

Assessing Agronomic Nitrogen Use Efficiency of Potato Cultivated in Nuwara Eliya Using Controlled, Released and Stabilized Nitrogen Fertilizers

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Groundwater pollution due to excessive use of agrochemicals especially chemical fertilizers is a major concern in the upcountry region. Potato cultivation is a key contributor to this problem in Nuwara-Eliya and Badulla districts. A pot experiment was conducted at Agricultural Research Station, Sitha-Eliya, Sri Lanka, to examine the effect of different nitrogen fertilizer sources, rates, and the use of stabilized urea on growth, tuber yield, and the agronomic Nitrogen Use Efficiency (NUE) of potato. The experiment was arranged in a completely randomized design with five replicates consisting seven treatments; T1: no nitrogen fertilizer (control), T2: Department of Agriculture recommendation (150 kg N/ha), T3: farmer practice in the region (220 kg N/ha), T4: farmer practice +10% (weight basis) nitrogen stabilizer (Dicyandiamide [DCD], and N-(n-butyl) thiophosphoric triamide [NBPT]), T5: 75% farmer practice + 10% (weight basis) nitrogen stabilizer, T6: Yara fertilizer (116 kg N/ha), T7: Yara fertilizer + 10% (weight basis) nitrogen stabilizer. Leachate and plant growth parameters were measured weekly. The results showed significant differences for plant height, tuber number, and tuber yield in T6 and T7 compared to T2 ($p < 0.05$). The highest yield was recorded in Yara fertilizer + 10% nitrogen stabilizer (T7), which was 26.2 t/ha and 35.75% higher yield than the T2. T6 and T7 showed significant differences in Agronomic N use efficiency (AE_N) compared to T2 ($p < 0.05$). T7 reported the highest AE_N and it was 132.46 kg tuber yield per kg of N applied compared to the control. Results showed that the application of a higher dose of N in the basal dressing increased N leaching and acidification of leachate, which exceeded WHO standards for NO_3^- N concentration in the leachate. Application of nitrogen stabilizers to inorganic fertilizers can reduce leaching of NO_3^- , while increasing yield potential of potato, AE_N , and providing significant environmental and economic benefits.

Keywords: Agronomic efficiency of nitrogen, DCD, NBPT, Potato, Urea