UNIVERSITY OF HOHENHEIM

Institute of Agricultural Sciences in the Tropics (Hans-Ruthenberg-Institute) (490)

The effect of fertilizer rates and splits on lowland rice grown in two temperature environments in Rwanda

Boshuwenda Chuma Andre [*1,3], Kalisa Alain[3],Senthilkumar Kalimuthu [2], Arisoa Rajaona [2], Marc Cotter [1], Folkard Asch [1]

(1) University of Hohenheim, Management of Crop Water Stress in the Tropics and Subtropics (490g);
(2) The Africa Rice Center; (3) Rwanda Agriculture Board

Introduction

Even though significant differences in the thermal growth environment for rice cultivars grown at the different altitudes are acknowledged, official fertilizer application recommendations often do not reflect this. The consequence is a mismatch between nutrient requirements in specific growth stages of the plant and fertilizer application strategies.

Conclusion

- Application of basal N results in lower yields at high altitude.
- It can lead to a high number of unproductive tillers and/or a lower number of spikelets per panicle.
- Basal N decreased yield component's direct effects on grain yield.

Results and Discussion

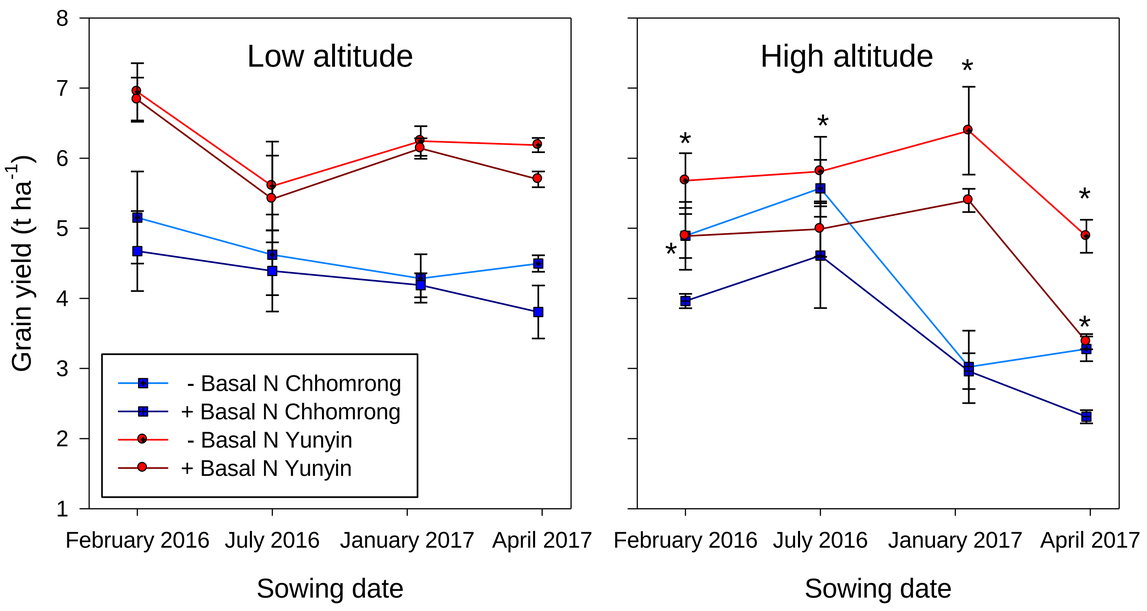

Fig. 1 Grain yield of two genotypes as affected by N splits at low and high altitudes. (*) indicates significant difference. Bars are standard errors.

- Grain yield was negatively affected by application of basal N at high altitude (Figure 1)
- ➢ Farmers should adapt their fertilizer management
- Grain yield variation is higher at high than low altitude
- ➢ Flexible sowing schedule at low altitude is possible
- Basal N application decreased PPT, SPP, PFS and TGW (Table 1)
- Higher TPH and PFS directly effect grain yield with postponed basal N at tillering and panicle initiation stages (Figure 2)
- ➢ Basal N should be postponed to tillering and panicle initiation stages to reduce unproductive tillers

Table1: Yield components as affected by application of basal N at high altitude during the second sowing date. Letters are mean separation with LSD.

