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Title: IMPACT OF LONG-TERM NUTRIENT MANAGEMENT PRACTICES ON PHOSPHORUS DYNAMICS IN AN ALFISOL UNDER SOYBEAN-WHEAT

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**Abstract:** Phosphorus (P) is by far the most important mineral nutrient for crop production, after nitrogen. Ninety percent of the Indian soils are low to medium in available P content. In India, about 50 Mha areas is acidic, in which Alfisol occupy major portion. Majority of the P mainly exists as low solubility Fe and Al phosphates in Alfisol that is responsible for widespread P deficiency. Plants only able to utilize a small part of P-fertilizers applied to the agricultural soils, while the rest is converted into forms, which are not immediately available to plant. Long-term fertilizer management provide the valuable information on residual effect of applied P as transformation and establishment of equilibrium needs sufficiently long time. Therefore, one long-term fertilizer experiment (LTFE) on soybean-wheat continuing since 1972 at Ranchi, Jharkhand was chosen. Eight treatments viz., control, 100% N, 100% NP, 50 % NPK, 100% NPK, 150% NPK, 100% NPK+ FYM and 100% NPK + Lime were selected. The soil samples were analysed for different P fractions. Adsorption-desorption experiment was also performed by equilibrating the soils with graded P solutions. Results indicated that Fe-P was the most dominant P fraction comprising about 37% total inorganic P. Soluble and loosely bound P occupied only a very small portion (<1%) in both depths (0-15 and 15-30 cm). Super-optimal dose of P showed maximum accumulation of all inorganic P fractions except Ca-P in both soil depths as compared to others treatments. Long term absence of P increased P adsorption capacity of soil and made the adsorbed P more unavailable to plants. Increase in P application from 50% NPK to 150% NPK rate has significantly decreased the adsorption maxima. Application of lime with 100% NPK also showed a positive impact on reduction of P fixation over 100% NPK in surface depth. It was apparent that only a fraction of the adsorbed P was available for desorption. The results also revealed that the extent of P desorbed was largest with 100% NPK + FYM treatment. So, it can be concluded that application of optimum and super-optimum dose of P fertilizer, incorporation of lime and FYM in nutrient management system proved to be beneficial both toward increasing different P fractions as well as reducing P fixation by soils and increasing desorption potential. **Keywords:**

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