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Evaluation of soil phosphorus tests and its relation to inorganic P forms in flooded soils

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ABSTRACT

Field experiments were conducted with rice under flooded condition to evaluate the efficacy of various soil tests for available P. Available P status as estimated by different extractants and its relationship with different inorganic P forms as influenced by various organic manures and P fertilizers under wetland ecosystem is reported.Among different indices of P availability,Olsen's soil test was found to be the most suitable method.The P extracting power of different extractants was in the order: Mehlich I > Bray I > Truog >Olsen >Morgan.Olsen and Bray No.1 extractants were consistent in extracting P from specific P fractions than the other three extractants.Iron-P was the dominant inorganic P fraction followed by Ca-P,Al-P and saloid-P.Available P in this rice soil depended on the concentration of Fe-P and saloid-P. Inorganic P forms jointly contributed to 94 per cent variations in Olsen-P.

Key words : Labile P, Soil tests, Inorganic P forms, P fertilizers, Organic manures

Knowledge on the contribution of different inorganic P forms to labile P provides useful information in assessing the available P status of soils. It also provides information for estimating the degree of chemical weathering of soil.(Singh and Datta,1987).Aluminium bound phosphate governs P availability, particularly in uplands, whereas, ferric and reductant soluble phosphates are available to plants under reduced conditions (Mandal, 1979). The suitability of a soil test vary to a great extent depending on soil, crop and climatic conditions. Often a method found useful for one area has proved less satisfactory for other areas, suggesting that the difficulty in assessing P availability in soils is a consequence of diverse soil physical and chemical characteristics. (Rahman *et al*., 1995).

Several extractants are being used to determine the labile P in soils and these are not consistent in extracting the available soil phosphate. Phosphate in soil occurs as saloid-P, Al-P, Fe-P and Ca-P. Since these inorganic P forms have different solubilities the availability and uptake depend upon their amount in the soil. (Vig *et al*., 2000) The objectives of the present investigation were to evaluate existing soil testing methods for available P in Madukkur soil series of Tamil Nadu, India under flooded condition and to study the relationship with inorganic P forms as influenced by P fertilizers and organic manures.

MATERIALS AND METHODS

Two field experiments were conducted in neutral soil belonging to Madukkur series (Alfisol) with rice as test crop. The treatments consisted of three organic manures *viz.*, Farm Yard Manure (FYM) poultry manure (PM) and green leaf manure (GLM) @ 12.5 t ha^{-1} and inorganic P sources *viz.*, single super phosphate (SSP) and Udaipur rock phosphate (URP) @ 0, 30 and 60 kg P_2O_5 ha^{-1}. The experiment was conducted in a randomized block design with three replications. The initial soil characteristics are presented in Table 1. After the harvest of the first crop, each plot was divided into two portions.

Table 1 : Analytical values of initial soil

Properties	Values
Mechanical analysis	
Clay (Per cent)	21.92
Silt (Per cent)	8.23
Fine sand (Per cent)	42.78
Coarse sand (Per cent)	23.36
Physical properties	
Apparent specific gravity (Mgm^{-3})	1.43
Absolute specific gravity(Mgm^{-3})	2.68
Pore space (per cent)	44.48
Water holding capacity (per cent)	35.36
Chemical constituents	
Total sesquioxides (Percent)	10.80
Iron (Fe_2O_3) (Percent)	6.56
Alumina (Al_2O_3) (Per cent)	4.24
Organic carbon (Percent)	0.48
Available N (Kg ha^{-1})	146
Available P (Kg ha^{-1})	950
Available K (Kg ha^{-1})	250
Electro-chemical properties	
pH	7.30
Electrical conductivity (dSm^{-1})	0.24
Cation exchange capacity (C Mol (P^+) kg^{-1})	22.2