TOLERANCE OF POTATO MINI-TUBERS TO PRE AND POST HERBICIDE APPLICATIONS

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Introduction

Demand for disease-free potato seed in Michigan is high due to a large yield return upon planting pathogen-free seed. Using aseptically grown plants through tissue culture methods, potato mini-tubers can be generated as a clean seed source. However, many cultural practices for raising potatoes from mini-tubers are adopted from traditional seed piece production practices including herbicide recommendations. Growers in Michigan have observed injury following application of herbicides to mini-tubers and have become concerned about herbicide selection.

Objective

- To observe the growth and response of mini-tubers following PRE and POST herbicide applications
- To evaluate if there is a varietal response to herbicides

Materials and Methods

- Study conducted in 2008 and 2009
- Plots were arranged in a RCBD with 4 replications
- Three potato cultivars were used
  - Atlantic (ATL), Frito-Lay (FL) and FL2
- Planted in 86.4 cm rows, 6.4 cm deep at an 20.3 cm spacing
- Plot size = 6.1 m X 2.6 m
- Each plot contained a row of each mini-tuber cultivar
- Herbicides (Table 1)
  - PRE treatments applied 2 weeks after planting (WAP)
  - POST treatments applied 6-8 WAP
- Plots were maintained hand weed-free
- Injury was visually evaluated during the season on a 0-100% scale
- 3 m of the 6.1 m row was harvested and graded
  - US #1 (3.8 - 8.3 cm in diameter and less than 340g), tuber smaller and larger than US #1 and abnormal shaped tubers
- Statistical analysis was conducted using ANOVA procedures in SAS software

Table 1. Herbicide Treatment List

PRE applied alone

Herbicide	Rate (kg ai/ha)
dimethenamid	0.74
KIH-485	1.41
S-metolachlor	1.42
pendimethalin	0.8
linuron	0.56
metribuzin	0.56
imazosulfuron	0.45
rimsulfuron	0.026

PRE combinations

Herbicide	Rate (kg ai(ae)/ha)
S-metolachlor + linuron	1.42 + 0.56
S-metolachlor + linuron + metribuzin	1.42 + 0.56 + 0.1
S-metolachlor + pendimethalin + metribuzin	1.42 + 0.27 + 0.1
S-metolachlor + pendimethalin + metribuzin + glyphosate + AMS	1.42 + 0.27 + 0.1 + 0.86 + 3.8

PRE fb POST combinations

Herbicide	Rate (kg ai/ha)
S-metolachlor + linuron fb rimsulfuron + NIS	1.42 + 0.56 fb 0.018 + 0.47 L
S-metolachlor + linuron fb metribuzin + rimsulfuron + NIS	1.42 + 0.56 fb 0.28 + 0.018 + 0.47 L
Non-treated	

