FERTILIZER PHOSPHORUS AVAILABILITY INDICES IN RELATION TO SOIL CHARACTERISTICS UNDER WHEAT CROP

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ABSTRACT

Fertilizer P availability indices (F_i) are required to initialize soil and plant P model. The developed F_i were related with soil characteristics ($CaCO_3$, Al_2O_3, Fe_2O_3, clay, silt, sand, organic matter, pH) including labile-P (P_{ii}), Olsen-P (OP), P_{ii}/OP ratio, and plant yield and P-uptake. Correlation coefficient and stepwise multiple regression were employed to relate F_i developed at two incubation period (a 7-day and a 6-month) using labile-P (^aF_i) and Olsen-P (^bF_i) test values of 19 alkaline calcareous soils (0-30 cm layer) treated with 0, 30, 60 and 90 mg P kg^{-1} soil. The ^bF_i developed at a 7-day incubation correlated significantly with relative yield at all P rates (r = 0.48 to 0.57) and soil P_{ii}/OP ratio at higher P rates (r = -0.45 to 0.69), but not with P-uptake (r = 0.19 to 0.37). The ^aF_i correlated significantly with relative yield at 60 mg P kg^{-1} soil (r = 0.629**) and P-uptake at 90 mg P kg^{-1} soil (r = 0.541*). Employing stepwise multiple regression, ^aF_i increased significanily with a decrease in both Al_2O_3 and Fe_2O_3 and increase in P_{ii}/Op ratio with low P addition (R^2 = 0.67**). At higher P levels, ^aF_i increased significantly with a decrease in surface area (SA) and organic matter (OM) and increase in P_{ii} test values (R^2 = 0.71 to 0.72**). With ^bF_i, OM and OP test values were related mostly under different P status (R^2 = 0.78 to 0.93**). At moderate applied P, ^bF_i increased with a decrease in $CaCO_3$ and P_{ii} test values (R^2 = 0.91**). With higher P addition, ^bF_i increased with an increase in OP and decrease in OM and P_{ii}/OP ratio explaining 93 percent of variation. It indicated the need of different equations required to predict F_i under different soil P status. Partitioning of the soils based upon Al_2O_3 and Fe_2O_3 contents may be helpful for further studies and testing under field conditions.