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UTILISATION OF PHOSPHATES IN RICE SOILS

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Much response has not been obtained in laterite soils of India containing large amounts of ferrugenous and aluminous clay to the application of phosphatic fertilizers. It is possible that higher levels of super phosphate given in conjunction with high levels of green manure may give encouraging results in such soils (Abdul Samad and Sahadevan 1952). This investigation was therefore, conducted to study the response of phosphatic fertilizer at higher levels in conjunction with different levels of green manure in laterite soils of Kerala.

Materials and Methods

An experiment was conducted at Agricultural Research Station, Pattambi for 3 *kharif* seasons during 1950-53 and 2 *rabi* seasons during 1950-52 with four levels of green leaf @ 0, 2000, 4000 and 6000 kg/ha and 3 levels @ 0, 30 and 60 kg of P205 per hectare as superphosphate. The trial was laid out in randomised block design with four replications. Green leaf was incorporated in the plots ten days before transplanting. Superphosphate was applied just before transplanting. The variety Ptb. 2 was used during the *kharif* season and Ptb. 20 during the *rabi* season.

Results and Discussion

The yield data of individual seasons analysed separately are given in Table 1. Since the error variances of *kharif* seasons are homogenous, unweighted analysis was adopted to combine the results. The results of two pooled analyses are set out in Table 2.

The treatment differences are statistically significant in one *kharif* season and two *rabi* seasons. There was definite response to the application of higher doses of superphosphate in combination with higher doses

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of green leaf, Over the application of superphosphate alone. The recommended dose of green leaf for the tract is 4000 kg to 6000 kg/ha. Over a basal dressing of 4000 kg of green leaf, the increase in yield obtained with 30 and 60 kg P205 levels per hectare were not consistent, though with green leaf at 6000 kg level, 60 kg P_2O_5 consistently increased the yield over 30 kg P205 ranging from 111 kg to 276 kg/ha. The treatment 4000 kg green leaf plus 30 kg P_2O_5 recorded consistently increased yield over 4000 kg green leaf alone in all the five seasons. With lower levels of green leaf and 30 kg P205, the result was not consistent and the difference was negligible.

The response of P_2O_5 at higher levels of green leaf (6000 kg) was not consistent in *kharif* season but in *rabi* the response was higher. With regard to green leaf alone, there was increased yield with incremental doses, the extra yields ranging from 231 to 434 kg/ha in *kharif* and 98 to 641 kg in *rabi*. With P_2O_5 alone the yield increase due to increased doses was not so marked, Table 3.

In both the seasons appreciable increases in yield were obtained by the combined application of 4000 to 6000 kg of green leaf along with 30 and 60 kg levels of P2 05 over the application of P205 alone. The greater response of phosphatic fertilizers when applied with organic matter might be attributed to a multiplicity of factors. Phosphorus in the form of superphosphate might remain in the safe custody of organic molecules by absorption and adsorption and thus reversion to unavailable form would be prevented (Russel, 1964). It might also be possible that during the decomposition of organic matter, the mineral form of phosphorus added by way of superphosphate might be converted to organic phosphates through biological agencies which resist fixation and make it more available to plants (Martin Alexander, 1961). Organic anions formed during the organic matter decomposition such as citrates, tartarates. acetates, oxalates might release phosphate ions by anion exchange and would make it more available to crops. Some products of organic decay might also act as chelating agents forming complex compounds which would be available to plants (Tisdale and Nelson, 1970). Experiments of Das (1945) showed ffiat the combined action of decaying organic matter and phosphatic fertilizers produced organic phosphorus complexes which being soluble in water, neutral in action and having colloidal properties were found to be more available to the plants than the inorganic phosphates which were usually rendered insoluble in the soil. Apart from that decaying organic matter might form a coating on iron and aluminium compounds thereby prevent its reaction with soluble phosphate compounds (Buckman and Brady 1971).

X el o ddy d E OO th o CO 5

O a	g		00 TH		182	ro 0 NO	
O S	0 kg				211 o		7 o
Oree o	kg		22	ro 5 ro	22 00		229
Gee	0		2 5	21	225 00	GO	253
G	30 kg 2						
G	0 kg d						
G	g + kg						
G	g + NO kg						
G	g + kg						
G	g + NO kg						
G	g + 3 kg						
G	g + 6 kg						00 3
	GM		GO		3.9		ON 0
	SE						5

Table 2

Results of pooled analyses showing the mean hectare yield of paddy

Treatments	Mean of 3 kharif seasons		Mean of 2 rabi seasons	
	Yield in kg/ha	Percentage on control	Yield in kg/ha	Percentage on control
Green leaf 0 kg	1860	100.0	1613	100.0
Green leaf 2000 kg	2129	114.5	1737	107.7
Green leaf 4000 kg	2290	123.1	1750	108.5
Green leaf 6000 kg	2241	120.6	2014	124.8
Green leaf 0 kg + 30 kg P2 O5	2161	116.2	1669	103.4
Green leaf 0 kg + 60 kg -do-	2016	108.4	1663	103.1
Green leaf 2000 kg+30 kg -do-	2254	121.2	1744	108.1
Green leaf 2000 kg+60 kg -do-	2426	130.4	1866	115.7
Green leaf 4000 kg+30 kg -do-	2501	134.4	1793	111.2
Green leaf 4000 kg+60 kg -do-	2529	135.9	1706	105.7
Green leaf 6000 kg+30 kg -do-	2351	126.4	2032	125.9
Green leaf 6000 kg + 60 kg -do-	2527	135.8	2166	134.2
GM	2274	122.2	1913	118.6
SE	204		298.2	
'Z'	—		NS	
CD (0.05)	422.0			

Table 3

Average increase in grain yield in kg/ha due to incremental doses of P2 Os alone

Increase over green leaf in kg/ha	Kharif (3 seasons)		Rabi (2 seasons)	
	30 kg P_2O_5/ha	60 kg	30 kg P_2O_5/ha	60 kg
0	301	156	56	50
2000	125	297	7	129
4000	211	239	43	44
6000	110	286	18	152

The results also show that interaction was not statistically significant. It would appear that the response to the combined applications of heavy doses of green leaf and superphosphate is additive to a certain extent. It might be **that** good response was obtained when favourable conditions also were created in the soil for the easy availability of phosphates. These favourable conditions which had influenced the availablity of phosphates are to be investigated before any definite conclusion is drawn in this regard.

Summary and Conclusion

An experiment was conducted at Agricultural Research Station, Pattambi during 3 *kharif* seasons from 1950-53 and 2 *rabi* seasons of 1951-52 to study the response of rice to the application of superphosphate either alone or in conjunction with green leaf in a randomised block design with four replications. The results indicated that there was definite increases in yield at both the levels of 30 kg and 60 kg P_2O_5 only when applied in conjunction with 4000 kg and 6000 kg of green leaf per hectare. At the level of 6000 kg of green leaf, application of 60 kg P_2O_5 consistently increased the yield over 30 kg P205 in all the seasons. With regard to green leaf alone the yield was found to increase with incremental doses both in *kharif* and in *rabi* seasons while the yield was not increased with increased doses of superphosphate alone.

Application of superphosphate along with green leaf or cattle manure has a much wider scope since the latter are used as a common source of plant food carrier by farmers all over the country and incorporation of superphosphate with them will offer no practical problem.

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