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EFFECT OF SLOW RELEASE NITROGEN FERTILIZERS ON YIELD AND NITROGEN USE EFFICIENCY OF RICE

Due to the continuous submergence in paddy fields, even the split application of nitrogenous fertilizers leads to loss of nitrogen. In this context the use of slow release nitrogen fertilizers (SLNF) will be meaningful. But the performance of many of the SLNF material has not been explored in laterite soils of Kerala under waterlogged situation. So a study was conducted to evaluate the efficiency of SLNF in relation to yield and nitrogen use efficiency of rice. ' A pot culture experiment was conducted using the rice variety Jyothi in a completely randomized design with four replications. The treatments were as follows:

Notation	*Treatment*
C	Control (recommended dose of 90 kg N, 45 kg P_2O_5 and 45 kg K_2O 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, 18% P) .

The SNLF treatments also got the recommended level of N, P and K but for their forms. Up to crop maturity, 3-4 cm of standing water was maintained in the pots.

The physico-chemical characters of the soil under study revealed that it belongs to the textural class of loamy sand with pH 4.7 and CEC 6.34 cmol (p+) kg^{-1}. The organic carbon was 0.38%, available P (Bray 1) 35.61 kg ha^{-1} and available K *(\N* neutral ammo. acetate) 138 kg ha^{-1} (Jackson, 1958)

Required quantities of SLNF fertilizers and SSP were added as basal. Urea and MOP were applied in two split halves, where ever necessary as one basal and the second half, one week prior to panicle initiation (KAU, 1989).

The total N in the plant sample was estimated by standard method and N content of the plant was multiplied with respective dry matter yields to get the uptake values. The biological nitrogen use efficiency (N response) and chemical nitrogen use efficiency (apparent N recovery) were computed with the following formula.

N response = [Yield in treatment - yield in control] ÷ N applied

Apparent N recovery = [(N uptake in treatment - N uptake in control) x 100] ÷ quantity of N applied

The data on the grain and straw yield are presented in Table 1.

Table 1. Yield and nitrogen use efficiency of rice as influenced by the treatments

Treatment	Grain yield, g/pot	Straw yield, g/pot	N response	N recovery %
C	36.1	27.4	15.7	65.0
NF	26.5	18.7	-	-
UF	41.1	24.4	23.7	44.8
NP tab	29.3	19.7	4.6	2.9
NPK tab	30.8	23.8	7.0	1.5
GCU	39.9	26.1	21.8	26.2
UAS	49.6	26.0	37.6	26.7
MAP	56.5	25.0	48.8	75.4
CD (0.05)	12.0	NS	-	

The total grain yield was found to be the highest in MAP (56.5 g per pot) and the least with the NF treatment (26.5g per pot). However, the treatments are in the order of MAP > UAS > UF > GCU > C> NP > NP > NF, in registering the grain yield of rice. The treatments MAP and GCU were found to be better treatments with profuse growth and good dry matter production as they contain the secondary elements Ca and Mg. The partitioning of dry matter in the grain yield may be better for UF and UAS as there was slow release of nitrogen throughout the crop growth. The treatments NP and NPK tabs were recorded as the poor yielders of rice due to their low recovery of N. The influence of treatments on straw yield was non-significant.

The ranking of fertilizers on the basis of N response was found to be in the order of MAP > UAS > UF > GCU > C > NPKtab > NPtab (Table 1). Regarding the total N recovery, the values ranged from 1.45 to 75.37%, recorded by treatment NPK tab and MAP respectively. This may be due to the slow release of N from MAP coupled with the split application of urea. The highest dry matter yield, straw yield and N content in the grain might have attributed to the high recovery percentage. The observations of Dutta *et al.* (1990) and Molette *et al.* (1990) are corroborative of these findings. The slow nitrification of UF due its resistance to microbial decomposition and low solubility might have caused the higher grain yield and nutrient uptake by rice. Hence, more N recovery percentage was obtained for UF. Slow hydrolysis of urea to ammonia in the UF because of very low activity of urease was reported by Bopiah and Biddappa (1987).

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