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Effectiveness of reduced rates of N on productivity and economic returns of Sorghum in Striga infested semi-arid areas of Tanzania

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Abstract

Performances of three sorghum (*Sorghum bicolor* L. Moench) genotypes (Wahi, Hakika and Pato) and inorganic soil amendments (i.e. 10, 20, 30, 40, 50 and 60 kg N/ha) were studied under naturally *Striga asiatica* [L.] Kuntze infestation for one cropping season (2015/16) in two locations: Ngamu (6° 37' 10" S; 34° 57' 05" E, and altitude of 1650 m.a.s.l) and Hombolo (5° 54' 29" S; 35° 57' 36" E, and altitude of 1020 m.a.s.l). It was use a split plot design laid out in a randomized complete block design with four replications. A susceptible sorghum (Pato cultivar) was used as a bioassay to evaluate the effectiveness of reduced rates of N under *Striga* infestation.

At Hombolo, 40 kg N/ha had significantly ($P < 0.05$) lower emerged *S. asiatica* shoots count/m² than all other rates of N, except at 11 week after planting (WAP). Yields with 30 kg N/ha (0.64 t/ha) was significantly ($P < 0.05$) lower than yields from all other rates of N (1.08 - 1.52 t/ha). At Ngamu, fertilization played no significant ($P < 0.05$) role in *S. asiatica* emergence and attachment. Yields with 10 kg N/ha (4.89 t/ha) was significantly ($P < 0.05$) lower shoots than yields from all other rates of N (5.2 - 6.0 t/ha).

Across locations, variety Hakika had significantly ($P < 0.05$) fewer emerged *S. asiatica* shoots count/m² compared with varieties Wahi and Pato. At Hombolo, Yields on Hakika variety (0.96 t/ha) was significantly ($P < 0.05$) lower than the yield in all other varieties (1.21 - 1.28 t/ha). At Ngamu, variety Pato gave more yields (7.21 t/ha) than the other varieties (2.81 - 5.95 t/ha).

At Hombolo, when rates of N were applied, economic analysis showed no maximum net profit was gained since it resulted in economic loss. Benefit-cost ratio for sorghum production showed that for every shilling invested, there was a loss of -550/= Tshs and -810/= Tshs for 60 kg N/ha and 30 kg N/ha, respectively. The best treatments for *S. asiatica* control were 30 and 40 kg N/ha with 24 140 and 13 670 Marginal Rate Return (MRR), respectively.

At Ngamu, where farmer's field trial was located, economic analysis showed that the highest net income (Tsh 1 912 160/= per hectare) was obtained from 50 kg N/ha and the lowest income (877 160/= Tsh) was obtained with 10 kg N/ha. Benefit-cost ratio for sorghum production, the results showed that for every shilling invested, there was a return of 470 and 220 for 50 kg N/ha and 10 kg N/ha, respectively. The best treatments for *S. asiatica* control were 40 and 10 kg N/ha with 2 330 and 3 800 MRR, respectively.

This study showed that the most effective rates of N; 40 and 60 kg N/ha (Hombolo) and 50 kg N/ha (Ngamu) should be promoted in semi-arid areas of Tanzania where *S. asiatica* poses a serious threat. Results also showed that varieties Hakika and Wahi proved their resistance/ tolerance to *S. asiatica* compared to variety Pato.

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