

Assess the Nitrogen Use Efficiency of Maize (*Zea mays* L.) Cultivated with Different Nitrogen Fertilizer Rates, Combinations, and Stabilized Methods

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Nitrogen use efficiency (NUE) of Maize cultivation is about 33%, and the remaining 67% of applied Nitrogen is lost, causing severe monetary loss and environmental pollution. Different Urea fertilizer rates combined with Urea stabilizers, Bio-char compound fertilizers, and super absorbent polymers (SAP) have the potential to enhance the NUE. A field experiment was conducted at the Experimental Station of the University of Peradeniya at Dodangolla to evaluate the growth and production of maize, Agronomic NUE (AE_N), and Ammonia emission under eight treatment combinations. There were four urea fertilizer rates (T1-0%; T2-75%; T3-100%; T4-125% of Department of Agriculture recommendation [DOA] of 315 kg/ha), two urea fertilizer rates amended with SAP (T5-100%; T6-75% of DOA), T7-75% DOA amended with DCD/NBPT, and T8-Bio-char compound fertilizer (Bio-Carbon Hybrid [BCH]). The DCD 15%, NBPT 30% commercially available stabilizer was used with the rate of 2 ml per 1kg of urea in the T7. The result showed that cumulative Ammonia Nitrogen loss was below 2% of the applied Nitrogen amount. The highest ammonia emission was observed in T2, T3, and T5. The T6, T7, and T8 reported more than a 50% reduction in Ammonia emission compared to T2, T3, T4, and T5. The DOA-recommended Nitrogen fertilizer rate amended with SAP (T5) gave the highest AE_N . There was no significant difference ($p < 0.05$) in AE_N among T2, T4, T6, and T7. The green cob yield did not show a significant difference ($p < 0.05$) among 100% (T2) 125% DOA recommendation (T3), 100% DOA recommendation with SAP (T5), 75% of recommended Nitrogen rate amended with DCD/NBPT (T7) and BCH (T8). Results suggest that the DOA-recommended urea rates could be reduced by 25% without yield reduction by amending urea with SAP, DCD/NBPT, and BCH.

Keywords: Agronomic efficiency of nitrogen, DCD, NBPT, SAP, Urea stabilizers

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