Acta Oecologica 46 (2013) 10–16

Contents lists available at SciVerse ScienceDirect

Acta Oecologica

journal homepage: www.elsevier.com/locate/actoec

Original article

The role of fleshy pericarp in seed germination and dispersal under flooded conditions in three wetland forest species

Juan P. Mora[a,b,*], Cecilia Smith-Ramírez[b], Alejandra Zúñiga-Feest[a]

[a] Instituto de Ciencias Ambientales y Evolutivas, Universidad Austral de Chile, Casilla 567, Valdivia, Chile
[b] Instituto de Ecología y Biodiversidad (IEB), Universidad de Chile, Casilla 653, Santiago, Chile

A R T I C L E I N F O

Article history:
Received 20 December 2011
Accepted 29 October 2012
Available online

Keywords:
Fleshy fruit
Flooding
Submergence
Seed dispersal mechanisms
Swamp forest

A B S T R A C T

In flooded habitats, inundations affect important forest regeneration processes, such as seed dispersal and germination. The main seed dispersal mechanism used by species in Austral South American temperate swamp and riparian forests is endozoochory, which releases seeds from the fleshy pericarp. Endozoochory could be favorable or unfavorable in wetland habitats, since this mechanism exposes seeds directly to water and can, in some cases, be detrimental to germination. In this study, we studied whether or not the fleshy pericarp favors germination after the flooding period's end. Furthermore, we quantified if the number of days which the fruit was found to be floating related to its germination success. We used the seeds of three common fleshy fruit species of flooded habitats from southern Chile, the trees *Luma apiculata* and *Rhaphithamnus spinosus*, and the vine *Luzuriaga radicans*. We simulated flooding periods of 7, 15, 30 and 45 days submerging seeds, with and without pericarps, in water. We found that the pericarp's presence significantly increased *Luma*'s germination success and significantly decreased that of *Luzuriaga*. The germination of *Rhaphithamnus* was low after periods of flooding in both seed treatments, with no significant differences found between them. The fruits could float for an average of one to four weeks, depending on the species, which did not relate to their germination success. These results show that germination was affected by the presence of fleshy pericarps in flooded conditions and furthermore, that flotation allows for hydrochory from one week to one month. We suggest that in swamp forests multiple seed dispersal mechanisms are advantageous, especially for fleshy-fruited species.

1. Introduction

Many tree species in wetland forests disperse their seeds during the flooding season (Kubitzki and Ziburski, 1994; Schneider and Sharitz, 1988), with some seeds falling in the water after release from the parent plant. Continuous submersion in water produces changes in seed viability and germination (Guo et al., 1998; Lobo and Joly, 1998; Parolin et al., 2003; Walls et al., 2005). Many seeds from wetland forest species have evolved tolerance to prolonged periods underwater, employing different strategies to avoid anoxia produced by submersion (Parolin, 2001; Parolin et al., 2003). Different responses to flooding have been described in tropical and temperate forests, such as increased or decreased seed viability as well as delayed or even accelerated seed germination (Ferreira et al., 2007; Parolin, 2001; Rudinger and Dounavi, 2008; Walls et al., 2005). Seed responses vary with flooding duration, which determines seed germination patterns and the establishment success of seedlings and future wetland forest composition (Parolin et al., 2004; Scarano, 1998; Walls et al., 2005).

The presence of external structures (e.g., waterproof tissues, air cavities, appendages, hairs, pericarp or wings) of fruits and seeds can provide certain advantages when seeds drop into the water. These structures can permit flotation and movement of propagules by water (hydrochory), but they can also be related to dispersal by wind (anemochory) and animals (zoochory) (Parolin et al., 2010). These floating structures can allow seeds to avoid negative submersion impacts, especially at times that are not favorable to seed germination (Kubitzki and Ziburski, 1994; López, 2001; Parolin et al., 2003). Although some structures may not have evolved for reproduction through seeds in water-flooded habitat, they may favor seed dispersal and seed survival in flooded habitats (Cousens et al., 2008; Van der Pijl, 1972), by providing flotation and long distance dispersal

* Corresponding author. Instituto de Ciencias Ambientales y Evolutivas, Universidad Austral de Chile, Independencia 641, Casilla 567, Valdivia, Chile.
E-mail addresses: juan.mora@alumnos.uach.cl, morjuanpa@hotmail.com (J.P. Mora).

1146-609X/$ – see front matter © 2012 Published by Elsevier Masson SAS.
http://dx.doi.org/10.1016/j.actao.2012.10.010