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Decomposition and Nitrogen Release Rates of Buried Chickpea (*Cicer arietinum* L.) Residue in a Mollic Phaeozem of Njoro, Kenya

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Abstract

Synchronization of nutrient release from organic material and nutrient uptake requires a better understanding of plant residue decomposition kinetics. A field experiment was consequently conducted, at field 7 research station of Egerton University, to determine chickpea residue decomposition and N mineralization rates.

Fresh chickpea residue, weighing 50 g, was placed in each of the fifteen 7 mm-mesh litterbags measuring 25 × 25 cm. The litter bags were arranged in a randomized complete block design and buried horizontally in the plough layer with five bags per replicate. One bag was randomly retrieved from each replicate after 10, 20, 30, 60 and 90 days. Dry weight of the residue was recorded after oven drying at 70°C for 48 hours.

The decomposition (KD) and N release (KN) rate constants were estimated using a single exponential model $Y_t = Y_0 \times e^{-kt}$; where: Y_0 is the original amount of material applied and Yt the proportion of the initial dry matter or N remaining after a period of time t, in years. The K value was the slope of the linear regression of $l\eta Y$ verses t.

The chickpea residue initially decomposed rapidly with 67 % of the original weight being lost within the first 30 days and 80, 94 % by 50 and 90 days, respectively. On a logarithmic scale, the calculated KD was -11.05 year^{-1} and 20 days were required for 50 % loss in dry weight.

Nitrogen released from the residue followed the same trend as dry weight loss. The calculated KN of the chickpea residue was -3.11 year^{-1}. The cumulative N mineralized, in 30 days, was 18.9 g kg^{-1} (58%) out of the 32.4 g kg^{-1} contained in the residue before incorporation in soil.

To synchronize nutrient release and nutrient demand, the chickpea residue incorporation should therefore be done closer to planting to benefit the subsequent crop.

Keywords: Chickpea, decomposition, litter bags, nitrogen release, synchrony

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