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Miscanthus Establishment and Survival

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Abstract
Rising costs of petroleum fuels and increased awareness of the adverse effects of greenhouse gases have spurred interest in renewable fuels and other 'green' products. Recent legislation has set goals of approximately 20 billion gallons of renewable fuel produced from non-corn starch sources by the year 2022. These driving forces have increased interest in dedicated bioenergy crops. Among perennial grasses, which have received an exceptional amount of attention as dedicated energy crops, one stands out: Miscanthus (*Miscanthus x giganteus*).

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Miscanthus Establishment and Survival

RFR-A1146

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Introduction

Rising costs of petroleum fuels and increased awareness of the adverse effects of greenhouse gases have spurred interest in renewable fuels and other 'green' products. Recent legislation has set goals of approximately 20 billion gallons of renewable fuel produced from non-corn starch sources by the year 2022. These driving forces have increased interest in dedicated bioenergy crops. Among perennial grasses, which have received an exceptional amount of attention as dedicated energy crops, one stands out: Miscanthus (*Miscanthus* x *giganteus*).

Miscanthus is an introduced species native to Eastern Asia. The main interest in Miscanthus lies in its impressive yields. Trials at the University of Illinois show Miscanthus can yield three-fold more than switchgrass, with expected commercial yields of ten dry tons/acre. However, this naturally-occurring triploid hybrid variety is sterile and produces no viable seed. Though it hinders cheap planting, a lack of seed is desirable from an ecological standpoint as there is little chance of Miscanthus becoming invasive or weedy.

Without viable seeds, propagation and establishment of large scale plantations of Miscanthus is challenging. Current practice is to dig rhizomes from existing plantations and replant them in new fields. This is disruptive to the parent stand and the tillage required releases soil carbon. Another method of planting Miscanthus uses live plants, known as "plugs," generated in greenhouses. Though this method may be advantageous, some evidence indicates plug plants have a decreased survival rate due presumably to a smaller rhizome system in the first season.

To address these issues and gauge the success of Miscanthus plantations in Iowa, a field study was established in 2009 at three locations in Iowa: Northwest Research Farm (Sutherland, IA), Armstrong Research Farm (Lewis, IA), and the Hinds Research Farm (Ames, IA). The goals of this project are to: 1) evaluate the relative establishment success of rhizomes and plugs, 2) evaluate the relative winter survival of rhizomes and plugs, and 3) evaluate the relative growth and yield of plants generated from rhizomes and plugs.

Materials and Methods

At each site, eight 40 ft by 40 ft plots were established in a completely randomized design with four replicates in late spring 2009. Plots were either established using plugs (Figure 1) or rhizomes (Figure 2). Plants were arranged in an equal spacing grid with 30 in. within and between rows. Plug plots were watered regularly for the first two weeks of establishment or until new shoots emerged from the original transplant.

Weed control was done using a one-row cultivator, hand weeding, and herbicides (2,4-D (Amine 400, pbi/Gordon Corp, Kansas City, MO), and Pendimethalin (Prowl®, BASF, Florham Park, NJ) in the first two seasons. Only spot spraying for Canadian thistles was done in the third season at the Sutherland location. No weed control was required at the Ames and Lewis locations in the third season.

Results and Discussion

In 2011, yields ranged from 7.6 to 14.0 dry tons/acre (Figure 3). Mean yields from each site were not significantly different (P=0.0903). Also at each site, yields of rhizome plots and plug plots did not differ significantly (P>0.05).

Yields from 2011 were increased from the first year, but were very similar overall to the 2010 growing season. Further investigation is underway to determine the lack of increase of yields and increased variability of yields from 2010 to 2011. Our initial hypothesis is that the observed differences in yields and variability were due to the effect of weather. Yields in this study have been comparable with yields in Illinois studies.

These results are further evidence that Miscanthus is a good candidate for energy crop in Iowa.

Acknowledgements

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Figure 1. Greenhouse grown plug of *M.* x *giganteus*.

