

NITROGEN TRANSFORMATIONS IN ACID RICE SOILS OF KERALA

The slow rate of nitrogen release from slow release nitrogen fertilizers (SLNF) usually matches with plant uptake of nitrogen by rice due to the extended span of nitrogen availability by reducing the losses due to leaching, de-nitrification and ammonia volatilization. So a study with four acid rice soils was taken up to assess the pattern of release and trans-

formations from N from SLNF. An incubation experiment was conducted at the College of Horticulture Vellanikkara, Trichur using laterite, kari, kuttanad alluvium and coastal sandy soils in a completely randomized design with three replications. The physico-chemical properties of soils are detailed in Table 1. The treatments were as follows

Notation	Treatment
C	Control (recommended doses of N, P & K as urea, SSP and MOP respectively)
NF	Absolute control (No fertilizers)
UF	Urea formaldehyde (35% N)
NP tab	NP tablets (26 % N and 4% P)
NPK tab	NPK tablets (16 %N, 8% P and 8% K)
GCU	Gypsum coated urea (37% N, 12% Ca and 3.9% S)
UAS	Blended urea ammonium sulphate (32% N and 12% S)
MAP	Magnesium ammonium phosphate (7% N, 14% P)

Properly dried and sieved soil sample (1kg) was transferred into plastic containers. All the fertilizer treatments were supplied with NPK @ 90:45:45 kg ha⁻¹ by supplementing with straight fertilizers if necessary. The soil

samples were maintained at field capacity for a period of six months and samples were drawn for the determination of pH, ammoniacal N and nitrate N using standard analytical procedures (Jackson, 1958).

Table 1. The general characters of the selected soil types

Soil type	Location	Textural class	Field capacity %	PH	CEC cmol (p+) kg ⁻¹	Organic carbon %
Laterite	Mannuthy	Loamysand	20.5	4.7	6.34	0.38
Kari	Karumadi	Sandy loam	25.71	3.4	9.96	3.96
Kuttanad alluvium	Moncompu	Clayey	22.05	4.3	5.63	1.86
Coastal sand	Kayamkulam	Sandy	16.05	4.8	4.2	0.82

Maximum release of ammoniacal nitrogen was found to be on 90th day in all the soil types except kari where it was on 150th day. This may be due to the mineralization of native nitrogen of the particular soil type at

later stages of incubation. Similar results were reported from CRR (1983). The treatment MAP and NPK tab recorded the highest rate of release of ammoniacal nitrogen, whereas UF and NP tab recorded the lowest.

Table 2. Ammoniacal nitrogen release from different soils as influenced by periods of incubation (ppm)

Soil	Period (in days)					
	30	60	90	120	150	180
Laterite	34.4	34.5	36.3	21.9	28.8	12.1
Kari	148.5	219.9	296.3	281.1	327.3	320.2
Kuttanad alluvium	105.8	142.8	162.5	157.3	135.4	105.5
Coastal sand	21.4	8.5	35.1	13.5	14.3	10.3

Nitrate nitrogen content of the soil also recorded significant variation due to the effect of treatments. An increased nitrification rate was recorded during the early periods of

incubation for the laterite and sandy soil, while in kuttanad alluvium and kari, the nitrification was more during the later periods of incubation (Table 3).

Table 3. Nitrate nitrogen release from soils as influenced by period of incubation (ppm)

Soil	Period (in days)					
	30	60	90	120	150	180
Laterite	26.8	40.1	58.2	38.5	30.6	12.0
Kari	32.5	33.4	35.2	52.3	42.1	33.0
Kuttanad alluvium	20.4	22.0	36.1	52.0	55.7	21.9
Coastal sand	41.7	48.2	52.7	41.7	40.4	15.0

In the case of sandy and laterite soil, more release of ammoniacal nitrogen in the early periods of incubation might have resulted in higher rate of nitrification. The slow nitrification in kari and kuttanad alluvium may be due to low pH. Since nitrobacter bacteria can not thrive under very acidic situation, nitrification might have reduced. This is in conformity with the opinion of Goswamy and

Sahrawat (1982). The slow nitrification rate of kuttanad alluvium was recorded by John (1987) also. In the later stage of incubation, the lower values of ammoniacal nitrogen and nitrate nitrogen may be due to lower values of native nitrogen and low CEC. The treatment MAP and UAS recorded the highest rate of release of ammoniacal nitrogen, whereas UF and NPK tab recorded the minimum.

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