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VOLATILIZATION LOSS FROM UREA AND MODIFIED FORMS OF UREA

Urea is the most commonly used nitrogenous fertilizer because of its high nitrogen content, hydrolysable nature, lower cost and easy availability. Urea when applied to soil is hydrolysed by the enzyme urease to ammonium carbonate and carbon dioxide. As ammonium carbonate is unstable, it dissociates to ammonium ion and carbon dioxide. The free ammonia formed in this process is usually lost to the atmosphere by volatilization. Volatilization loss of ammonia from applied urea is reported for both acid and calcareous soils (Fenn and Miyamotto, 1981; Fenn and Hossner, 1985; Rao and Batra, 1983), the loss being more in the latter. The nitrogen loss through ammonia volatilization is higher when the rate of application of urea is more (Sharma and Gupta, 1989). Many reports are available about the use of coating materials like neem cake on delaying nitrification and ammonia volatilization loss from urea (Bains *et al.*, 1971; Duraiswamy and Palaniappan, 1990). Coating of urea with indigenous materials like neem cake and tar are reported to improve the efficiency of applied urea in rubber growing soil mainly through delaying the nitrification process (Karthikakuttyamma *et al.*, 1994; George *et al.*, 2000). The present study was undertaken to study the nitrogen loss from surface applied urea at different rates of application and the effect of modified forms of urea on reducing the loss of ammonia.

The incubation study was conducted according to the standard method of Sharma and Gupta (1989). The soil used for the study was collected from the experimental area of the Rubber Research Institute of India (RRII) farm at Kottayam in Kerala state. The soil used for the study belonged to the taxonomic classification of ustic khandihumults. It was acidic (pH 4.39), high in organic carbon status (2.59%), sandy clay loam in texture with a cation exchange capacity of 8.2 cmol (p+)/kg. Soil samples were collected from the top 0-30 cm layer, air-dried and sieved through 2mm mesh and 250g was placed in a 500ml conical flask. Two test tubes, one containing 5ml of 4 percent boric acid and the other containing 2.5ml of 20 per cent barium peroxide were suspended in the flask using a thread. Boric acid was used to absorb the ammonia evolved from the fertilizer applied and barium peroxide for obtaining ample supply of oxygen into the system. Moisture of the soil was maintained at field capacity. Urea at different rates *viz.*, 100, 250 and 350 kg N/ha and three modified forms *viz.*, neem cake blended urea, neem coated urea and nimin coated urea at the rate of 250 kg N/ha were placed on the soil surface. The flasks were closed with rubber cork and incubated. Each treatment was replicated five times. A blank with no fertilizer was also run. At every 24 hour intervals, the test tube containing ammonia absorbed in boric acid was taken out and titrated against standard 0.01N hydrochloric acid using mixed indicator, methyl red and bromocresolgreen. Barium peroxide was renewed every two days. Ammonia volatilized was calculated as per cent loss of nitrogen from the applied nitrogen.

A nitrogen loss of 2.6 per cent occurred when urea equivalent to 250 kg N/ha, the nursery application dose was applied (Table 1). Whitehead and Raistrick (1990) reported a cumulative ammonia volatilization loss of 0.6 per cent in 9 days for soils having pH 3.7. Similarly, a nitrogen loss of 3.2 per cent from a soil having pH 4.8 under banana cultivation was reported by Prasertsak *et al.* (2000). The present observation is thus comparable to the earlier reports for acidic soils. The loss of ammonia was found to occur from the second to the tenth day of incubation. No ammonia evolution recorded on the first day in any treatment. Maximum loss was observed on the third day and there after the