed to the adsorption of Cu by organic matter in peat.

Conclusions

Agronomic parameters and fruit quality of pineapple grown on tropical peat (sites 1 and 2) varied greatly with the types and levels of nutrients used. Fruit size increased with increasing N level of addition up to 800 kg N/ha and declined. However, the greatest fruit weight (1.31 kg) was obtained following the addition of 24 kg MgO/ha on site1. The optimum level for each nutrient in this study can be derived from the response curve. Due to a great variation of nutrients leaching for both sites (site 1, 3 to 4 days and site 2, within 7 days) the fertilisation programme should be carried out in a precise manner to avoid the leaching losses, thus reducing the fertiliser cost and environmental pollution.

References

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