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Adaptation of Fertiliser Application Strategies to Low Temperatures at High Altitudes Sites in Lowland Rice

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Abstract

Rice in Rwanda is mainly produced in irrigated systems. Since Rwanda is a very hilly country rice is produced over a large gradient in altitude with the lowest production system situated at 900 m and the highest at about 2000 m above sea level. This results in significant differences in the thermal growth environment for rice cultivars grown at the different altitudes. However, official fertiliser application recommendations do not differentiate between growing environments resulting in a mismatch between nutrient requirements in specific growth stages of the plant and fertiliser application strategies. Hypothetically, in early growth stages rice at high altitudes will take up smaller amounts of nitrogen as compared to lower altitudes as low root zone temperatures may slow down growth and N uptake rates. Therefore, a basal N application could be reduced or omitted thus reducing unproductive losses of applied fertiliser. Field trials were established at two locations (900 and 1600 masl) investigating the response of 5 contrasting rice varieties to three N application rates (80, 120 and 160 kg ha^{-1}) with and without basal dressing and three further top dressings at mid-tillering, panicle initiation and heading. Root zone temperatures were 3.6oC lower at high altitude during the first planting date and 2.2oC during the second planting date. Duration to panicle initiation and flowering differed as function of planting dates and genotypes. Thermal conditions at high altitude site increased duration by 10–15 days depending on the genotype during the first planting date, and by 8 to 24 days during the second planting date. Thermal conditions during the second planting date increased duration to flowering by 11–14 and 1–18 days depending on the genotype at high and low altitude sites respectively. The high altitude site was the most affected by N split. Both grain yield and yield parameters were affected by N split. The Omission of basal application and increase of N application at mid-tillering and panicle initiation at high altitude location have increased the number of panicles, the 1000-grain weight and grain yield; but no significant effect of N split on yield and yield components was found at low altitude site.

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