EFFECT OF POTASSIUM FERTILIZER SPLIT APPLICATION ON GROWTH AND YIELD OF RICE PLANT AND SOIL K CONTENTS IN STRAW TREATED IRRIGATED RED YELLOW PODZOLIC SOILS

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INTRODUCTION

Rice is the single most important crop occupying 34 percent (0.77 million ha) of the total cultivated area in Sri Lanka. On average, 646,037 ha are cultivated during *maha* and 419,244 ha during *yala* making the average annual extent sown with rice to about 1,596,390 ha. About 1.8 million farm families are engaged in paddy cultivation island-wide (Central Bank Annual Report 2010).

Potassium is one of the major nutrient elements required for rice crop growth. When the experiments conducted in all agro-ecological zones in Sri Lanka showed that potassium is sufficiently available in majority of lowland rice soils. According to the Amarasiri and Wickramasinghe (1988), rice straw contains 1.3 – 2.0% of potassium. Rice straw contains about 0.6% N, 0.1% each of P and S, 1.5% K, 5% Si and 40% C. Incorporation of rice straw in to the soil returns most of the nutrients mainly potassium and reduce potassium leaching from the soil. Therefore, paddy straw can be used as a source of K with the use of MOP fertilizer. Thus the amount of the recommended potash fertilizers (MOP) can be replaced by straw to a significant level in paddy cultivation. In this paper, dynamics of potassium in soil treated with straw and chemical fertilizer under irrigated conditions are discussed.

The general objective of this research was to evaluate the potassium usage of MOP fertilizer and paddy straw addition to Red Yellow Podzolic soils. The study further investigated the changes of soil K with the application of K fertilizer and rice straw, the effect of K application on rice production and the ways of reducing the amount of K fertilizer application.

MATERIALS AND METHODS

This experiment was conducted at the Rice Research and Development Institute, Batalegoda in Low Country Intermediate Zone of Sri Lanka in 2010/2011 *Maha* season to evaluate the dynamics of potassium in soil treated with straw and chemical fertilizer under irrigated conditions. Experiment comprised with six treatments namely: N, P, Zn fertilizer (T1); N, P, Zn with Rice Straw (T2); N, P, Zn, 15 kg of K (at Basal), 20 kg of K (at Panicle Initiation) with Rice Straw (T3); N, P, Zn, 15 kg of K (at Basal) with Rice Straw (T4); N, P , Zn, 20 kg of K (at Panicle Initiation) with Rice Straw (T5); N, P, Zn, 15 kg of K(at Basal) with 20 kg of K (at Panicle Initiation) (T6). The experiment was conducted using Randomized Complete Block Design with four replicates.

Rice straw was incorporated at the rate of 5 t/ha, at two weeks after 1st ploughing. Soil samples were taken before planting and after harvesting. Plant samples were taken at 50% of flowering stage. Soils samples were analyzed for exchangeable K and Non-Exchangeable K and plant samples were analyzed for total K contents. At Harvesting, number of panicles per plant, number of seeds per panicle, percentage of filled grain per panicle and 1000 grain weight (at 14 % moisture content) were recorded.

Difference between the treatments was tested by the Analysis of Variance (ANOVA) using SAS Software package. Duncan's New Multiple Range Test was used for the mean separation of the treatments.

RESULTS

Exchangeable K content in all six treatments was significantly low at planting and at harvesting. There was no significant difference in exchangeable soil K between fertilizer treated and straw treated plots (Figure 1). Dry matter yield of arial parts, yield components and grain yield were also not significantly different among the six treatments. Significant differences in K concentration of plant parts (Figure 2) and the soil non-exchangeable K content were observed. At harvesting, soil non exchangeable K content in all the plots treated rice straw were over 100mg/kg while it was below the 100mg/kg in non treated plots. Non exchangeable K contents in T3 (N, P, Zn, 15 kg of K (at Basal), 20 kg of K (at PI) with Rice Straw) and T4(N, P, Zn, 15 kg of K (at Basal) with Rice Straw) were similar and there was no significant difference among specified treatments.

