THE LOSS OF SOIL NITROGEN BY DENITRIFICATION PROCESSES IN TEA SOILS

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Gaseous loss of nitrogen (N_2 and N_2O) with the exception of ammonia volatilization is referred to as denitrification. Nitrate ions denitrify in the soil but NH_4^+ ions do not (Broadbent and Stojanovic 1952).

The rates of evolution of N_2, N_2O and Co_2 from St. Coombs soil were measured under steady state gas flow conditions (Wickremasinghe *et al.*, 1978). In surface soil (0-15 cm) under anaerobic conditions (0.5% 0_2 in a helium atmosphere) N_2 and N_2 O evolution was observed in the effluent gas stream after six hours of anaerobiosis. N_2 and N_2O accounted for 40-60 percent of the nitrate lost. Proportionately more N_2O was produced than N_2. The production of CO_2 was proportional to N_2 and N_2 O evolution dropping sharply to a steady rate when the soil nitrate was exhausted indicating that nitrate respiration was responsible for this. The final steady rate of CO_2 evolution resulted from fermentative reactions in the soil.

Addition of increasing amounts of nitrate merely extended the period of denitrification and not its rate. Gaseous (N_2 + N_2O) losses at pH 6 was only 8% more than that at pH 4 and no nitrite was found in the incubated soil. This suggests that significant losses as NO were unlikely.

Denitrification was not observed in subsurface, 15-30 cm depth, soil which contained large amounts of indigenous soil nitrate even after adding glucose. Inoculating this soil with increasing amounts of the surface soil up to 15% by weight induced substantial denitrification.

If these observations are generally true of tea soils, then large amounts of the nitrate in the subsurface soil resulting from the leaching of nitrified $(NH_4)_2 SO_4$ will not be lost by denitrification even under truly anaerobic conditions because of the absence of denitrifiers in the soil below 0-15 cm depth. However, our measurements suggest that after nitrification, anaerobiosis even for a few hours in these *surface soils* could cause substantial losses of ammonium and urea nitrogen fertilizers by denitrification.

References:

Broadbent, F. E. and Stojanovic, B. J. (1952). The effect of partial pressure of O_2 on some soil nitrogen transformations. Soils Science Society American Proceedings. 16, 359-363.

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