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Impacts of delayed field curing of rice in a humid tropical environment on subsequent seed germinability and vigour

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A common post-harvest practice among rice farmers in Ghana is to field cure harvested panicles in the open field for about five weeks before threshing. Consequentially, the seeds may develop fissures and cracks, enhance physiological deterioration of both embryo and endosperm then, and during storage, and create favorable environment for seed micro-flora activity, especially fungi. In this study, three upland rice genotypes, viz. *Oryza sativa, O. glaberrima* and an *O. sativa x O. glaberrima* interspecific hybrid, were grown in Ghana, harvested, and cured in the open (wet) and within containers (dry) in the field for five weeks with objective of comparing the impacts of wet and dry curing on subsequent seed germinability and vigour. The relationships between air temperature and relative humidity ($p<0.001$), and seed moisture content and seed equilibrium relative humidity ($p<0.001$) differed significantly between curing environments. However, within curing environments, relationships between seed moisture content and seed relative humidity were comparable among genotypes. 18 fungal species each were isolated from seed samples from wet and dry environments; these included soil borne fungal species such as *Alternaria* spp., *Sclerotium rolfsii, Trichoderma* spp and *Verticillium* spp. in the wet environment. Fungal colonies was significantly ($p=0.027$) higher in dry-cured seeds, with O. sativa and *O. glaberrima* being significantly ($p<0.002$) more susceptible to fungal infection. Seeds with cracks were more prevalent in wet-cured seeds. These observations may explain why delayed field curing resulted in germination and vigour loss across all genotypes investigated. These findings have implications for rice seed curing and subsequent storage.

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Ultrastructural responses of plant zygotic embryo cell walls to desiccation: A case study of three gymnosperm species differing in their sensitivity to drying

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Plant cell walls are dynamic in that they can change conformation during ontogeny and in response to various stresses. These changes have been characterised for vegetative tissues; however, even though seeds are the primary propagatory units in most plants, little is known about the conformational responses of zygotic embryo cell walls to desiccation, which is a common abiotic stress. This motivated the present study, which investigates the effect of drying on the gross morphology of the zygotic embryo cell walls of three gymnosperm species: *Podocarpus henkelii*, which produces desiccation-sensitive seeds; *Pinus elliottii*, the seeds of which are desiccation-tolerant and; *Podocarpus falcatus*, which produces seeds that appear to be intermediate. Cryo-scanning electron microscopy was used to observe the responses of embryo cell walls to desiccation. Hydrated embryos of all three species displayed polyhedral cells with relatively straight walls. Upon desiccation to c. 0.05 g g-1 (dry mass basis), cell walls assumed an undulated conformation, the severity of which appeared to be limited by the subcellular accumulation of carbohydrate-containing amyloplasts in *P. henkelii*, lipid bodies in *P. falcatus*, and protein and lipid in P. elliottii. Intercellular spaces between cortical cells were also observed to enlarge upon desiccation, suggesting that components and/or processes at these junctions may be affected by desiccation. When dried embryos were rehydrated, embryo cell walls of *P. henkelii* remained moderately undulated, while those of *P. falcatus* and P. elliottii returned to their original straight conformation. Cell-cell connectivity and hence, communication (via the plasmalemma) is dependent on cell wall conformation. The results obtained here suggest that seed desiccation sensitivity may in part be based on the inability of dried-rehydrated embryo cell walls, such as those of *P. henkelii*, to regain their original straight conformation which can compromise cell-cell communication needed for growth.

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