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EFFICACY OF UREA FORMS AND MODE OF APPLICATION ON LOWLAND RICE

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Field trial was conducted at Tamil Nadu Agricultural University, Coimbatore for four seasons during 1978-80 in a deep clay loam soil, to study the efficiency of different urea forms with split application of prilled urea on lowland rice. The grain yield was consistently higher with granulated compost. Placement of super granules in the reduced zone was next best in efficiency. Neem cake coated urea, urea enriched FYM and split application of prilled urea were comparable in their efficiency. The panicles per square metre were greater and mean panicle weight heavier when granulated compost was used as a source of nitrogen.

Urea is the principal source of nitrogen fertilizer for rice because of its cheapness and sulphur, content. However, problems with urea includes its hygroscopic nature, rapid dissolution in water and volatilization as ammonia associated with a temporary rise in soil pH around the zone of application. Denitrification, and ammonia volatilization are considered to be the major mechanisms of losses of N and for the lower efficiency of the surface applied urea in low land rice culture. Such losses can be minimized through split application of N based on the physiology of rice plant; use of sources that have a low rate of dissolution in water and urea coated with sulphur, wax, etc., which reduce the dissolution rate in soil water. Neem cake coated urea that retards the biological transformation of $NH_4^+ - N$ into $NO_3^- - N$ 5 also reported to improve the efficiency of urea. The potential N losses are reduced when fertilizer N is placed deeply below the oxidised surface zone (De Datta *et al.*, 1968). Granulated compost an organo inorganic source of N as well releases the N slowly to the crop.

MATERIAL AND METHODS

Field study was conducted at Tamil Nadu Agri University, Coimbatore for four seasons from 1978 through 1980. Prilled urea in split application was compared with neem coated urea, urea enriched FYM and granulated compost, as well as that with placement of super granules of urea at 10 (m) depth all at 60 kg N/ha P and K were applied (all basal) at 30 kg each of P_2O_5 and K_2O/ha. In a randomized block design the ten treatmental combinations were replicated thriee. The urea super granules of one and two grams sizes developed by IFFCO were used. The granulated compost is an organo-inorganic source of N from the mechanical compost plant with five per cent N. Neem cake coated urea mixed with powdered neem cake (5:1) of urea and Neem cake by weight. The soil was of deep clay loam type (Alfisol) with availability of 113 kg N/ha, 0.09 ppm of P_2O_5 and 60 kg K_2O/ha. The soil pH was 8.1 and organic matter content was 1.1%

RESULTS AND DISCUSSION :

The grain yield of rice when granulated compost was used as nitrogen source was consistantly higher during all the four seasons tried. This is a reflection of greater number of panicles per m^2 and heavier panicles. Consequently the response (16.6 kg grain/kg N) was also considerably higher with granulated compost as compared to other forms of N application. The efficiency of urea super granules spot placed at the reduced zone was comparable with that of granulated compost during the monsoon season whereas during summer as well as in the pooled analysis granulated compost was un parallel in efficiency. Urea enriched compost and neem cake coated urea were equal in efficiency only with split application, which in turn was better than all basal application of N. No significant difference on grain yield was observed with different split applications tried.

The urea nitrogen when applied to the oxidation zone of the submerged soil is oxidised and moves down as nitrates. On reaching the reduced zone denitrification starts in. In this processes volatilisation and leaching losses occur When urea is applied at different physiological stages of rice when N is required in adequate quantity by crop of immediate utilisation and the N efficiency was better and as such the increased efficiency with split application than basal dressing of N. Ninty six kg of N was required to have a response of one tonne of grain with all basal as against 60 kg N with various split applications. Neem cake blended urea and urea enriched FYM by their slow release actions were able to bestow this benefit and the efficiency was comparable with split application of urea. Reddy and Prasad (1980) observed neem cake coating of urea were very effective in reducing nitrification of urea and reported an increase of 24 per cent in rice yield with neem cake coated urea.

Placement of urea super granules in the reduced zone to confer increased efficiency has been reported by several workers (De Datta *et al.*, 1968). The reason attributed being, low dissolution rate, reduced denitrification of ammonia and leaching losses. No difference in efficiency was observed between the two grades of urea super granules of one or two gram size. The greater efficiency of granulated compost than any one of the materials tried opens up scope for the use of indigenous materials and the use of organic waste for gainful purposes.

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The grain yield, panicles 1S q.m., panicle weight and efficiency of different urea forms and mode of application on low land rice (data for four seasons during 1979-80)

Treatment	Grain yield (kg/ha)					Panicle No. M²					Panicle weight (gms)					Response of grain yield	
	1979	1980	1979	1980	Mean	1979	1980	1979	1980	Mean	1979	1880	1979	1980	Mean	kg grain kg N.	kgN to produce 1 tonne
1	3069	3252	3326	3035	3170	301	335	271	383	322	1.20	1.68	2.03	1.50	1.64	0	—
2	3454	3919	3955	3840	3791	349	330	273	370	332	1.33	1.60	2.22	1.90	1.72	10.35	69.8
3	3878	4482	3867	4261	4122	332	338	233	333	310	1.33	1.95	2.33	1.80	1.87	15.87	63.0
4	3903	4347	4466	3962	4169	354	340	259	383	334	1.37	1.83	2.52	1.42	1.91	16.65	60.0
5	3555	4587	4687	3969	4174	351	326	269	345	323	1.36	1.94	2.35	1.68	1.88	16.73	59.7
6	4035	4297	3983	4340	4264	361	346	270	413	348	1.34	2.06	2.10	1.51	1.83	16.56	60.6
7	3929	4428	3869	4572	4199	342	358	340	378	355	1.29	2.23	2.30	1.55	1.94	17.15	58.3
8	4262	5063	8071	4720	4779	408	360	293	368	357	1.37	2.29	2.93	1.69	2.18	26.81	37.3
9	4373	5128	4959	4725	4796	397	355	278	383	353	1.39	2.29	1.83	1.59	2.17	27.10	36.9
10.	4751	5879	5240	4851	5130	406	390	313	400	378	1.42	1.39	2.91	1.68	2.24	36.67	27.3
C.D.	331	430	329	159	328	36	29	53	87	30	0.31	0.30	0.36	N.S.	0.24		