	Chhomrong		Yunyin	
	- Basal N	+Basal N	- Basal N	+ Basal N
TPH	14.6 a	13.7 a	13.7 a	14.3 b
PPT (%)	81.0 a	80.0 a	84.6 a	78.8 b
SPP	74.7 a	66.5 b	91.1 a	76.3 b
PFS (%)	82.8 a	73.0 b	80.4 a	78.9 a
TGW (g)	35.0 a	33.8 b	30.2 a	28.9 b

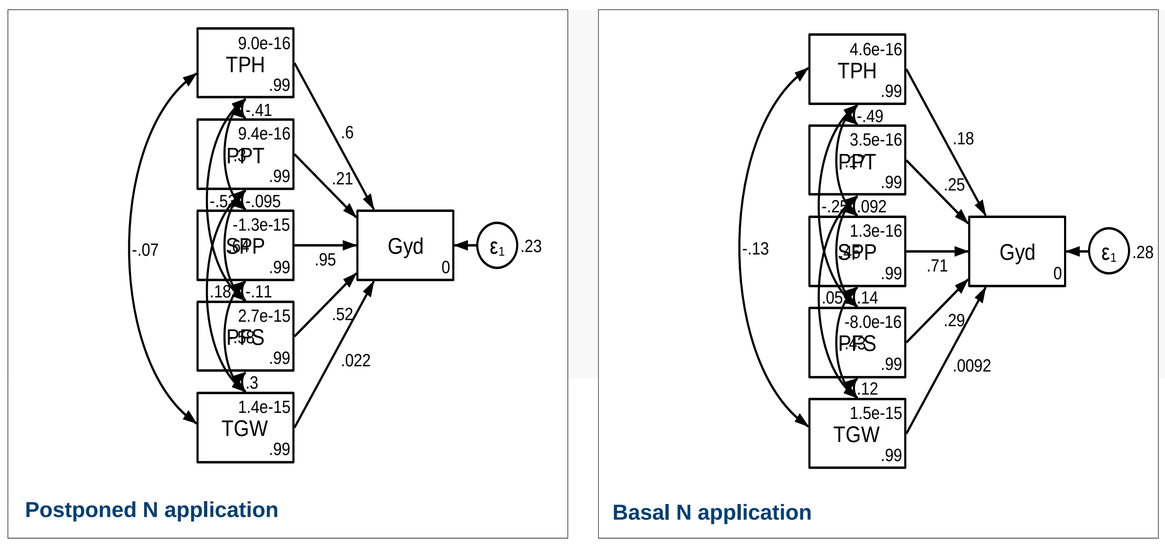

Fig. 2 Path analysis diagram by splits at high altitude; postponed N application (left) and basal N application (right). Abbreviations: Gyd, grain yield; TPH, tillers per hill, PPT, percentage of panicles per tiller; SPP, spikelets per panicle; PFS, percentage of filled spikelets; TGW, thousand grain weight. Arrows and values towards Gyd indicate direct effects of a yield component on grain yield.

Material and Methods

This experiment was conducted in two marshlands located at 1600 and 900 m asl in Rwanda. Fertilizer treatments consisted of three N rates (80,120 and 160 kg ha^{-1}) in two splits, with and without delayed basal application. Climatic data were recorded at 30 minutes interval with mini meteorological stations placed at the experimental sites. Panicles were hand-harvested at maturity stage from an averaged 3-hill sample in each subplot for the quantification of yield components. P and K rates of 30, 40 and 60 and kg ha^{-1} were applied to the plots which received total N rates of 80, 120 and 160 kg ha^{-1} respectively. Two contrasting genotypes, Chhomrong and Yunyin were used for this study.