

Use of sorption studies for fertilizer recommendation to wheat in vertisols

S.P. PANDHARE, A.G. DURGUDE AND Y.J. PATIL

See end of the article for authors' affiliations

Correspondence to :

S.P. PANDHARE

Department of Soil Science and Agricultural Chemistry, Mahatma Phule Krishi Vidyapeeth, Rahuri, AHMEDNAGAR (M.S.) INDIA

Accepted : May, 2008

ABSTRACT

In order to know the relative sorption of P, K, Cu, Mn and Zn in Vertisols and to derive appropriate balanced nutrition for fertilizer recommendation to obtain sustainable crop production, incubation studies of P, K, Cu, Mn and Zn were conducted in Vertisols (Otur) in comparison with Inceptisols (sawargaon) and Entisols (Pargaon) soils of Central Farm, MPKV, Rahuri. All three soils exhibited wide variation in P, K, Cu, Mn, and Zn sorption behavior. The per cent sorption of the soil decreased as the concentration of added solution increased. The sorption capacity of Vertisols ranked higher than Inceptisols and lower in Entisols. Based on this field experiment was conducted in Vertisols for wheat crop. The highest average grain yield of 44.44 q ha⁻¹ was obtained by the application of N, P, K on the basis of fertilizer prescription equation in combination with zinc which is the best method of fertilizer recommendation for wheat in vertisols.

Key words : Sorption of nutrients, Nutrient uptake, Yield target.

Vertisols are potentially productive soils, but their actual production is low under traditional farming systems. Out of twenty two per cent total vertic soils of India, eighty two per cent of Vertisols and associated soils exists in Maharashtra (Murthy *et al.*, 1982). Vertisols have their strong points like high moisture retentivity and also weak points like poor workability, poor drainage, poor response to added fertilizer due to their high retentivity / fixing capacity.

Studies conducted by many workers (Udo and Uzu, 1972; Shailaja and Sarawat, 1990) have shown that soil factors like pH, clay content, organic matter, CaCO₃ etc. are largely responsible for sorbing nutrients in soil. Vertisols contain appreciable extent of these soil factors and therefore, show high nutrient requirements.

The response of crop to added P in vertisols has been generally reported to be lower than those obtained in other soil types under similar agro-climatic conditions (Kanwar, 1986).

In order to know the relative sorption capacity of various nutrients like P, K, Cu, Mn, and Zn in Vertisols, Inceptisols and Entisols and also test response of wheat to the application of P, K, Cu, Mn and Zn application on the basis of sorption capacity of a vertisols in comparison with recommended dose as per soil test and yield targeting equation and derive appropriate balanced nutrition for the fertilizer recommendation to obtain sustainable crop production, it was thought to study their sorption behavior taking wheat as the test crop.

MATERIALS AND METHODS

Laboratory studies carried out for the determination of physical and chemical properties of Vertisols, Inceptisols and Entisols and incubation studies for sorption of P, K, Cu, Mn, Zn in three soils and based on this the field experiment was conducted during *rabi* season, 2000 at Post Graduate Institute Farm, MPKV, Rahuri on the most widely spread soil series (vertisols) in randomized block design with 11 treatments and 3 replications.

Treatment details

Sr. No.	Treatment	N	P	K	Zn
1.	N ₀ P ₀ K ₀	-	-	-	-
2.	Recommended dose	120	60	60	-
3.	AST	150	75	30	-
4.	YT ₄₅ q ha ⁻¹	212	52	-	-
5.	N ₁ P ₃ K ₀	120	248	-	-
6.	N ₁ P ₃ K ₁	120	248	60	-
7.	RD + Zn	120	60	60	6.5
8.	AST + Zn	150	75	30	6.5
9.	YT ₄₅ q ha ⁻¹ + Zn	212	52	-	6.5
10.	N ₁ P ₃ K ₀ + Zn	120	248	-	6.5
11.	N ₁ P ₃ K ₁ + Zn	120	248	60	6.5

Fertilizer prescription equation of wheat for achieving yield target of 45 q ha⁻¹ were used. FN = 7.45 T - 0.74 SN, FP₂O₅ = 1.90 T - 2.788 SP, FK₂O = 2.49 T - 0.22 SK, whereas FN, FP₂O₅, FK₂O are fertilizers to be added, T is target, SN, SP and SK are soil available nutrients. Soil sample collection and sample preparation for