From Forest Nursery Notes, Summer 2009

50. © *Imperata cylindrica*, an alien invasive grass, maintains control over nitrogen availability in an establishing pine forest. Daneshgar, P. and Jose, S. Plant and Soil 320:209-218. 2009.

Plant Soil (2009) 320:209–218
DOI 10.1007/s11104-008-9886-8

REGULAR ARTICLE

Imperata cylindrica, an alien invasive grass, maintains control over nitrogen availability in an establishing pine forest

Pedram Daneshgar · Shibu Jose

Received: 8 September 2008 / Accepted: 29 December 2008 / Published online: 21 January 2009

Abstract In a field experiment in Florida, USA, ^{15}N-labeled Ammonium Sulfate was used to compare how *Pinus taeda* seedlings take up and use N in the presence of *I. cylindrica* and native vegetation using three treatments: 1) vegetation free 2) native competition, and 3) *I. cylindrica* competition. *Imperata cylindrica* competition led to smaller pine seedlings with significantly less N content in the pine foliage and roots than those in the native treatment. Competition from *I. cylindrica* for N contributed to the pine seedlings taking up a greater percentage of the applied fertilizer than the seedlings competing with native vegetation; however, because of their reduced growth they were less efficient in utilizing the fertilizer N. The belowground biomass of *I. cylindrica* on average was seven times higher than the native species. Despite its lower N concentration in foliage and roots, it retained significantly more N per hectare compared to the native vegetation. While the native species retained more N aboveground, *I. cylindrica* held significantly more belowground, thus invasion by this grass would lead to a shift of N pools from above to belowground. The fact that we were able to account for 81.5% of the applied fertilizer in the *I. cylindrica* treatment compared to 62.2% in the native treatment suggests that *I. cylindrica* tightly retains most of the available N on site making it a particularly good invader.

Keywords Nitrogen isotopes · *Pinus taeda* · Exotic invasion · Nutrient competition · Belowground competition

Responsible Editor: Inderjit.

P. Daneshgar
Iowa State University,
Ames, IA, USA
e-mail: pedram@iastate.edu

S. Jose (✉)
School of Forest Resources and Conservation,
University of Florida,
351 Newins-Ziegler Hall, PO Box 110410, Gainesville, FL 32611, USA
e-mail: sjose@ufl.edu

Introduction

Alterations in system-level rates of resources supply has been suggested to be one of the major changes in ecosystems brought about by biological invasion (Vitousek 1990). The degree that exotic plant invasions affect resource supply and in particular nutrient availability depends on how the characteristics of the invader are different from the native resident species (Chapin et al. 1996; Ehrenfeld 2003). Often, the traits that make a particular species invasive have the greatest impacts on nutrient cycling. Invasive species that achieve success by utilizing resources not being taken up by the local species (Elton 1958; Levine and D'Antonio 1999; Mack et al. 2000) alter nutrient cycling by capturing untapped nutrients and redistributing them through litter decomposition. Some