Seasonal influence on placement of urea supergranules in rice

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Placing urea supergranules (USG) in the reduced zone is a practical method to increase N use efficiency in transplanted lowland rice. Rice is grown in wet season (WS) (Apr/May-Sep/Oct) and dry season (DS) (Sep/Oct-Dec/Jan) in Kerala, India. We investigated whether the effects of USG placement on the crop differ for the seasons and whether crop performance is affected by timing of USG placement.

The experiment was laid out in a randomized block design with four replications for two consecutive seasons at the Regional Agricultural Research Station, Pattambi, Kerala. We applied 56 kg N/ha as USG at transplanting and 5, 10, 15, and 20 d after transplanting (DT), and 56 kg N/ha as urea in two equal splits as a basal application and at panicle initiation. All treatments received a uniform basal dose of 19.8 kg P/ha and 37.3 kg K/ha. Two seedlings/hill were transplanted at 20- × 10-cm spacing.

Total rain was 2,393 mm during WS and 239 mm during DS. Soil at the experimental site is a sandy clay loam. Soil characteristics are in Table 1.

Urea supergranules were not superior over a split application of urea during WS, but the effect of USG placement was significant during DS (Table 2). This seasonal difference was probably due to the sand in the soil and the different amounts of rain. Rainfall was heavy but intermittent in the WS, resulting in alternate wetting and drying of the soil. This caused more nitrification of USG than usual for a heavy soil despite deep placement. Heavy rains caused the nitrate N to be leached from the root zone. Nitrification rate during DS was expected to be the same, but the leaching loss was less due to low rainfall, resulting in higher efficiency of deeply placed USG. Timing of USG placement did not significantly influence rice yield during either season.

In sandy clay loam soils, USG effectively increases N use efficiency of lowland rice under low rainfall and controlled water situations. Placement can be done any time between transplanting and 20 DT. ■

Table 1. Soil characters of the experimental site. Pattambi, Kerala, India.

Physicochemical character	
pH	5.5
Organic C (%)	1.62
Total N (%)	0.18
Available P (kg/ha)	14.2
Available K (kg/ha)	191.0
CEC (meq/100 g soil)	13.9
Particle size distribution	
Sand (%)	64.3
Silt (%)	10.2
Clay (%)	24.1

Table 2. Seasonal influence on placement of USG. Pattambi, Kerala, India.

Treatment	Grain yield (t/ha)		
	WS	DS	Difference
USG at transplanting	3.6	4.3	0.7
USG at 5 DT[a]	3.5	4.2	0.7
USG at 10 DT	3.3	4.3	1.0
USG at 15 DT	3.2	4.4	1.2
USG at 20 DT	3.5	4.5	1.0
Urea in 2 splits	3.7	4.0	0.3
LSD (0.05)	ns[b]	0.3	0.4

[a]DT = d after transplanting. [b]ns = not significant.

Fate of applied N in traditional, modern, and conservation farming systems of lowland rice in Sri Lanka

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We compared the soil N fertility of traditional and modern rice farming systems prevailing in Sri Lanka's dry zone with that of conservation farming. Applied N availability, retention, and loss in rice were studied using the ^{15}N isotope technique.

The nutrient source in the traditional system is soil-incorporated vegetation that grows during the fallow period; that in the modern system is chemical fertilizer, applied according to Department of Agriculture recommendations (see table). Conservation farming involves a basally applied leguminous green manure (*Sesbania rostrata* or *S. speciosa*) followed by topdressed chemical fertilizers (half of the recommended N and all of the recommended P and K).

The study was conducted in a lowland site at Maha Illuppallama. The soil is Tropaqualf with pH of 7.3, 4.4% organic matter, 0.095% total N, and 94 µg available P/g soil. The experiment was laid out in a randomized complete block design with four replications, using 1- × 1-m isotope plots lined with polythene. Nutrient sources and their ^{15}N-labeled materials were alternately applied to plots to trace the dynamics of plant and chemical fertilizer N. Rice variety BG38/4 was transplanted. The crop harvest, stubble, and soil were analyzed at harvest for total N and ^{15}N.

S. speciosa applied under conservation farming removed the most soil-incorporated plant N through crop harvest (see table). Significantly large amounts of soil-incorporated plant N were found in stubble with *S. speciosa* application and the traditional system when compared with *S. rostrata* application.

The biggest loss of soil-incorporated plant N was with *S. rostrata*, meaning that the soil did not retain it well. Chemical fertilizer did not show significant differences among the systems except for its high retention in stubble under *S. speciosa*. *S. rostrata* appeared to stimulate the release of soil N (positive added N interaction), as reflected in the crop harvest.

The low net N removal from the traditional system is probably compensated for by the biological N_2 fixation (BNF) associated with soil-incorporated materials from natural fallow. Soil N