“Seed Biopriming to increase Tolerance against Abiotic Stress.”

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Adjuvants (sodium alginate, carboxymethylcellulose, gum arabic, xanthan gum) were used to bioprime biocontrol agent (BCAs): *Trichoderma asperellum* and *Pseudomonas fluorescens* on pak choy and chilli seeds. The efficacy of bioprimed seeds was studied under pot trial. Seeds were first treated by coating adjuvants without BCAs, and examined for seed performances after different imbibition period, as a measure of compatibility. BCAs were incubated in various concentrations of adjuvant solution, as a toxicity assay. Meanwhile, the metal and salt tolerance profile of both BCAs were established by conducting tolerance assay, as a guideline of stress introduction in the subsequent pot trial. Then, the coating efficacy of each adjuvant was studied by examining the percentage of BCA distribution and cell viability after biopriming. The adjuvant with the highest coating efficacy was selected and employed into pot experiment. Results revealed that all adjuvants demonstrated high compatibility to seeds and BCAs. The optimum imbibition time was within 0.5h to 1.0h for pak choy seeds and 1.0h to 6.0h for chilli seeds, without any negative impact on seed performances. Overall, adjuvants are efficient coating agents and benefited both BCAs in terms of promoting viability of BCAs. The bioformulation was further finalized with sodium alginate (1.5% w:v), the highest coating efficacy in entrapping more *T. asperellum* spores during biopriming. Whereas, xanthan gum (0.2% w:v) has the highest coating efficacy in coating *P. fluorescens* on seeds and retained high number of viable cell after biopriming. Pot trial revealed the effectiveness of biopriming technique in promoting tolerance of bioprimed seeds against abiotic stress. Seeds bioprimed with both BCAs are effective in lowering stress-related metabolites under metal stress, indicating the BCAs successfully colonize the soil and seedlings, providing protection to seedlings against environmental stress. Seedling physiological characteristics were less affected under both metal and salt stress during early seedling stage. Under low salinity stress, seeds bioprimed with *P. fluorescens* performed better than *T. asperellum*-bioprimed seeds in reducing proline content and malondialdehyde (stress markers). However, *T. asperellum*-bioprimed seeds revealed higher malondialdehyde level than non-bioprimed seeds, suggesting induced systemic resistance may have been triggered in plants.

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