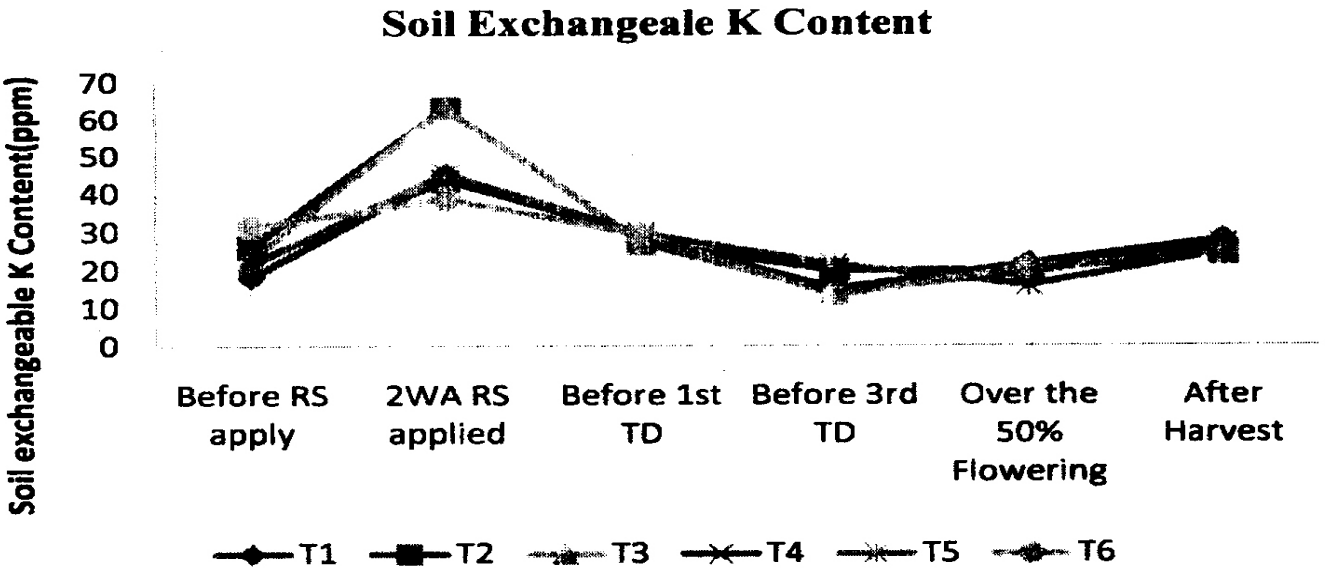
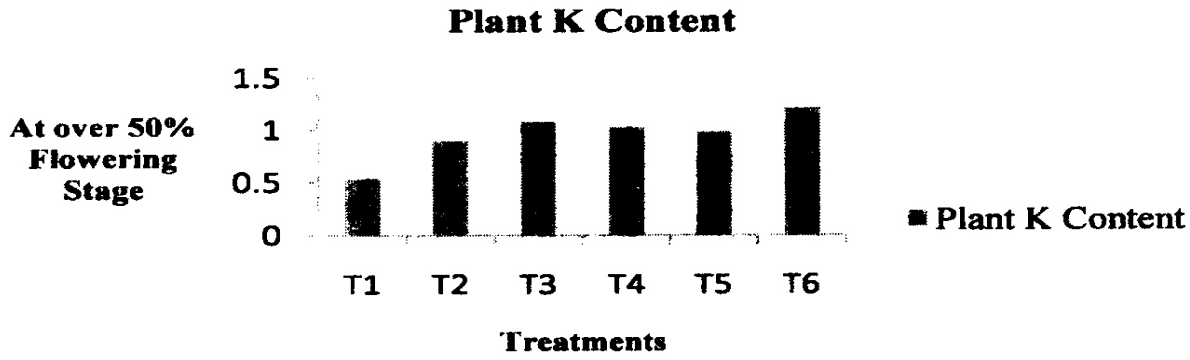


Figure 1- Mean Values of Soil K Content



Application of rice straw is necessary to maintain K content in paddy soils. As such, application of chemical fertilizer can be cut down by half when rice straw is added to paddy fields without affecting soil K content or the grain yield of rice. Measurement of non exchangeable K content of soil is far much better indicator to estimate the importance of application of rice straw on K dynamics in soil, yield and yield components of rice compared to the exchangeable K content.

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