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RESEARCH ARTICLE

Promoting Germination in Dormant Seeds of *Pritchardia remota* (Kuntze) Beck., an Endangered Palm Endemic to Hawaii

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ABSTRACT: *Pritchardia remota* is an endangered palm endemic to the northwest Hawaiian Island of Nihoa. Current management actions include the development of suitable populations for out-planting through seed propagation. However, this action is hindered due to potential seed dormancy. We provide evidence that incorporation of fruits into the soil is necessary for germination in the wild and that seeds possess non-deep, simple, morpho-physiological dormancy. Germination is initiated five wk after sowing and can be spread over 21 wk. Seeds do not require light for germination. Rapid (22 to 34 days) and complete (98 to100%) germination is promoted by removal of the endocarp and/or the operculum followed by incubation at high temperatures (25 to 35 °C).

Index terms: Arecaceae, conservation, germination ecology

INTRODUCTION

The Hawaiian archipelago is a floristically diverse area with nearly 1500 indigenous vascular plants of which almost 90% are endemic. Unfortunately, this astounding level of endemism is paralleled by a high rate of extinction and an exceedingly large proportion of endangered plants (Wagner et al. 1999). For these reasons, Hawaii is classified as an area of concern within the Polynesia-Micronesia Global Biodiversity Hotspot (Conservation International 2007). Despite Hawaii's floristic richness, the genus *Pritchardia* is the only indigenous representative of the palm family (Arecaceae) throughout the island chain. Currently, 28 species of *Pritchardia* are recognized and these are restricted to the Pacific archipelagos of Hawaii, Fiji, Cook Islands, Tonga, and Tuamatos. Twenty-three of the 28 *Pritchardia* species are endemic to Hawaii. Furthermore, each Hawaiian species is endemic to a specific island within the archipelago (Wagner et al. 1999; Chapin et al. 2004). Fossil evidence indicates that *Pritchardia* was a major component of lowland and higher elevation forests in Hawaii prior to human contact (Hotchkiss and Juvik 1999; Athens et al. 2002).

Pritchardia provide refuge for a variety of animals such as insects (Richardson 2006), ocean-going birds (David Woodside, U.S. Fish and Wildlife Service, pers. comm.), and the endangered Oahu tree snail (*Achatinella spp.*) (H. Pérez, pers. obs.). A few species are important in the nursery trade. Despite the ecological and economic importance of *Pritchardia*, 50-87% of the Hawaiian species are listed as endangered or threatened by various federal and local agencies. Major threats to *Pritchardia* populations include: invasive, non-native seed predators; exotic weeds; non-native ungulates; habit loss; habitat fragmentation; stochastic events; and reduced reproductive vigor (U.S. Fish and Wildlife Service 1998; Department of Forestry and Wildlife 2001; Chapin et al. 2004).

Conservation and recovery of *Pritchardia* are hampered by highly variable germination. For instance, germination of diverse *Pritchardia* species was observed to occur from 28 to 308 days after sowing (Wagner 1982). Orozco-Segovia et al. (2003) reported that many palms begin germinating within 17 weeks of shedding and thus show a period of dormancy. Although seed dormancy acts as a mechanism to increase the probability of seedling survival (Fenner and Thompson 2005), it may be a confounding factor in determination of seed storage behavior (Hong et al. 1998) and regeneration of germplasm (Ellis et al. 1985).

Pritchardia remota (Kuntze) Beck. is endemic to the Hawaiian island of Nihoa and currently listed as an endangered species in the United States. Existing management plans call for development of seed storage and germination protocols. Consequently, understanding mechanisms that control germination may assist in meeting the recovery goals for this species (U.S. Fish and Wildlife Service 1998). The objectives of this study were to determine if: (1) germination is delayed in natural dispersal units (i.e., drupes); (2) the endocarp and seed coat are water-permeable; (3) covering structures delay embryo emergence and, therefore, radicle protrusion; and (4) embryos are underdeveloped at shedding.