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Development of a new slow release biomass fertilizer system using urea incorporated crape-jasmine plant bark particles

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Urea is one of the fast release nitrogen (N) fertilizers that dissolves within few days with sufficient amount of water in soil matrix. The excessive use of urea can weaken the overall health of the plant and lead to adverse environmental issues such as eutrophication. Slow-release fertilizers may overcome these complications. In this research, a new slow release fertilizer system was developed using urea incorporated *Tabernaemontana divaricata* (Apocynaceae) plant, which is commonly named crape-jasmine. New fertilizer system was prepared from crape-jasmine bark particles (< 5 mm) after treating with a saturated solution of urea. Crape-jasmine plants were obtained from Rathmalagara estate, Madampe in Coconut Research Institute (CRI), Sri Lanka. The release patterns of nitrogen from urea incorporated crape-jasmine bark particles (10 g) in a soil matrix (200 g) were investigated using columns with deionized water (pH 6.7). Parallel studies were carried out to evaluate the leaching patterns of commercially available three nitrogen fertilizers sold in Sri Lanka in the soil matrix using the columns. Control reactions were carried out with urea in a soil matrix and soil matrix alone. Each experiment and analysis was carried out in triplicate. According to the experimental results, the level of nitrogen (N) in leaf, mid rib, root, bark and stem of the plant varied from 5,313 mg/kg to 12,740 mg/kg. It was found that phosphorous (P) and potassium (K) content in the plant varied from 268 mg/kg to 1,805 mg/kg and from 289 mg/kg to 906 mg/kg respectively. Nitrogen content was increased by more than five-fold giving the maximum value of 72,240 mg/kg after crape-jasmine chips were treated with saturated urea. The initial nitrogen content in the bark was 12,565 mg/kg. Experimental results indicated that within 24 hours, more than 80% of the nitrogen was eluted from urea and commercially available fertilizers in the soil matrix given. But, only 24% of nitrogen was eluted from urea incorporated crape-jasmine bark particles within 24 hours. After 15 days, eluted nitrogen amount was recorded as only 50% from the incorporated crape-jasmine bark particles indicating that N was released in a slow release pattern. Therefore, crape-jasmine can be identified as a potential N fertilizer carrier and urea incorporated crape-jasmine bark particles can be further developed as a new slow release biomass fertilizer system.

Keywords: Biofertilizers, crape-jasmine, nitrogen, slow-release fertilizers, urea