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Differential response of phosphorus uptake efficiency, yield and yield attributes in relation to phosphorus nutrition in rice crop

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Abstract

Phosphorus (P) is an essential nutrient for rice growth, but phosphorus is usually deficient in tropical soils, particularly in upland soils where phosphorus is commonly bound to iron and/or aluminum oxides through chemical precipitation or physical adsorption. Phosphorus is one of the major factors worldwide limiting crop yield on more than 30 per cent of the world's arable land. Low phosphorus availability is a principal constraint to crop production worldwide. Low available P status of soil or lack of availability of applied P in soils has been found to be major cause for low crop yields. The low response of crops to P may also be due to transformation of added P into different reaction products with low availability. Therefore, the development of P-efficient rice varieties that can grow and yield better with low P supply is a key to improve crop production. Exploitation of genetic variation in plants in nutrient efficiency has been increasingly explored and emerging as a variable alternative approach to crop production in low nutrient environment. Focusing in this preview field experiment was conducted with twenty two rice genotypes in low phosphorus soil (7 kg ha^{-1}) which was located in Paddy Breeding Station, TamilNadu Agricultural University, Coimbatore. The treatments comprised of two levels of P *viz*., 0 and 50 kg P_2O_5 ha^{-1}. Nitrogen was applied as four equal splits and full dose of phosphorus and potassium was applied as basal application. The results revealed that among the various rice genotypes TM07278 registered highest number of grains per panicle (215) and number of filled grains per panicle (186.2) while the rice genotype CORH-3 (hybrid) registered maximum 1000 grain weight (30.4 g). The highest grain and straw yield were recorded in the rice genotype TNRH-180 (hybrid) (7434 and 11331kg ha^{-1} respectively) at control P. Phosphorus uptake efficiency (It is the ratio of P uptake in plant to available P in soil) was found maximum in rice genotype TM07278 (9.3 kg kg^{-1}) followed by CB08504 (8.1 kg kg^{-1}), TNRH 180 and CB08509 (7.6 kg kg^{-1}) and the lowest in ASD 16 (3.6 kg kg^{-1}).