Effect of Preemergence Herbicides on *Miscanthus* Species

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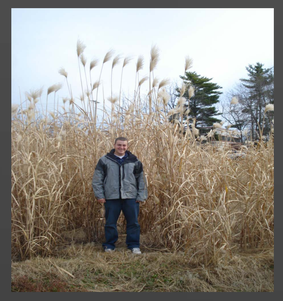
Introduction

Cellulosic ethanol has been proposed as a potential renewable energy source for reducing global dependence on fossil fuels. *Miscanthus* has been investigated as a potential candidate for use as a cellulosic biofuel crop due to its exceptional growth and perennial growth habit. *Miscanthus* is a sub-tropical perennial grass planted from rhizomes or transplants. However, during establishment, crop development is slow and can take up to 5 years to achieve a solid stand. Researchers have purposed the slow establishment of *Miscanthus* could be compounded by competition with weeds, increasing the time it takes to fully establish. However, research on weed control in *Miscanthus* has been limited, including chemical weed control.

Objective

To evaluate current commercial herbicides as potential candidates for use for preemergence weed control in *Miscanthus* species.



Materials and Methods

- Greenhouse studies were conducted at Michigan State University and Texas Tech University
- RCBD design, 4 or 6 replications, 2 runs
- Each university evaluated a separate *Miscanthus* species
  - *Miscanthus giganteus* – Planted by Michigan State University
  - *Miscanthus sacchariflorus* – Planted by Texas Tech University
- *M. giganteus* rhizomes were planted into field soil and then treated over the top
- *M. sacchariflorus* was transplanted into treated field soil
- 9 herbicide treatments were evaluated including a non-treated check (Table 1)
- Injury was assessed visually on a 0-100% scale 28 days after treatment
- 35 days after application plants were harvested and dried for shoot and root biomass samples
- Means were separated using Fisher's Protected LSD at p=0.05

Table 1. Herbicide treatments and rates evaluated on *Miscanthus* spp.

Herbicide	Rate (kg ai/ha)	Herbicide	Rate (kg ai/ha)
Non-treated		mesotrione	0.21
acetochlor	1.57	metribuzin	0.37
clomazone	0.84	pendimethalin	1.06
dicamba	0.56	*S*-metolachlor	1.35
imazethapyr	0.07	sulfentrazone	0.21

