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Viability and ultrastructural responses of seeds and embryonic axes of *Trichilia emetica* to different dehydration and storage conditions

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Abstract

The seeds of *Trichilia emetica*, a multi-purpose tropical forest species, displayed typical recalcitrant behaviour, being shed at an average axis water concentration of 2.82 g per g dry matter ($g\ g^{-1}$), and losing viability when dehydrated to axis water concentrations below 0.42 and 0.26 $g\ g^{-1}$, when dried slowly or rapidly, respectively. The ultrastructure at shedding was indicative of active metabolism, as would be expected of mature recalcitrant seeds which grade into germinative metabolism after shedding. Rapid dehydration enabled the maintenance of ultrastructural integrity to water concentrations as low as 0.3 $g\ g^{-1}$, while cells of axes dried slowly to similar water concentrations displayed total subcellular destruction. In the fully hydrated state, the storage lifespan of the seeds was limited to 60 days at 16 °C, after which all the seeds had germinated in storage. Ultrastructural examination, however, indicated that prolonged mild water stress had occurred, which the seeds are suggested to have suffered as germination proceeded in storage. When stored at 6 °C, the seeds showed extensive ultrastructural derangement, which was accompanied by loss of viability after 20 days, presumably as a result of chilling injury, while storage at 25 °C resulted in all seeds germinating in storage in 35–40 days. Even though the seedcoat has been shown to inhibit germination, it did not appear to affect seed longevity or germination in storage at any of the temperatures used.

Keywords: Desiccation sensitivity; Medicinal plants; Recalcitrant seed; Seed storage; *Trichilia emetica*

1. Introduction

Trichilia emetica Vahl. typifies many tropical species producing recalcitrant seeds: a high exploitation and extinction rate (UNEP, 1995; Scott-Shaw, 1999; Pitman et al., 2002), intensified by the absence of any, or at least useful, information on the physiology and/or storability of the seeds. This lack of information thwarts efforts aimed at conservation, considering that seeds provide the safest and the least costly means of plant germplasm conservation and are therefore widely utilised in, and form the basis of, the establishment of seed-banks and gene-banks around the world. Successful seed storage, however, requires an understanding and prudent exploitation of the post-shedding physiology of the seeds.

T. emetica grows in forests along the eastern coast of southern Africa and in open riverine-alluvial lowland rainforests of tropical Africa (Beentje, 1994). Throughout its range, the species has a wide range of uses, including the use of the bark in herbal medicine, the use of oil from the seeds as food and for cosmetic purposes, and the provision of wood products (Watt and Breyer-Brandwijk, 1962; Mabogo, 1990; Pooley, 1993). The species is not considered threatened, but the available populations in South Africa may be only those planted in cities, with no wild populations encountered in the course of this study.

Seed production by *T. emetica* is often abundant, but mature seeds are available for a relatively short period in the seeding season (usually c. 3 weeks, according to our observations), and the seeds are reported to have short longevity and are recommended to be sown within three days of collection (Hines and Eckman, 1993). Within this period, the seeds are overrun by fungi unless the aril is removed and the seed surface-sterilized, a treatment that, however, delays fungal contamination only by a matter of days (Myeza, 2005).

This investigation sought to establish the response of the seeds and/or embryonic axes of *T. emetica* to various dehydration and storage regimes, with the aim of understanding the post-harvest physiology of the seeds and establishing

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