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Effects of rhizome size, depth of planting and cold storage on *Miscanthus* x *giganteus* establishment in the Midwestern USA

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ABSTRACT

High-yielding perennial grasses have been touted as ideal candidates for widespread commercial bioenergy production due to the combination of high productivity and low inputs. Recent research on *Miscanthus* x *giganteus* has shown it to be a particularly attractive option for biomass production in the Midwestern USA, however no previous research has been done on optimizing the establishment of *M.* x *giganteus* under the growing environment within the Midwest. In side-by-side replicated field experiments, the optimal rhizome size and planting depth of *M.* x *giganteus* rhizomes was determined in Urbana, IL USA. In a glasshouse study, the effect of cold storage over time was determined on *M.* x *giganteus* rhizomes. Results of this study suggest that to maximize above-ground biomass production of *M.* x *giganteus* in the establishment year, rhizomes should be 60–75 g, planted to a depth of 10 cm and kept in cold storage for as little time as possible. These results provide necessary data for maximizing the likelihood of establishing commercially viable *M.* x *giganteus* production from rhizome propagation in an area that is projected to be a major contributor to renewable energy goals in the U.S.A.

1. Introduction

The perennial rhizomatous grass, *Miscanthus* x *giganteus* has great potential as an energy crop because of its high yield and low energy input [1,2]. *M.* x *giganteus* is a naturally occurring sterile triploid hybrid of *Miscanthus sacchariflorus* and *Miscanthus sinensis* [3]. Many of the characteristics which make *M.* x *giganteus* an ideal feedstock for energy production have been suggested to be characteristics of invasive weeds [4], therefore it is desirable that sterile germplasm be used for widespread biomass feedstock production to minimize the risk of invasiveness. *M.* x *giganteus* has been studied for use as a biofuel in Europe for more than 10 years without reported escapes into natural or cultivated ecosystems [5]. This experience has shown the advantages of the crop including high yields with low fertilizer and pesticide inputs, and has also identified limitations, namely relatively high establishment costs, a narrow genetic base, and limited hardiness in the first winter following establishment [5].

The cost of establishing *M.* x *giganteus* is high because the plant's sterility necessitates that it be planted from propagules other than seed and to date, very little specialized equipment exists for this purpose. Planting is done vegetatively [6], which is typically more difficult and costly than seed establishment. Two means of vegetative reproduction have been studied: rhizome division and plantlet micro-propagation in tissue culture [5]. The advantage of rhizome division is that it takes place while the plant is dormant and less

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