

DIPEPTIDE INCORPORATED HYDROGEL AS A POTENTIAL SEED COATING TO ENHANCE SEEDLING VIGOR AT MOISTURE STRESS CONDITIONS

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Moisture stress, primarily intensified by climate change and presents a major challenge to worldwide agriculture, especially in seed germination and seedling growth. Hence, the present study aimed to evaluate the efficacy of (Phe-Gly) dipeptide as a hydrogel seed coating to mitigate drought stress during early seedling growth. The dipeptide was synthesized using solid-phase peptide synthesis. The peptide-incorporated gel formulation was developed by combining synthesized Phe-Gly peptide with carboxymethyl cellulose sodium salt (CMC). Phe-Gly dipeptide (0.2% w/v) and CMC (4% w/v) followed by crosslinking with CaCl₂ (5% w/v) were used as the seed coating. A seed germination test and a seedling study were conducted using composite hydrogel-coated tomato seeds (*Solanum lycopersicum*) under two soil moisture regimes (100% and 40%). Three seed treatments used were: non-coated, coated with CMC, and CMC+Phe-Gly. CRD one-factor T-test was used for the germination test and CRD two-factor Analysis of Variance (ANOVA) model was used for the seedling study. Phe-Gly dipeptide in phosphate buffer (pH 6) formed a clear hydrogel through self-assembly upon cooling after boiling at 85°C for a few minutes. Self-assembly of the dipeptide to form a hydrogel was confirmed using FTIR analysis. According to the results through t-test, at ($p > 0.05$), compared to non-coated seeds, no significant change in seed germination was observed with CMC and CMC + dipeptide coated seeds and revealed that the developed seed coating formulation has not shown any seed toxicity in the seed germination process. According to the overall results, at ($p > 0.05$), the resilience of tomato seedlings to moisture stress was improved with the hydrogel application compared to seeds without hydrogel exposed to moisture stress. Thus, the Phe-Gly-CMC hydrogel shows potential for alleviating drought stress in early seedling growth.

Keywords: Hydrogel, Moisture stress, Phe-Gly dipeptide, Seed coating