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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 × giganteus).

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# Miscanthus Establishment and Survival

**RFR-A9068**

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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* × *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 10 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: the ISU Northwest Research Farm, Sutherland; the ISU Armstrong Research Farm, Lewis; and the ISU Hinds Research Farm, Ames. The goals of this project were 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 × 40-ft plots were established in a complete 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. At the ISU Northwest Research Farm, 2,4-D (Amine 400, pbi/Gordon Corp, Kansas City, MO) and Pendimethalin (Prowl®, BASF, Florham Park, NJ) were used to control broadleaves and for pre-emerge control of weeds, respectively. Pendimethalin alone was used at the ISU Hinds Research Farm; no herbicides were used at the ISU Armstrong Research Farm.

## Results and Discussion

The results of this experiment will inform growers about the potential of Miscanthus in Iowa and their choice of planting options should they choose to adopt Miscanthus in their operation. The results also may change the conventional approaches used in Miscanthus propagation. Our hypothesis is that Miscanthus plants grown from plugs will establish, perform, and survive similarly to rhizome-grown Miscanthus. Since there are currently few plantations of Miscanthus available for rhizome harvest in the U.S., such a result would mean farmers could establish the crop from cheaper, more readily available plugs with no penalty on stand establishment or biomass yield. This experiment also will inform the geographical range over which plugs are viable propagules for Miscanthus establishment.

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

**Figure 2.** Field dug *M.* x *giganteus* rhizome.