Abstract

The Great Lakes coastal wetlands have long been invaded by monocultural plant species such as Phragmites australis (common reed) and Typha x glauca (Hybrid cattail) (Sturtevant et al., 2019). These wetland invaders rapidly spread by underground rhizomes and outcompete native plants for space and nutrients. The presence of these invasive species effectively reduces biodiversity and overall natural ecosystem health. Long-term restoration is required to manage invasive populations and recover wetland function. Recently, large scale mechanical harvesting of invasive plants has been shown to be effective, though large amounts of biomass is wasted (Hazelton et al., 2014). Reeds and cattails have been sources of cordage fibers in indigenous communities, yet commercial rope production depends on imported fibers (often jute and hemp). The goal of this project was to address the issues of rope production depends on imported fibers (often jute and hemp). Biodiversity. Setbacks to conservation work include lack of adequate funding, lack of societal understanding of conservation work, and large biomass build-up that often becomes waste.

Introduction

Problem A: The Great Lakes coastal wetlands are heavily invaded by Phragmites australis and Typha x glauca. These species compete for space and nutrients, decreasing native biodiversity. Setbacks to conservation work include lack of adequate funding, lack of societal understanding of conservation work, and large biomass build-up that often becomes waste.

Problem B: Quality rope is almost exclusively imported to North America. Jute production is centered in India, Nepal, and Bangladesh. Sisal is largely exported from Brazil, Tanzania, and Kenya.

Research Questions:

a) Are Phragmites australis and Typha x glauca fibers fit to produce quality rope comparable to that of commercial rope?
b) What are the ideal retting conditions for Phragmites australis and Typha x glauca?

Methods

Harvesting: Typha x glauca and Phragmites australis plants were harvested in Des Plains, IL.

Water retting: In an attempt to avoid chemical inputs in the retting process, plants were submerged in water for 14 days. Following this process, fibers were unable to be isolated easily.

Chemical retting: Small segments of Typha x glauca leaves, Phragmites australis stems, and P. australis leaves were submerged in water for 24-48 hours. Samples were then placed in 0%, 1%, 2%, and 3% NaOH solutions and heated in a hot water bath for 1 hour. Fibers were gently removed by rubbing stems/leaves under running water. Typha x glauca leaves retted with 3% NaOH produced the highest quality fibers.

Scaling up: 75 Typha x glauca leaves were retted in 3% NaOH and left to dry for 48 hours. Bunches of fibers were then twisted into yarn by twisting them between hands. A Lehman’s Rope Making Machine was used to twist the yarn into small rope samples.

Results and Conclusions

Typha x glauca fibers were found to be a promising substitute for jute fibers in rope making. The rope samples produced were strong and flexible. Phragmites australis, however, did not yield high quality fibers for rope making. P. australis leaf fibers were weak and brittle while stem fibers were rigid.

Using Typha x glauca as a commercial resource will decrease the presence of this invasive in the Great Lakes coastal wetlands. Commodifying this species can also increase funding of restoration efforts. Biomass build-up produced by restoration work will be reduced. Typha x glauca rope would also fill the need for locally sourced rope and support the regional economy.

Further research should be done to fully understand the properties of Typha x glauca rope and optimize the quality and quantity of fibers yielded.

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Citations


