

Acquisition, loss and re-establishment of desiccation tolerance in orthodox seeds

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Orthodox seeds are desiccation tolerant, which enable them to be dried and stored for many years. On the other hand, recalcitrant seeds, that are desiccation sensitive, represent a big challenge for those who need to store them. To progress towards a protocol for drying and storage of this category of seeds, it is essential to gain insight into the causes of their desiccation sensitivity. The research on recalcitrant seeds faces a number of obstacles such as the very limited time of availability of fresh seeds. For this reason, germinated orthodox seeds can be a useful model system for studies on recalcitrance, since upon germination they lose desiccation tolerance (DT) and become comparable to the recalcitrant types. Many processes, at the physiological, cellular and molecular levels, related to the loss of DT in germinated orthodox seeds, may be similar to those responsible for the desiccation sensitivity in recalcitrant seeds. When orthodox seeds are imbibed, DT remains unchanged for some time, so they can be safely dried back to their original moisture content. However, if seeds are allowed to imbibe longer, DT is gradually lost. Recent studies have shown that DT can be re-established in germinated seeds by applying osmotic stress. Substances such as sucrose and dehydrins, which accumulate during orthodox seed development and deplete during germination, accumulate again during re-establishment of DT. The use of germinated orthodox seeds and the re-induction of DT in these seeds enable the comparison of different levels of DT in seeds of the same species, and emerge as an outstanding tool for studies on the mechanisms of desiccation tolerance and sensitivity in seeds.