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NOTES AND COMMENTS

A field study of seed germination in the endangered *Trillium reliquum* Freeman (Trilliaceae)

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Abstract

Previous studies examining the seeds of most *Trillium* species have reported double dormancy, a type of seed dormancy where two cold periods and one warm period are needed for complete germination. In the present paper, we describe a field study examining the federally endangered *Trillium reliquum* Freeman (Trilliaceae) in which moderate to high numbers of seeds germinated after one winter following seed production. Sixteen baskets with seeds were placed in four *T. reliquum* populations (four baskets in each population) in Georgia, USA, in June 2005. In spring 2006, all seed baskets contained seedlings. Germination percentages ranged from 33.3 to 83.3% across sites with a mean of 56.9 ± 3.9%. *Trillium reliquum* had higher germination percentages compared with other field-based germination studies with other *Trillium* species. Our findings will inform future demographic studies of *T. reliquum* and suggest that double dormancy in seeds may not be as widespread as previously reported within the genus *Trillium*.

Keywords: endangered plant, germination, seed basket study, seed dormancy, *Trillium*.

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Introduction

Seeds of *Trillium* species are known to exhibit double dormancy, a type of morphophysiological dormancy in which two winters (or cold periods) and one summer are needed for complete germination (Case & Case 1997; Baskin & Baskin 1998). Radical dormancy break takes place in the first winter and is followed by radicle growth and seedling development in a warm period, and then epicotyl dormancy is broken in the second winter (Barton 1944; Baskin & Baskin 1998). In the growing season following the second winter, a photosynthetic shoot (cotyledon) emerges above ground. Thus, seeds of *Trillium* species are known to have a complicated germination process and need 1.5 years or longer to fully germinate (Walck *et al*. 2005; Suzuki & Kawano 2010). This type of seed dormancy has been found in studies of *Trillium erectum* (Barton 1944), *Trillium grandiflorum* (Barton 1944; Patrick 1973), *Trillium flexipes* (Pringle 1984), *Trillium camaschatcense* (Samejima & Samejima 1962) and *Trillium ovatum* (Jules 1997). However, it should be noted that Baskin and Baskin (1998) report that seeds of *T. flexipes* and *Trillium sessile* have epicotyl dormancy.

In this paper, we report on a field seed basket study of the endangered *Trillium reliquum* Freeman (Relict Trillium) in which a high percentage of seeds displayed complete germination after the winter following seed production (i.e. without double dormancy). *Trillium reliquum* is a federally endangered species endemic to isolated localities in the Piedmont and Coastal Plain provinces of Alabama, Georgia and South Carolina, USA (Currie 1990; Patrick *et al*. 1995). Although it has a life history similar to other members of the genus (see Patrick 1973; Kawano *et al*. 1986; Jules 1998), a recent study by Heckel and Leege (2007) found that seeds of *T. reliquum* germinated after only one winter in a population in the Coastal Plain of Georgia. In the present paper, we expand on these findings with a field study carried out across four populations in Georgia in 2005 and 2006. This work adds to the knowledge of *Trillium* biology and has implications for the conservation of the rare species *T. reliquum*.

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