

AUTOTROPHIC NITRIFYING BACTERIA AS AFFECTED BY NEEM (*Azadirachta indica*) PRODUCTS

R.M.C.P. RAJAPAKSHA

Department of Soil Science, Faculty of Agriculture, University of Peradeniya

Neem seedcake and seed powder extracts are widely used in organic farming as a fertilizer and a pesticide. In addition, inhibitory effects on autotrophic nitrifying bacteria have also been documented. This study was conducted to assess the potential inhibitory effects of neem seedcake and neem powder extractions on autotrophic nitrifying bacteria. Undisturbed soil samples were collected into PVC cores from vegetable growing plots at Nuwara Eliya. Treatments were control, neem seedcake and neem powder extracts, replicated three times. All nine core samples were incubated at 70% moisture content for 40 days. Sub samples were taken from each soil core in every fourth day. Colony forming units (cfu) of heterotrophic bacteria and fungi were counted by the agar plate technique. Autotrophic nitrifying bacteria were enumerated using the Most Probable Number technique. Potential nitrification activity (PNA) was assessed in soil slurries provided with optimum growth conditions for nitrifiers with respect to moisture, pH, substrate and oxygen. Soils were also analyzed for KCl extractable NH_4^+ and NO_3^- levels colorimetrically.

Fungal population of the neem seedcake treated soils increased from 9.7×10^3 to 8.3×10^5 cfu g^{-1} soil by the 12th day and then declined gradually. Heterotrophic bacteria showed the same trend with a peak of 8×10^7 cfu g^{-1} soil at the 8th day of incubation. Concentrations of KCl extractable NH_4^+ reached a maximum of 290 mg g^{-1} soil by the 16th day of incubation and declined thereafter. In contrast, NO_3^- levels showed a drastic increase during the first four days and remained at about 95 mg-N g^{-1} soil until the end of incubation. A 10- to 100-fold increase in the population of nitrifiers was observed in the neem seedcake treatment in comparison to that of control, 97750 cells g^{-1} soil. The trend observed for the PNA was similar to that of the population dynamics of nitrifiers. The maximum rate of PNA observed for the neem seedcake treatment was 66 $\mu\text{g g}^{-1} \text{soil d}^{-1}$ and coincided with the highest population density of nitrifiers. Results obtained from the soils neem powder treatments were comparable to those of neem seedcake treated soils.

Population size and activity of nitrifiers of neem treated soils remained much higher than the control throughout the incubation. During the first two weeks of incubation, major fraction of NH_4^+ released from neem seedcake was immobilized by rapidly growing heterotrophic bacteria and fungi. Consequently, nitrifiers were out-competed in the competition for NH_4^+ resulting in a slow growth. Nevertheless, their population increased towards the latter part of the incubation. Therefore, results indicated that initial lag in the activity of nitrifiers was due mainly to the limited availability of NH_4^+ and not due to an inhibitory compound release from the tested neem products.