Can Inhibition of Soil Nitrification Increase Potato Crop Growth in an Ultisol Under Plant-house Conditions?

Ranabahu S.A., Dandeniya W.S. [*], Nissanka S.S.P.[1] and Abethilakerathne P.D.[2]
Department of Soil Science,
Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka

A study was conducted to assess the effect of nitrification inhibition on potato crop growth and nitrate leaching from the soil under plant-house conditions. First, cinnamon leaf powder (CLP), cinnamon oil (CO), Venivelgeta powder (VP) and dicyandiamide (DCD) were added separately to a soil (Ultisol soil order) collected from a potato grown field and their impact on potential nitrification rate (PNR) was assessed. Application of CLP resulted in significantly (P<0.05) low PNR (1.12 µg/ml/day) followed by VP (6.84 µg/ml/day) and CO (10.46 µg/ml/day). Comparable PNR were observed for the DCD-applied treatment and soil-only control (13.30 and 12.01 µg/ml/day, respectively). Secondly, a pot experiment was conducted in a plant house in Nuwara-Eliya, where potato was grown with seven N-treatments; zero urea (T1), urea applied at 100% recommended rate (T2), T2+DCD (T3), T2+CLP (T4), T2+VP (T5), and T2-25% urea (T6) T2+25% urea (T7). Leachates was collected from pots after each irrigation event that allowed free drainage and measured for NO_3^- concentration. At 70 days after planting crop was harvested and yield and plant dry-biomass were recorded. Cumulative NO_3^- leached was significantly (P<0.05) different between treatments and the lowest was observed in T1 (29.4±1.25 mg). Cumulative NO_3^- leached from T3 and T4 were comparable to T1. The highest values were observed for T2 (45.7±3.47 mg) and T7 (46.9±3.54 mg). Potato yield was significantly affected (P <0.05) by treatments. The highest yield was recorded in T4 (311±4.1g) and the lowest was in T3 (203±20.7g). Potato yields for T7 (287±29.1g) and T5 (253±29.1g) were comparable. Results indicated that the CLP, VP, and CO are effective in suppressing nitrification in the studied potato-grown soil while DCD did not show strong effective nitrification inhibition. Further, CLP was effective in improving growth of potato.

Keywords: Cinnamon, DCD, Nitrification inhibitors, Venivelgeta

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[1]Dept. of Crop Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka
[2]Agricultural Research Station, Seetha-Eliya, Sri Lanka
[*]warshisd@agri.pdn.ac.lk