DECOMPOSITION AND NUTRIENT RELEASE OF OIL PALM EMPTY FRUIT BUNCH IN THE PRESENCE OF N AND K FERTILISERS

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Introduction

Malaysian soils are very deficient in organic matter and nutrients, and recycling of empty oil palm fruit bunch (EFB) back to the land is a sound agricultural practice in line with the overall concept of sustainable agriculture. Use of EFB is one method of sustaining the viability of the oil palm industry. It is widely recognised that integrated nutrient management system involving organic and inorganic fertilisers can contribute to the maintenance of a sustainable system in maintaining high crop yield. Currently, field application of EFB to oil palm is a widely accepted practice. Most of plantations owners recognised the benefits of EFB application to oil palms as a mulch, but little information is available on the process of decomposition and nutrient release from these EFB with and without inorganic fertiliser amendments.

Materials and Methods

Three rates of EFB (0, 37.5 and 75 t/ha/y) were applied to 17- year old oil palms grown on Durian series soil. The EFB were applied in a single layer of 2m width along the oil palm inter-row for the 37.5 t/ha/yr rate, while the 75 t/ha/year rate were applied as double layer in a 2m band. Three rates of N (0, 0.74 and 1.47 kg N/palm/year) were applied as ammonium sulphate (21% N) and 3 rates of K (0, 1.75 and 3.50 kg K/palm/year) was applied as muriate of potash (50% K). A basal fertiliser of 1 kg Phosphate rock (15.7% P) and 2.0 kg ground magnesium limestone (10.2% Mg) were broadcast to all treatments. There were 3 replications for each treatment. Two whole EFB were randomly sampled from each treatment every 2 months until 10 months after application. For the double layer 2 EFB were taken both from top and bottom layer. The samples were dried at 70°C, weighed and ground for analysis. The analysis carried out was total N and K (dry ashing). Data obtained were analysed using analysis of variance and non-linear regression using exponential models were made.

Results and Discussion

The general pattern of decomposition was an exponential model with rapid initial losses in dry matter and declining rates at later stages. Total physical disintegration of EFB took 6 months after which little dry matter loss was observed. The single layer was fastest to decompose followed by double layer top and double layer bottom EFB. The regression equation obtained for the decomposition of single layer EFB was:

Dry matter = 1.9502. $e^{-0.4590 .\text{months}}$, with $r^2 = 0.777$. The dry matter loss of double layer tp EFB was:

Dry matter = 1.6231. $e^{-0.4363.\text{months}}$; with r^2=0.7132, and for the double layer bottom, dry matter loss was:

Dry matter = 1.7485 . $e^{-0.2819.\text{months}}$, with $r^2 = 0.8553$. The addition of inorganic N significantly increased the decomposition rate of single layer EFB with 3.75 kg N/palm /year being significantly affecting decomposition. Higher N rate did not significantly accelerate decomposition. This is in agreement with previous work (Rosenani et al. 1996; Van Vuuren and Van der Eerden, 1992) and thought to be due to enhanced microbial activity (Parr and Papendick, 1978). Inorganic K fertiliser application did not significantly affect decomposition rates. Potassium has been shown to reduce the mineralisation of organic matter in soils (Viro, 1992), but its effects were not detected in this experiment. This is likely due to the inherent high content of EFB-K in the decomposing EFB that could have masked the effects of added inorganic K. There was no release of EFB-N at the end of the 10 months of monitoring. The EFB-N contents remained relatively as high as the original N content in EFB placed in the three layers. The mineralised N from the EFB could have been immobilised by the microorganisms involved in the process of decomposition. The 10 months period used in this experiment apparently was inadequate to detect EFB-N released. Application of N and K inorganic fertilisers did not significantly affect the EFB-N release. The rates of EFB-K release were very rapid in the initial stages where 90% of the total K content was released during the first 6 months. At the 10^{th} month, 99% of the EFB-K was released. The double layer top EFB released K faster than the singe layer and double layer bottom. The exponential models obtained for the EFB-K release showed a very high r^2 value. There was no significant difference detected in the regression coefficients of EFB-K release with the addition of inorganic N and K fertilisers.

Conclusion

The general pattern of EFB decomposition was an exponential model with rapid initial losses in dry matter and EFB-K and declining at the later months. There was no EFB-N release detected during the ten months of field monitoring with and without the addition of inorganic fertilisers. EFB-K was released very rapid and almost complete release of EFB-K was obtained at 10 months. The total amount of K released from 37.5 mt of EFB can supplement the K requirement of oil palm for optimum yield with no extra addition of potassium fertiliser.

References

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