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Effect of Fertiliser Rates and Splits on Lowland Rice in two Temperature Environments in Rwanda – With a Special Focus on the Effectivity of Basal Applications

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Abstract

In Rwanda, rice is cultivated across a large altitude gradient. However, the recommended fertiliser application rate does not differ across these altitude gradients, 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, the basal N application could be reduced or omitted thus reducing unproductive losses of applied fertiliser. To test this hypothesis, field trials were established at two locations (900 and 1600 m a.s.l.) in Rwanda, investigating the response of 5 contrasting rice varieties to three N application rates (80, 120 and 160 kg ha^{-1}). Different splits of these fertilisers were tested, with and without basal dressing and three further top dressings at mid-tillering, panicle initiation and heading. Two sowings were conducted in 2016 (February and July) and two others in 2017 (January and April). Duration to flowering was 25–34 days, 33–47, 39–46 and 83–123 longer at high altitude than at low altitude during the first, second, third and fourth planting dates, respectively, depending on the genotype due to thermal conditions. Mean air temperatures were 4.91°C, 4.10°C, 4.14°C and 4.96°C lower at high altitude during the first, second, third and fourth planting dates respectively. At the high altitude, when shifting the N application from basal to mid-tillering and panicle initiation, the number of panicles, percentage filled grains, 1000-grain weight and grain yield increased. At the low altitude, there was no significant effect of different N splits tested for yield and yield components. As expected from the temperature conditions, the grain filling percentage was higher at the low altitude as compared to the high altitude. Yields at low altitude were higher than at high altitude across the planting dates. The potential improvements to fertiliser recommendations might include omission of basal N and shifting the N application to mid-tillering and panicle initiation stages at high altitudes.

Keywords: Altitude gradient, nitrogen, planting dates

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