



Reed Canarygrass: Friend and Foe?

Purpose: The purpose of this publication is to discuss the status of reed canarygrass (*Phalaris arundinacea* L.) as a forage or biomass crop in the USA.

What is an Invasive Species?

Many beneficial perennial forage crops have been labeled as invasive weeds, depending on the landscape in question. Presidential Executive Order 13112 defines 'Invasive Species' as a non-native species whose introduction does, or is likely to cause economic or environmental harm or harm to human health (www.invasivespecies.gov). Most perennial forage crops in the USA are naturalized and non-native. So while most wild reed canarygrass is Eurasian in origin and invasive in nature, native non-invasive reed canarygrass also exists in the northern USA (Jakubowski et al. (2014).

Reed canarygrass is native to North America (USDA-NRCS, 2002), having been documented in the USA around 1825 in remote areas before extensive settlement and agriculturalization. It was not mentioned as an invasive species until the early 20th century.



Fig. 1. Seed is small, light and readily dispersed by water and in animal fur.

Reed Canarygrass is an Aggressive Species

Reed canarygrass has a number of traits that make it an aggressive species in wetland environments. It can reproduce vegetatively

from fragments of rhizomes or green stems. Seed matures and shatters quickly, and can be dispersed by water. Established populations produce a dense thatch, leading to a monoculture. Stands cannot survive continuous flooding, but can survive flooding for several months if not completely submerged.



Fig. 2. Growth from previous year forms a dense thatch, encouraging the monoculture.

So What Has Changed?

Why is reed canarygrass an ecological problem now, when it was not one in the past? Plant breeding can increase the invasive potential of a species, by increasing growth rates, yield, and tolerance to environmental stresses. It has been proposed that European and/or Asian populations crossed with native reed canarygrass to increase genetic variability and vigor. It has also been suggested that cultivars outcompeted wild populations, or crossed with them to increase invasive potential. It now appears likely that most reed canarygrass found in the wild is of Eurasian origin.

There is ample evidence suggesting that it has been landscape changes which have favored the spread of reed canarygrass monocultures. Reed canarygrass has a competitive advantage in high nitrogen, highly disturbed wetland landscapes. The intensification of agriculture and other landscape disturbances by humans have greatly expanded the ideal environment for reed canarygrass. Landscape-scale changes may be required to have any restoration success in a particular wetland area.

How has breeding changed the species?

Reed canarygrass cultivars have been selected for a delay in seed abscission, and for lower levels of alkaloids. Both of these traits would tend to reduce the invasive properties of reed canarygrass, if they have any effect at all.

A recent study concluded that breeding efforts are likely not responsible for the wetland invasion of reed canarygrass (Jakubowski et al., 2011). Cultivars were very productive in upland environments with N fertilizer, but were no more productive in wetland environments than wild populations.

Invasive Species vs. invasive species

Many ecological organizations list reed canarygrass on their personal invasive species lists, and declare it to be either non-native, or of debatable ancestry. Four states have the species on plant regulated lists as an official Invasive Species. The species is listed as native, invasive, but not banned, in CT and IL. The species is listed as non-native, invasive, and a Class C noxious weed in WA. The species is listed as a non-native, invasive, on the noxious weed list, banned from sale, in MA.



Fig. 3. Reed canarygrass populations evaluated for biomass potential.

Are Low-Alkaloid Cultivars a Problem?

A group of accessions collected in the wild from Iowa to New Hampshire were evaluated along with 8 cultivars for yield (Casler et al., 2009). A large meadow vole population at one of the sites resulted in preferential severe grazing of the randomly distributed low-alkaloid cultivar plots (Cherney et al. 2013). Voles have been shown to graze low-alkaloid cultivars (Howe et al., 2006), and to preferentially graze tall fescue not containing endophyte alkaloids (Clay, 2001). The fact that

almost all accession plots (98%) resisted meadow vole grazing implied that they were high-alkaloid types. Low-alkaloid cultivars, grown by farmers since 1972, probably have not escaped cultivation to any great extent, based on the evidence above.

Summary

Reed canarygrass can be either native/non-invasive, or naturalized/invasive, giving it a Jekyll and Hyde species profile. Low-alkaloid, higher forage quality cultivars, developed for upland sites, likely are less competitive than wild types, and less likely to be an ecological problem. Breeding tends to make improvements across a narrow range of environments, and such changes are not stable across diverse environments. Any cultivars developed for bioenergy use should be designed for a specific environment, which will minimize their invasive potential in wetlands.

Additional Resources

Casler, M.D., J.H. Cherney, and E.C. Brummer. 2009. *Bioenergy Res.* 2:165-173.

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Clay, K. 2001. *Amer. Zool.* 41:810-824.

Howe, H.F., et al. 2006. *Ecology* 87:3007-3013.

Jakubowski, A.R., M.D. Casler, and R.D. Jackson. 2011. *PLoS ONE* 6(10): e25757. doi:10.1371/journal.pone.0025757.

Jakubowski, A.R., R.D. Jackson, and M.D. Casler. 2014. *Crop Sci.* 54:210-219.

USDA-NRCS Reed Canarygrass Plant Fact Sheet. 2002.

http://plants.usda.gov/factsheet/pdf/fs_phar3.pdf.

For more information



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