

Effects of different phosphorus levels on growth, yield and nutrient uptake of wheat (*Triticum aestivum* L.)

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(Accepted : May, 2006)

SUMMARY

The effect of different levels of P on growth, yield, and nutrient uptake of wheat (*Triticum aestivum* L.) was evaluated in a field experiment, conducted at Agricultural Farm Mungeli- Bilaspur Chhattisgarh, India during 2003 and 2004. The experiment was laid out in randomized complete block design (RCBD). Phosphorus @ 0, 7.5, 13.7, 19.0, 23.5 and 28.5 kg/ha was applied in respective plots in the form of single super phosphate (SSP). Various growth and yield parameters of the crop were influenced differently by various phosphorus levels. The studies concluded that 28.5 kg P/ha is optimum phosphorus requirement of wheat variety "UP 2338". The analysis for respective years of experimentation revealed that an application of 28.5 kg P/ha significantly increased the plant height (90.1 & 91.9 cm), total number of tillers/m² (1423 & 1445), number of grains per spike (45 & 47), 1000 grain-weight (41.1 & 42.7 g) and on the basis of pooled data the grain yield, straw yield and uptakes of N and P found to be 4559, 5931, 109.4 and 33.5 kg/ha respectively.

Key words: Crop, Fertilizer, Grain, Nutrient uptake, Phosphorus, Tiller, Yield.

In India wheat is the major grain crop and the species under cultivation is mainly *Triticum aestivum*. Wheat like other commonly grown field crops requires 16 essential elements to complete the metabolic processes necessary for growth and reproduction. Phosphorus (P) is essential macronutrient for plant growth and function. Phosphorus is being considered second major element whose deficiency has become widespread in Indian soils (Hasan, 1994). Productivity of different genotypes is greatly influenced by genetic make-up and agro-techniques. Role of phosphorus in increasing tillering and growth is well recognized. It also involved in root development and metabolic activities specially in synthesis of protein (Tanwar & Shaktawat, 2004). An adequate supply of phosphorus to the crop plants during their early growth period is very important for the initiation of leaves and florets primordial (Richards et al., 1985). Application of phosphorus improves various growth parameters like, plant height, fertile tillers/m² and yield parameters like grains/spike and 1000 grain weight. Phosphorus fertilizer is an expensive input and its use efficiency by crops may range from 10-25% (Bahl & Singh, 1986). Farmers mostly use single super phosphate as P source which contains 16% P₂O₅ and 12% S. Fertilizers constitute an essential input in modern agriculture and they help in realizing high crop yields. In normal conditions, the quantity of fertilizers to be applied depends on crop, inherent soil fertility status, yield goal and other considerations like irrigated or rainfed conditions. Optimal production requires suitable cultural practices including proper fertility management. Keeping these points in view, the present investigation was undertaken to determine the phosphorus requirement and productivity of wheat (*Triticum aestivum*).

MATERIALS AND METHODS

The field experiment was conducted at Agricultural Farm Mungeli- Bilaspur, Chhattisgarh, India during the rabi seasons of 2003 and 2004. The analysis for respective years of experimentation revealed that the soil had 0.52, 0.58% organic carbon, 200.50, 214.4 kg/ha available nitrogen, 19.4, 20.9 kg/ha available phosphorus, 203.4, 207.2 kg/ha available potassium, 9.1 and 9.3 mg/kg available sulphate-sulphur, and Cd 0.20, 0.22 mg/kg soil with pH 7.21 and 7.49. The experiment was laid out in randomized complete block design with three applications of commercial grade single super phosphate as P source which contains 16% P₂O₅ and 12% S. Phosphorus @ 0, 7.5, 13.7, 19.0, 23.5 and 28.5 kg/ha was applied in respective plots at the time of sowing. A uniform application of 125 kg/ha N as urea and 100 kg/ha K as K₂O were given to all the plots. Wheat 'UP 2338' was sown at a row spacing of 25 cm x 10 cm in the first week of November. Crop was raised following the recommended package of practices.

The plant height and tillers/m² were measured 100 days after transplanting. The plots were harvested and the total grain and straw yields were recorded and yield-attributes viz grains/spike and 1000-grain weight were recorded from plant samples. The nitrogen and phosphorus in plants were analysed as per standard methods, viz Nessler's reagent colorimetric method (Linder, 1944) and Vanadomolybdo phosphoric yellow colour method (Richards 1968), respectively. The data were analyzed statistically on pooled basis for both years, as per procedure suggested by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

The results indicate a pivotal role of phosphorus nutrition in improving growth, productivity, and nutrient uptake of wheat. As reported by Wilson et al. (1978),