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Nitrogen Use Efficiency of Some Maize Genotypes Improved or Selected for Tolerance to Low Nitrogen and Drought Stress

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Abstract

Nitrogen is often the most limiting nutrient in maize production in the West African savanna. One important characteristic of maize is its high and relatively rapid nutrient requirement. The soils for example must supply about 50–60 kg N (usually nitrate) ha^{-1} in plant available forms for each ton of grain produced. In the West African savannah where maize is increasingly becoming important, inorganic fertilizer use is limited due to high cost and unavailability. One approach to reducing the impact of N deficiency on maize production may be to select cultivars, which are superior in the utilization of available N, either due to enhanced uptake capacity or because of more efficient use of the absorbed N in grain production.

Low-N tolerant variety trials that included promising varieties from diverse sources and hybrid checks were conducted in Mokwa (southern Guinea savanna zone) and Zaria, (northern Guinea savanna zone) of Nigeria. The treatments consisted of 15 entries and three N levels (0, 30, and 90 $^{kg}/_{ha}$). At each N level, the varieties were arranged in a randomised complete block design (RCBD) with three replications. The varieties ACR8328C7, ACR91SUWAN, DTSR-W, DTSR-Y, LNPC2, LNPC3, STR-EV-IWD and the hybrid OBASUPER1 produced the highest grain yields across N levels in both locations. Under sub-optimal N levels (30 $^{kg\ N}/_{ha}$), all these varieties out-yielded OBASUPER1 . Among the high yielding varieties, ACR8328C7, DTSR-W, ACR91SUWAN, LNPC3 had higher nitrogen use efficiency (NUE) while the rest performed well because of high nitrogen utilization efficiency. Populations and pools with high yield under low nitrogen conditions have been identified and are being further improved.

Keywords: Drought, maize, nitrogen use efficiency, low-nitrogen tolerance

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