Agri. Res. J. Kerala, 1968, 6 (2) : 68—73

EFFECT OF SOURCES OF NITROGEN ON YIELD OF PADDY IN KERALA

G. SREEDHARAN AND G. M. GEORGE
Agricultural College, Vellayani

Nitrogenous fertilizers play an important role in stepping up rice production. Nitrogen required for crop production is available in the form of different nitrogenous fertilizers. That the sources of nitrogen influence the yield of paddy differently in different soil types has been reported by Sukanya Subramanian *et al.* (1956), Sreenivasan and Balasubramanian (1959), Wells (1964), Anandakrishna Rao and Manjunatha Udupa (1965) and Balasubramanian (1967). But experimental evidences on the relative performances of the different forms of nitrogenous fertilizers on paddy are not adequate under Kerala conditions. Hence, the present investigations were undertaken to study the effect of the different nitrogenous fertilezers on the yield of some of the important paddy varieties grown in the first crop season in Kerala.

Material and Methods

The experiment was conducted in the first crop seasons of 1963–'64, 1964–65 and 1965-'66 at the Agricultural College and Research Institute, Vellayani. A split plot design with sources of nitrogen as main plot treatments and varieties of paddy as sub plot treatments and three replications was adopted for the experiment. There were 7 main plot treatments, viz , ammonium sulphate, ammonium sulphate nitrate, ammonium phosphate, calcium ammoninm titrate, sodium nitrate, urea and no nitrogen. The three sub-plot treasments were Ptb. 9, Ptb. 10 and Ptb. 26 Two seedlings were transplanted per hill at a spacing of 22·5 cm x 15 cm. The plot size was 4·5 m x 4'5 m during 63-64 and 6·4 m x 6·0 m during the other years. Nitrogen, phosphoric acid and potash were applied at 30 kg per hectare each. Half of the nitrogen was applied as basal dressing and the other halt three weeks after planting. The soil of the experimental field was sandy clay loam with the following chemical and mechanical analysis under moisture free basis.

Chemical

Moisture	1·35	Percent
Loss on ignition	8·30	,,
Sesquioxide	29·51	,,
Iron oxide	13·86	,,
Aluminiumoxide	15·65	,,
Calcium oxide	0·035	,,
Magnesiumoxide	0·037	,,
Total phosphoric acid	0·034	,,
Total potash	0·17	,,
Total nitrogen	0·15	,,
Acid soluble silica	4·70	,,
Water soluble silica	Trace	
pH	4·7	

Chilian nitrate IARI report published by Nitrate Corporation of Chile Ltd. and Rallis India Ltd . India

Balasubramoniam, B., Kalyanikutty, J , Sreenivasan, V , Palaniswamy, K. M. and Purushothaman, G. 1967. Calcium ammonium nitrate — A fertilizer to paddy. *Madras Agric. J. 54* (3) : 127

Nijhawan, S. D. 1960. Research note on the function of Calcium carbonate in Calcium ammonium nitrate. *Ferti. News* 5 : 10

Reheja, P. C. 1966. *Soil Productivity and crop growth.* Asia Publishing House. 135

Sreenivasan, V. S and Balasubramaniam, K. M. 1959. Ammonium chloride and Urea as Fertilizer for rice. *Madras Agric. J. 46* (10) : 394-95

Sukanya Subramanian, Parambaramani, C. and Sreenivasan, V. 1966. A preliminary study on the efficacy of Calcium ammonium nitrate for fertilizing rice. *Madras Agric. J. 53* (11) : 458

Wells, J. P. 1964. Sources of nitrogen for rice. *Rice J. 67* . 33-44.

(Accepted : 24-10-1968,

Table 4

Mean yield of straw in kg/ha of different varieties of paddy receiving different fertilizers

Paddy varieties	Ammonium sulphate (M_1)	Ammonium sulphate nitrate (M_2)	Ammonium phosphate (M_3)	Calcium ammonium nitrate (M_4)	Sodium nitrate (M_5)	Urea (M_6)	Control (M_7)	Mean
Ptb. 9 (V_1)	4044.8	3486·9	4099·4	5372·9	3520·3	3890·2	3538·5	3993·3
Ptb. 10 (V_2)	2161.9	2198.3	21164	1728.3	1231.0	1458·4	1376·6	1752·6
Ptb. 26 (V_3)	4260·1	3908·4	4275·3	4941·9	3514·2	3605·2	2750·1	3793·2
Mean	3489.9	3198·9	3496·0	3781·0	2756·2	2983·6	2556·1	31807

C. D. (0·05)	Manures	703·4
,,	Varieties	266·8
,,	Manures under each variety	912·7

Summary

In an investigation carried out at the Agricultural College and Research Institute, Vellayani, during the first crop seasons of 1963–'64, 1964–'65 and 1965-'66, the effect of six sources of nitrogen on three varieties of paddy was studied. Calcium ammonium nitrate was found superior to the other nitrogen fertilizers. Sodium nitrate was inferior to calcium ammonium nitrate, ammonium phosphate and ammonium sulphate. A differential response of varieties to the different sources of nitrogen was indicated.

Acknowledgements

The authors are grateful to the Principal, Agricultural College, Vellayani, for providing facilities for conducting this study and to Prof. E.J. Thomas, Head of the Division of Statistics for the help rendered in the statistical analysis of the experimental data.

References

Anandakrishna Rao, P. N. and Manjunatha Udupa, K. 1965. Some aspects of soil management to increase crop production on west coast. *Indian J. Agron. 70* (1): 23

Anoymous. 1960. Fertilizer trials with

Table 3

Mean yield of grain in kg/ha of different varieties of paddy receiving different fertilizers.