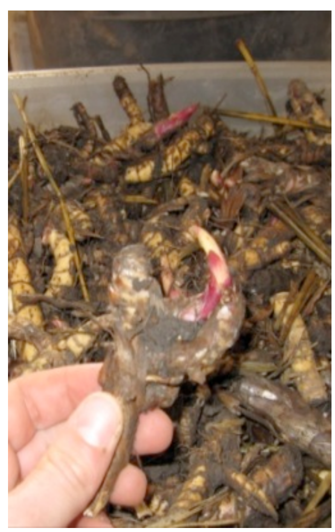

Figure 2. Field dug rhizomes of *M.* x *giganteus*.

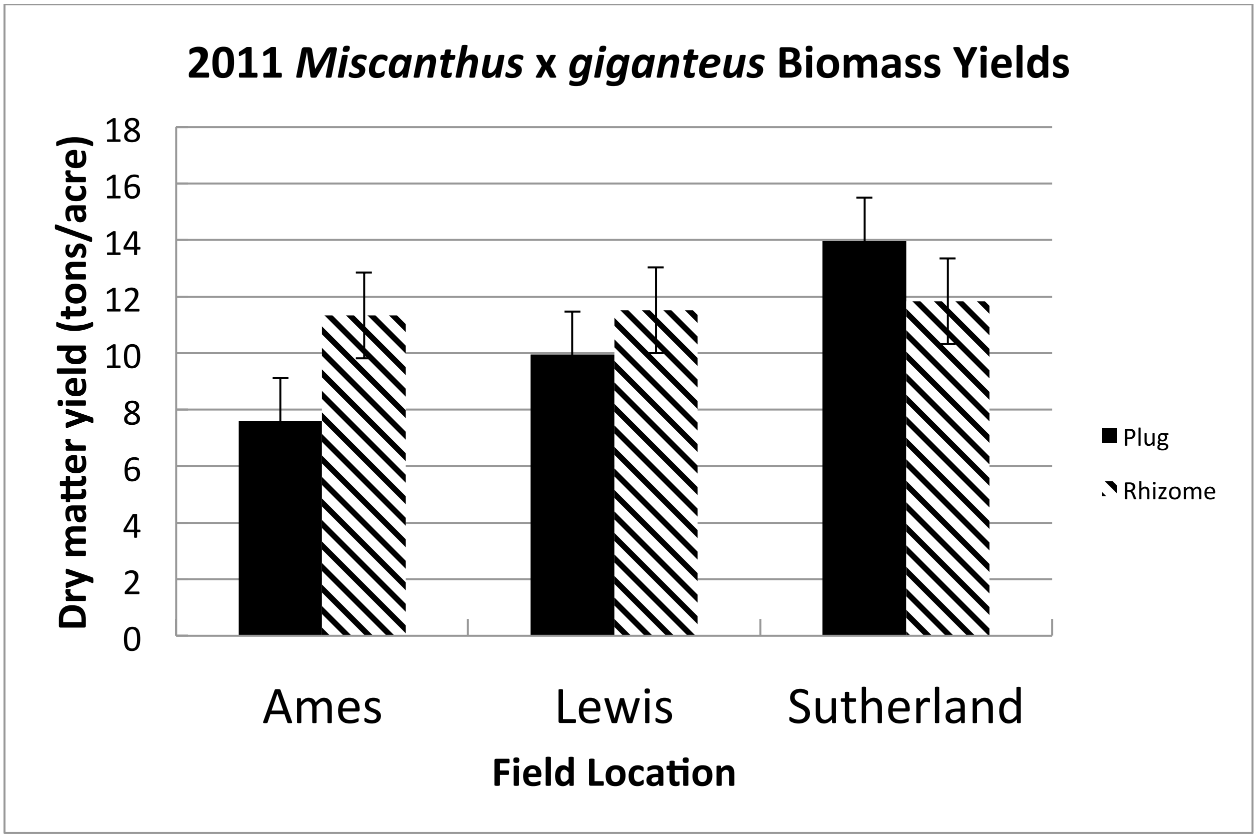

Figure 3. Hand harvested field dry matter yields of *M*. x *giganteus*. Means are the average of four plots and error bars indicate the standard error of the means.