Results

Fig. 1 *Miscanthus* spp. injury 28 days after application

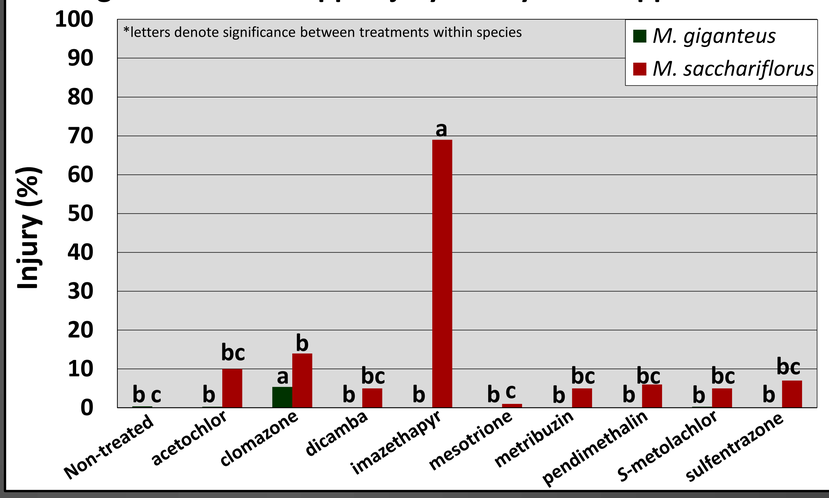


Fig. 2 Yield of *Miscanthus* spp. dry shoot matter

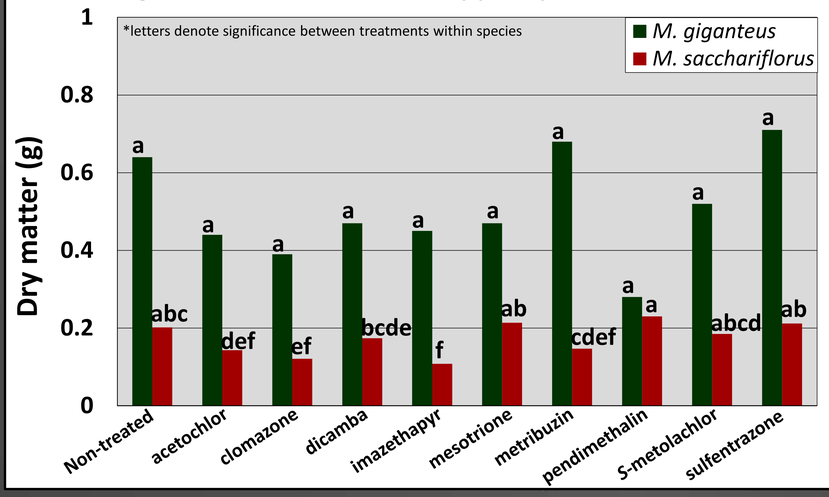
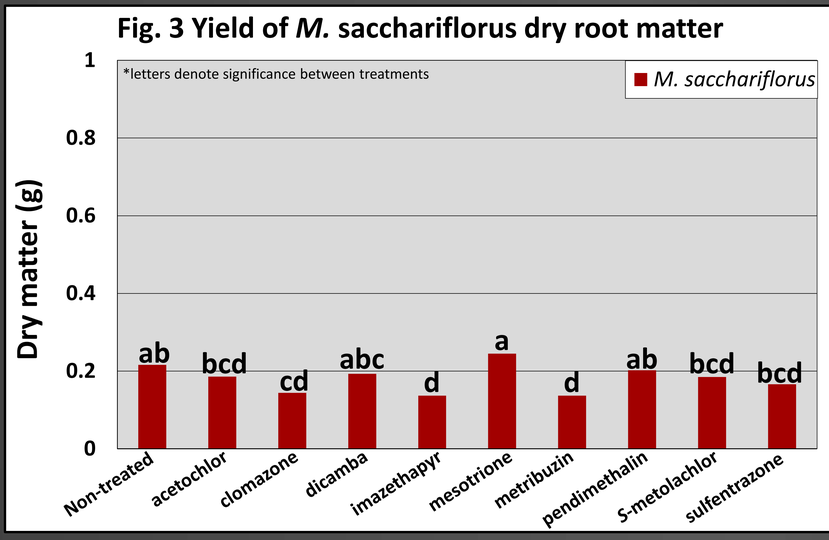


Fig. 3 Yield of *M.* sacchariflorus dry root matter



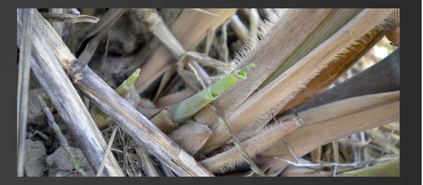
Discussion

- Runs from respective experiments/species were combined.
- *M. giganteus* was less symptomatic than *M. sacchariflorus* (Figure 1).
- Clomazone caused significant injury to both species.
- The treatment that caused the most injury on *M. sacchariflorus,* imazethapyr at 69%, caused 0% injury on *M. giganteus.*
- *M. giganteus* yielded 291% greater than *M. sacchariflorus* (Figure 2).
- No differences were found between treatments effect on shoot biomass accumulation of *M. giganteus.*
- Treatments of dicamba, mesotrione, metribuzin, pendimethalin, *S*-metolachlor and sulfentrazone on *M. sacchariflorus* yielded the same shoot biomass as the non-treated.
- Clomazone and imazethapyr reduced shoot biomass yields of *M. sacchariflorus* which also caused injury 28 days after preemergence application.
- Acetochlor also reduced shoot biomass yields of *M. sacchariflorus* but did not cause significant injury 28 days after preemergence application.
- Treatments did not affect root biomass accumulation of *M. giganteus* (data not shown).
- Treatments of acetochlor, dicamba, mesotrione, pendimethalin, *S*-metolachlor and sulfentrazone on *M. sacchariflorus* yielded the same root biomass as the non-treated.
- Clomazone and imazethapyr reduced root biomass yields of *M. sacchariflorus* which also reduced shoot biomass (Figure 3).
- Metribuzin also reduced root biomass yields of *M. sacchariflorus* but did not reduce shoot biomass.

Conclusion

- *M. sacchariflorus* demonstrated greater herbicide sensitivity compared to *M. giganteus* which could be due to:
  - Higher growth rate of *M. giganteus*
  - Difference in planting methods of the two species
  - *M. giganteus* emergence as a shoot encased by scales (Fig 4.)
- *M. giganteus* was tolerant to herbicides tested and will be further evaluated by field studies.
- Treatments of dicamba, mesotrione, pendimethalin, *S*-metolachlor and sulfentrazone were safe for application to *M. sacchariflorus* and will be further evaluated for use in the field
- Although acetochlor, clomazone, and metribuzin reduced root and or shoot biomass yield they could offer potential for weed control in *M. sacchariflorus*
- Imazethapyr caused significant injury and yield reductions of *M. sacchariflorus* and should not be applied preemergence to transplanted plants

Figure 4. A newly emerging *Miscanthus* shoot depicts the emergence of the species.



Acknowledgements

The authors would like to thank Travis Williams, Tyler Cooper and Mendel Biotechnology for their assistance in conducting this research.