Paddy varieties	Ammonium sulphate (MO	Ammonium sulphate nitrate (M_2)	Ammonium phosphate (M_3)	Calcium ammonium nitrate (M_4)	Sodium nitrate (M_5)	Urea (M_6)	Control (M_7)	Mean
Ptb. 9 (V_1)	2001·2	1543·3	1725.3	2440·8	1604·0	1722·2	1552·4	1798.0
Ptb. 10 (V_2)	809.6	936·9	1055·2	943·0	1043·0	7247	427·5	846·0
Ptb. 26 (V_3)	1691·9	1543·3	1788,9	2019.4	1382·6	1555·5	1246·2	1604·0
Mean	1500·9	1340.2	1522·1	1801·1	1343.2	1334.1	1076.4	1416.0

C. D. (0.05) — Manures = 330·5
Varieties = 139·5
Manures under each variety = 445·7

Tables 3 and 4 show the relative performance of different paddy varieties to the different sources of nitrogen with regard to grain and straw yield (average of data of 3 years). The interaction effect is significant for both grain and straw yield. Varieties Ptb. 9 and Ptb. 26 give the maximum grain yield by the application of calcium ammonium nitrate whereas Ptb. 10 has produced the best result with ammonium phosphate. In the case of straw yield Ptb. 9 has produced the maximum yield with the manure calcium ammonium nitrate while Ptb. 10 and Ptb. 26 have given the maximum straw yield with ammonium sulphate nitrate and ammonium phosphate respectively.

Table 2

Mean straw yield of paddy in kg/ha for different fertilizers in different years.

Treatment No.	Fertilizer	1963—'64	1964—'65	1965'—66	Mean
M_1	Ammonium sulphate	2391·98	3402·67	4280·02	3538.38
M_2	Ammonium sulphate nitrate	2214·97	3361.01	3668·22	3238.68
M_3	Ammonium phosphate	244460	3925.96	3754·13	3539.52
M_4	Calciumammonium nitrate	2420·68	3988.44	4436·23	3828.09
M_5	Sodium nitrate	2071.45	3553.67	2480·35	2790.48
M_6	Urea	2411.11	3756·74	2647.68	3020.72
M_7	Control (No nitrogen)	2162·35	2754·42	2650·28	2587.87
	F-test	N. S,	N. S.	N. S.	Sig
	C. D. (0.05)	—	—	—	712·20
	S. E, M. ±	173·15	313·50	540.47	248·12
	Conclusion	M_4 M_3 M_1	MX	M_6 M_5 M_7	

It is also seen that sodium nitrate is significantly inferior to calcium ammonium nitrate, ammonium phosphate and ammo nium sulphate. In an acidic soil of the type under study application of this fertilizer should have responded better (Anonymous 1960). The lack of response for sodium nitrate can be attributed to the light nature of the soil and heavy rainfall resulting in a heavy loss of the nitrate nitrogen of this fertiliser which is liable to loss by leaching. Similar low response of paddy to sodium nitrate was recorded previously by Raheja (1966).

Ammonium sulphate is found to be on par with ammonium phosphate and calcium ammonium nitrate statistically eventhough it has given lesser yields of both grain and straw when compared to calcium ammonium nitrate. Similar results were reported by Wells (1964) and Balasubramaniam « (1967). Ammonium sulphate nitrate and urea are found to be on a par with sodium nitrate.

Mechanical

Coarse sand	30·48	Percent
Fine sand	12·81	,,
Silt	15·82	,,
Clay	31·95	,,

Results and Discussion

The effects of different treatments on grain and straw yield and their statistical analysis are given in tables 1 and 2. The analysis of the whole data of all the three years has indicated significant differences between the different nitrogenous fertilizers in influencing the yield of paddy. It is thus seen that calcium ammonium nitrate gives the highest response. The ranking of the, fertilizers with reference to straw yield also shows the superiority of calcium ammonium nitrate over the other fertilizers under test.

The superiority of calcium ammonium nitrate may be attributed to the beneficial effect of the calcium present in this fertilizer (35 percent $CaCO_3$) the content of which is precariously Jow in the soil under study. Similar beneficial effects due to fertilization with calcium ammonium nitrate have been reported by Nijhawan (1960) according to whom the application of this fertilizer supplements the loss of calcium that is being removed in large quantities every year. On the other hand Sukanya Subramanian *et al* (1966) found ammonium sulphate superior to calcium ammonium nitrate in soils containing plenty of calcium. The beneficial effects of calcfum ammonium nitrate in soils low in calcium contents are thus confirmed.

Table 1

Mean grain yield of paddy in kg/ha for different fertilizers in different years.

Treatment No.	Fertilizers	1963—'64	1964—'65	1965—'66	Mean
M_1	Ammonium sulphate	1095·53	1283·49	1991·61	1519·57
M_2	Ammonium sulphate nitrate	1109·88	1116.87	1736·48	1356·87
M_3	Ammonium phosphate	1191·21	1299·11	1978·60	1541·06
M_4	Calcium ammonium nitrate	1368·21	1512·59	2379.53	1823·48
M_5	Sodium nitrate	937·66	1140·29	1811·98	1359·94
M_6	Urea	1138·58	1265·26	1551·64	1350·73
M_7	Control (No nitrogen)	947·22	960·66	1299·11	1089·79
	F-test	N.S.	Sig.	N.S.	Sig.
	C, D. (0·05)		251·23	—	334·61
	S. E. M. ±	91·61	81·50	280·39	116·57
	Conclusion				

M_4 M_3 M_1 MB M_2 M_6 M_7