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The Ecological Genetics of Plant Invasion: Range Expansion of Reed Canarygrass into North America

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Repeated introduction of European populations of reed canarygrass increased the evolutionary potential of North American populations. Introduced individuals emerged earlier and had greater biomass than the native counterparts suggesting that these individuals evolved to become more aggressive.

Photograph Credit - Sebastien Lavergne

Figure. 1. Flowering individual of Reed Canarygrass.

Invasive species threaten natural biodiversity and can dramatically alter ecosystem processes, such as fire frequency. Recent work illustrates how non-native species become noxious invaders through repeated introduction and genetic recombination.

Reed canarygrass, *Phalaris arundinacea*, is native to Eurasia occurring in wetland habitats from Finland to southern France. In the United States, reed canarygrass was intentionally and repeatedly introduced for a multitude of agronomic and restoration practices, such as forage, restoration of marginal lands, and ditch stabilization. Since initial introduction, reed canarygrass has spread into ecologically sensitive wetland habitats where it out competes native plant species, diminishing wildlife habitat and altering the hydrological regime.

EVOLUTION OF INVASIVE TRAITS

In order to understand the genesis of the invasive behavior of this introduced species, Molofsky collected plants from locations in the Czech Republic and southern France and locations in the introduced range

a) b)

Figure Credit - Lavergne and Molofsky 2004

Figure 2. Current geographical range of reed canarygrass in its invasive range in (a) North America and in its native range in (b) Europe. Adapted from Carlson, et al. (1996); Galatowitsch, et al. (1999); Kergu´elen (1993); Tutin, et al. (1964–1993); and USDA and NRCS (2001).

in Vermont and North Carolina. In its native Europe, the genetic diversity of reed canarygrass declined from north to south. The decline in genetic diversity of reed canary grass in Europe constrains its ability to adapt to changing climatic conditions. However, in the United States, there was no difference between the northern and southern populations. This means the introduced species may continue to adapt to changing climatic conditions throughout its introduced range. In addition, novel invasive genotypes developed through genetic shuffling between European varieties within the United States. Studies comparing the native European genotypes to the invasive North American genotypes revealed that the invasive genotypes emerge earlier, produce more tillers, and have greater overall biomass. Thus, invasive genotypes have evolved traits associated with aggressiveness in the introduced range.

IMPACT

The results from this study provide evidence for how a previously non-invasive introduced species can evolve into a highly aggressive invader. Understanding how plants develop invasive qualities will assist scientists, ecologists, and farmers with finding new ways to mitigate species that are currently invasive and preventing newly introduced plants from becoming invasive.

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