



Synchronization of Nitrogen Supply with Demand by Wheat Using Sewage Sludge as Organic Amendment in an Inceptisol

S.S. Biswas, S.K. Singhal, D.R. Biswas*, R.D. Singh, Trisha Roy¹,
Abhijit Sarkar², Avijit Ghosh and Debarup Das

*Division of Soil Science and Agricultural Chemistry, ICAR-Indian Agricultural Research Institute,
New Delhi 110 012*

Nitrogen (N) is the most important essential nutrient for plant growth. Intensive agriculture requires large quantities of N mainly applied through commercial fertilizers like urea. However, the N use efficiency (NUE) hardly exceeds 50% under best management practices. Use of organics as N source to increase NUE is a very promising approach. The present investigation was carried out to study the mineralization and subsequent release of N from sewage sludge for synchronization with crop demand and to evaluate its effectiveness for maximization of NUE by wheat. Sewage sludge was collected from Okhla sewage sludge treatment plant, Delhi, characterized and incubated in an Inceptisol along with fertilizer N to monitor the release pattern of N. A pot culture experiment was also conducted to evaluate the efficiency of sludge for synchronization of N supply with the demand of wheat crop. Incubation experiment revealed that the sludge amended soil released significantly higher amounts of $\text{NH}_4^+\text{-N}$ as well as $\text{NO}_3^-\text{-N}$ than that of control. Release of $\text{NH}_4^+\text{-N}$ from the sludge treated soil was slow during the first 15 days of incubation, then it increased and reached its maxima at around 45 days, after which it decreased sharply. Release of $\text{NO}_3^-\text{-N}$ was slow during the first 15 days of incubation, followed by a high release rate up to 45 days and a slow release rate beyond 45 days. Pot culture experiment revealed that maximum yield, N content and uptake by wheat was obtained when the soil was treated with sludge along with fertilizer N @ 100 mg kg^{-1} soil but those were statistically at par with the results obtained using sludge along with fertilizer N @ 50 mg kg^{-1} soil. The same treatment *i.e.* sludge along with fertilizer N @ 50 mg kg^{-1} soil, also showed the highest N recovery (50%). This treatment also showed significantly higher yield and N uptake over the sole fertilizer treatment *i.e.* N @ 100 mg kg^{-1} soil along with recommended dose of P and K. Hence, with sludge amendment fertilizer N requirement could be curtailed by 50% and might be implicative for better NUE.