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Factors Influencing Pitaya (Hylocereus spp.) Seed Germination Assessed with Conventional and Image Analysis Approaches

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Abstract

Pitaya (Hylocereus spp., Cactaceae), comprise several cultivated species that produce fleshy fruits which are consumed fresh, and have a great potential for the food industry as a source of betalain pigments. Plants from the genus Hylocereus utilise the Crassulacean Acid Metabolism pathway, which confers a better adaptation to xerophytic conditions and, at the same time, renders a water-efficient and high added-value crop alternative to farmers living in water-deficit prone areas. Although asexual clonal propagation by stem cuttings, or *in vitro* culture is commercially preferred, breeding and conservation of pitaya genetic resources require more information about optimum seed storage and germination conditions. The aim of this research was to evaluate the effect of the following factors on pitaya seed germination: storage time (up to 12 months), storage temperature (RT and 5.75 °C), light quality (red, blue, white and darkness), genotype and water potential (-0.5 MPa, $^{-1}$ MPa and $^{-2}$.0 MPa induced by polyethylene glycol 6000 and NaCl). To assess these effects, conventional and image analysis approaches were employed. The GERMINATOR package was used successfully to quantify seed germination (R^2 = 0.95 between manual and automatic counting). Using this method, a landrace was identified as showing a smaller seed size and higher vigour than the remaining tested accessions. Besides, it was observed that storage at room temperature decreased germination up to 50 % after 12 months, and fluctuations in seed moisture content were observed across time of storage. When different temperatures and qualities of light were tested, 15 °C and germination in darkness decreased seed germination. Finally, water potentials as low as -0.5 MPa affected seed vigour but not maximum germination (gMAX), and as low as $^{-1}$ MPa inhibited germination. Further studies on other landraces should be considered in order to preserve pitaya genetic diversity and characterise their tolerance to stressful conditions. Digital image analysis as a cost-effective and high throughput technology should be encouraged and implemented to develop comprehensive studies of seed germination, not only for scientific purposes but also for commercial seed testing.

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