

Improvement Drought Tolerance Properties in Rice through Soil Incorporation of a Superabsorbent Polymer with or without Compost

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Superabsorbent polymer (SAP) application can be used as an effective soil amendment method for relieving drought impacts on crops. Combining SAPs and Compost (COM) may boost soil available water, thereby dehydration tolerance (DT) capacity of rice. Therefore, Study was conducted under microcosmos conditions in two experiments: (E1) explore the effects of SAPs on DT strategies of Bg314 (a designated DT variety) and Bg352 (a general cultivar) and (E2) examine the cumulative impact of both SAP (50 kg ha⁻¹) and COM (COM: Soil=1.5:2.5) on the DT adaptations of Bg314. In both experiments, similar physiological drought cycles were imposed (i.e. 70-40% field capacity; FC) while control plants were kept above FC, saturated conditions. Continuous growth measurements and two sets of morpho-physiological measurements including photosynthetic gas exchange (GE), chlorophyll fluorescence (CF), electrolyte leakage (EL), relative water content (RWC), and chlorophyll content (Chl) were taken between maximum tillering and panicle initiation (M1) and then, between grain filling and maturity (M2). Yield, thousand grain weight (TGW), plant dry weight (PDW), water-use efficiency (WUE), soil moisture content (SMC), and root dry weight at two depths (RDWt; 0-40 cm, RDWd; 40-75 cm) were recorded at harvest. In both experiments, SAP effect was significant ($p < 0.05$) for most traits at M2 irrespective of the variety or COM. In E1, SAP significantly ($p < 0.05$) increased RWC, SMC, RDWt, and WUE and decreased EL in both varieties under drought. Similar effects were seen in E2 with a noticeable increase in RWC and decrease in EL. In E2, SAP had a significant ($p < 0.05$) positive effect on GE parameters of Bg314 under drought. However, SAP effect was not significant for CF, Chl, PDW, growth, and yield or TGW in both experiments ($p > 0.05$). Current results demonstrate that SAP stimulates rice DT while SAP and COM together improve DT, WUE, and GE in rice under drought.

Keywords: Dehydration Tolerance, Drought, Compost, Superabsorbent Polymer, Water Use Efficiency