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Full Length Research Paper

Comparative productivity of nitrogen-use efficient and nitrogen-inefficient maize cultivars and traditional grain sorghum in the moist Savanna of West Africa

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Abstract

Strategies to cope with low fertilizer use in West Africa include choice of crop (that is., sorghum vs. maize) and the development of nitrogen-use efficient maize (*Zea mays* L.) varieties. A two-year field study was undertaken to compare the N response of an N-use efficient maize (hybrid, cv. 8644-27) and a nitrogen-inefficient maize (cv. TZB-SR), and to compare the productivity of the two cultivars with a traditional grain-sorghum (*Sorghum bicolor* [L.] Moench) in the moist savanna agroecosystem in Zaria, Nigeria. The two maize cultivars were evaluated under three N levels (0, 60, and 120 kg ha⁻¹). Sorghum (cv. 'mori') was evaluated under 0 and 120 kg N ha⁻¹. Mean grain yield was 0.5 Mg ha⁻¹ greater for N-use efficient than for N-inefficient maize, mostly because of its larger harvest indices for dry biomass and for N, and a greater N-utilization efficiency. In both years, with 120 kg N ha⁻¹ applied, grain yield and grain-N were 54 to 275% higher in maize than in grain sorghum. Under nitrogen stress (zero -N), grain yield of the N-efficient maize was similar to that of grain sorghum. But sorghum had 2 to 3 times greater total aboveground dry-matter yield and 165 to 230% higher total N-uptake than the maize cultivars, suggesting that sorghum was exhausting the soil of a greater amount of mineral-N than maize. Results showed that even under limiting nitrogen supply, a maize-based system with N-efficient maize was potentially more ecologically sustainable than a sorghum-based system involving traditional grain sorghum.

Key words: Cereal-based systems, grain sorghum, moist savanna, N-efficient maize, N-inefficient maize, N-utilization efficiency, West Africa

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