

Effects of earthworms, arbuscular mycorrhizae, and phosphate rock on setaria grass (*Setaria splendida*) and phosphorus availability in soil

ABSTRACT

Phosphate rock (PR) is essentially insoluble in water. Dissolution of PR under acidic soil conditions is a necessary pre-requisite for uptake of phosphorus (P) by plant. Improvement in P dissolution could be achieved through the interaction of micro- and macro-organisms in soil. A greenhouse pot experiment was conducted with epigeic earthworms (W) (*Pontoscolex corethrurus* M.), arbuscular mycorrhizae (AM) fungi (*Glomus mosseae* Tul), and gafsa phosphate rock (GPR) to evaluate their effects on dry matter (DM), root colonization, and nutrient accumulation of setaria grass (*Setaria splendida*) and availability of P in the soil. Earthworms significantly increased DM yield (23.3 g pot⁻¹) and P accumulation (16 mg P pot⁻¹) of setaria grass. The AM colonization on inoculated plants was high (81%) compared to earthworms. Accumulation of P, N, K, Ca²⁺ and Mg²⁺ in grass were significantly higher in soils contained earthworms, compared to other treatments. Presence of worm (W), AM, and GPR significantly increased phosphorus utilization efficiency (PUE) of setaria grass. The residual P was lower in the soils treated with worm or AM compared to non-treated (control) soil which might be due to higher P uptake by setaria grass. However, plant's available P increased under AM or W treatment. There was a significant interaction effect between AM, W and GPR on P accumulation of setaria grass indicating, efficiency of grass in taking up phosphorous. Thus, it could be concluded that presence of W, AM and GPR have efficiency to increase the amount of plant available P in soil.

Keyword: Arbuscular mycorrhizae; Earthworms; Phosphate rock; Phosphorus availability; *Setaria splendida*