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ORIGINAL PAPER

Natural hybridization within seed sources of shortleaf pine (*Pinus echinata* Mill.) and loblolly pine (*Pinus taeda* L.)

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Abstract Shortleaf and loblolly pine trees (n=93 and 102, respectively) from 22 seed sources of the Southwide Southern Pine Seed Source Study plantings or equivalent origin were evaluated for amplified fragment length polymorphism (AFLP) variation. These sampled trees represent shortleaf pine and loblolly pine, as they existed across their native geographic ranges before intensive forest management. Using 17 primer pairs, a total of 96 AFLPs between shortleaf pine and loblolly pine were produced and scored on the sample trees and two control-pollinated F1 interspecies hybrids and their parents. In addition, the well known isocitrate dehydrogenase (*IDH*) isozyme marker was scored for all trees. *IDH* detected two putative hybrids among the loblolly pine samples and two among the shortleaf pine samples, while either 13 or 12 putative hybrids were detected using all AFLP markers and *IDH* and either NewHybrids or Structure software, respectively. Results of this study show that later generation hybrids can be reliably identified using AFLP markers and confirmed that *IDH* is not a definitive marker for detecting hybrids; that is, at least in some seed sources, the alternative species' *IDH* allele resides in the source species. Based on all the markers, hybridization frequency varied geographically, ranging from 30% in an Arkansas seed source to 0% in several other seed sources. The hybridization level was higher in populations west of the Mississippi River than in populations east of the river; the shortleaf pine hybridization rates were 16.3% and 2.4% and the loblolly pine rates were 4.5% and 3.3%, west and east of the river, respectively. The results suggest that hybridization between these two species is significant but varies by seed source and species, and the potential for the unintended creation of hybrids should be considered in forest management decisions regarding both natural and artificial regeneration.

Keywords Genetic diversity

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Introduction

Shortleaf pine (*Pinus echinata* Mill.) and loblolly pine (*Pinus taeda* L.) are both of considerable economic importance in southeastern USA. Both species can be used for construction lumber, plywood, posts, poles, paper, and other physical and chemical products. They have broad geographic ranges and a large sympatric region (Fig. 1).

Research has shown that shortleaf pine and loblolly pine have similar karyotypes (Saylor 1972, Islam-Faridi et al. 2007), so they are expected to cross with each other. As early as 1933, artificial hybrids between these two species were created by the Institute of Forest Genetics, Placerville, CA and reported by Schreiner (1937). In nature, however, there are other conditions such as flowering time that affect possible hybridization. Loblolly pine has mature male and receptive female strobili from the end of February to the middle of March, while shortleaf pine has mature male and receptive female strobili about 2 to 3 weeks later; however, peak maturity and receptivity timing may vary by as much