PHOSPHORUS USE EFFICIENCY AND SOIL TEST-CROP RESPONSE CORRELATION

BY

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INTRODUCTION

Phosphorus is an important element essential for nutrition and growth of plants. It plays a vital role in plant metabolism, energy transfer, stimulation of seedling growth and reproduction of plants.

Phosphorus, after nitrogen, is reported to be the most deficient plant nutrient in almost all soils in Pakistan. The use of phosphatic fertilizer in Pakistan started in 1960 with 100 tonnes P_2O_5 and reached a level of 350 thousand tonnes by the year 1986. However, as compared to nitrogen the level of phosphorus use per hectare is still low. Based on the national consumption figures in 1985-86, the ratio of nitrogen to phosphorus use is 3.2:1 (NFDC, 1986a). According to the Sixth Five Year Plan (1983-88) the ratio has been envisaged to narrow down to 2.9:1 by 1987-88 (Planning Commission, 1983). The low usage of phosphorus in relation to nitrogen is considered as one of the constraints holding back crop yields and thus affecting the efficiency and economics of applied nitrogen.

Phosphatic fertilizers, when applied to soils low in available phosphorus, promote plant growth. However, the low plant utilization of applied P fertilizer is still a major problem. The efficiency of phosphatic fertilizer use by plant roots is largely influenced by the rate of movement of phosphorus through the soil to the root. Phosphorus diffuses to the root and can diffuse only in short distances; consequently, for many

crops only 5 to 15% of the applied phosphatic fertilizer is used by the first crop (Barber, 1977). The recovery of applied phosphorus is reported to be low in alkaline, calcareous soils of Pakistan and this has been attributed to the rapid rates of fixation converting the applied available P into difficultly available forms (Chaudhry, 1982).

With rising cost of crop production inputs the cost of producing crops is becoming more expensive. It is, therefore, imperative for farmers to maximize their yield outputs through an efficient use of fertilizers. The amount of fertilizer phosphorus required to provide an adequate supply of available phosphorus to growing plants varies with the type and fertility status of soils. Several agronomic practices such as the method, time and rate of application of phosphate fertilizer influence the utilization of phosphorus by plants; hence, its efficiency in producing profitable economic returns in crop production. However, more information is needed under the various crop production conditions in Pakistan to further refine practices which could promote a more efficient utilization of applied fertilizer phosphorus.

There is an abundant evidence available to show that the immediate source of P for plants growing in soil is the soil solution P (Fox and Searle, 1978). Further, it has also been shown that a close relationship exists between P in solution and the P in sorbed state. Fox and Kamprath (1970) used this information to plot P required to maintain given level of P in solution. The P sorption curves obtained have been