DEVELOPMENT OF A HYDROGEL SEED COATING ENRICHED WITH GIBBERELLIC ACID FOR EARLY GROWTH OF MAIZE (*Zea mays)*

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Climate stress, which is caused by erratic rainfall and soil crusting, reduces the amount of global staple yields. Maize (*Zea mays*) is vulnerable during the critical days of seed establishment. The objective of this research was to develop and evaluate a starch-based hydrogel seed coating to improve the germination and early seedling growth of Maize. Hydrogel matrices were formulated from locally sourced potato starch, carboxymethyl cellulose, and xanthan gum, then enriched with gibberellic acid (GA3). The GA3 acid concentrations were selected based on the previous studies. Maize seeds were dip-coated in the polymer mixture maintaining a constant velocity, followed by cross-linking in 5% $CaCl_2$ solution and air-dried for 48 hours. In vitro germination was conducted for fourteen days across four treatments, T1 (uncoated), T2 (hydrogel only), T3 (0.015% GA3), and T4 (0.03% GA3). In the germination study, uncoated seeds (T1) achieved 100% germination with the fastest emergence. Coated seeds showed an initial lag from the polymer barrier. Hydrogel alone (T2) reached 92.5% germination. Low concentration of GA3 (T3) supported optimal early vigor at 82.5%, while the high dose (T4) appeared to cause shoot toxicity, reducing germination to 25% with notable delays. A pot trial was conducted with a completely randomized design under two water regimes, including the previous treatments for each regime, well-watered at field capacity and drought conditioned at 70% moisture depletion. Plants from high concentrated GA3 coated seeds showed a low rate of germination, but the established plants survived well. Statistical analysis confirmed significant treatment effects on shoot length by day 21 ($p < 0.05$). Comparison of the seed-coating treatments under drought and normal watering conditions revealed a stronger effect under drought stress ($p = 0.001$) than under normal watering conditions ($p = 0.023$). These results indicate that hydrogel seed coating combined with GA3 significantly enhances plant tolerance to water deficit and improves performance under drought conditions.

Keywords: gibberellic acid, hydrogel, seed coating