Figure 1. Vine discoloration 1 week after emergence

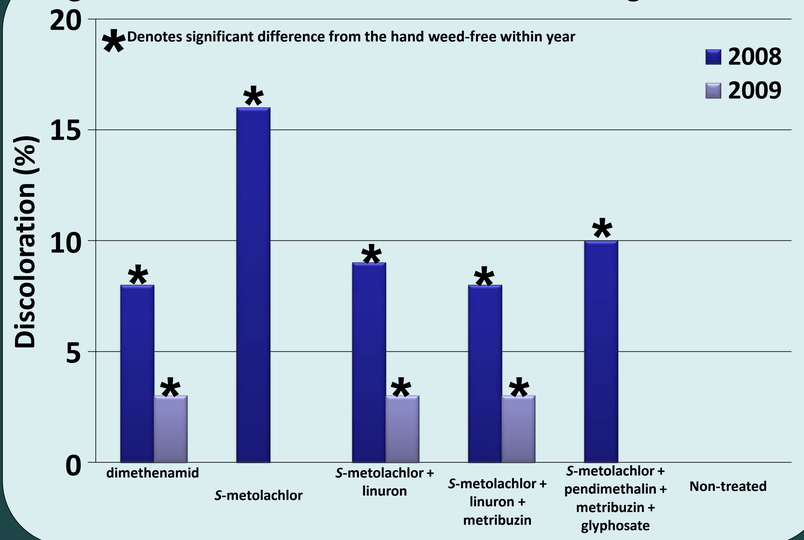


Figure 2. Vine discoloration 2 weeks after emergence

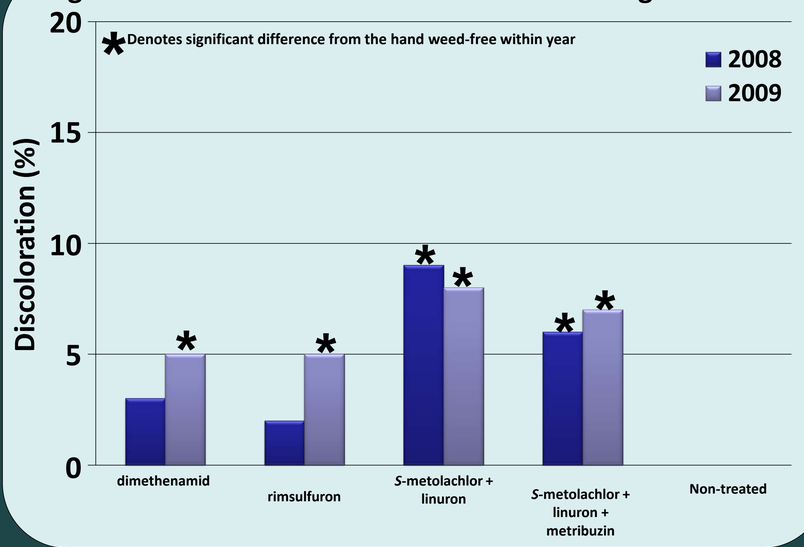


Figure 3. Total yield as affected by treatment in 2008

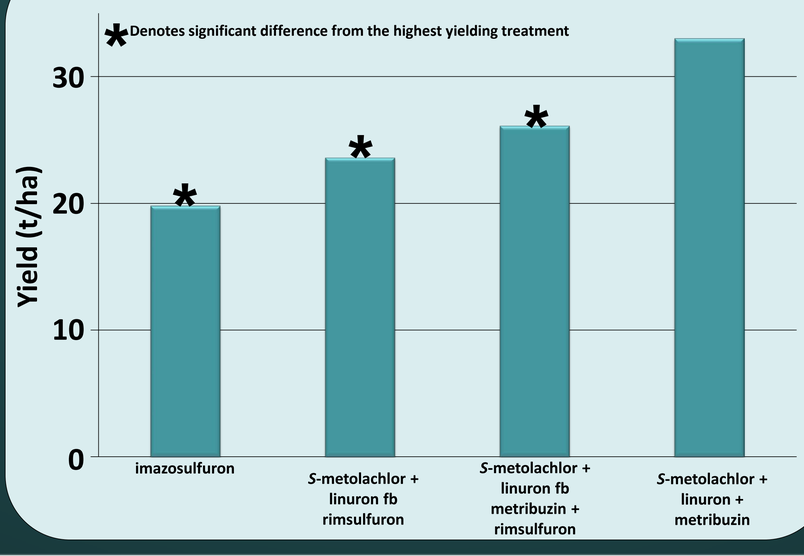
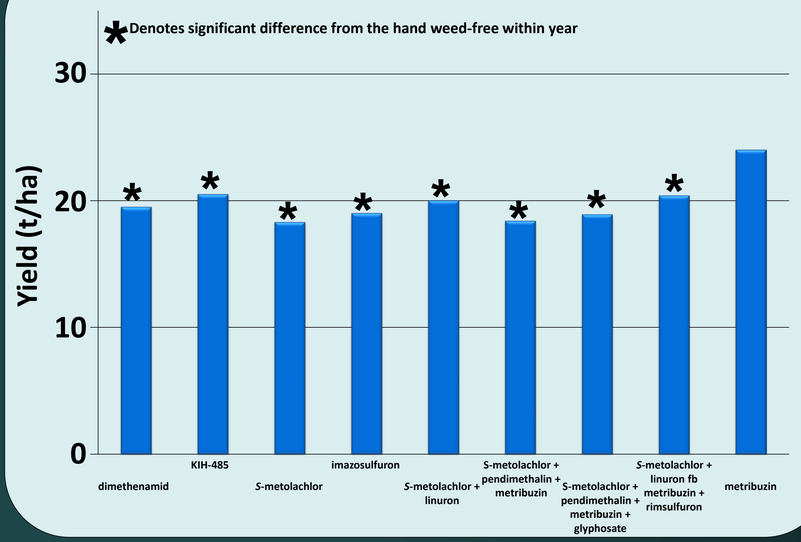


Figure 4. Total yield as affected by treatment in 2009



Results and Discussion

- Significant year by treatment interactions were reported thus data was separated by year
- There were no significant treatment by variety interactions therefore data was averaged over varieties
- *S*-metolachlor alone caused the greatest injury 1 week after emergence in 2008 at 16% but caused less than 1% in 2009 (Figure 1)
- *S*-metolachlor + linuron applied PRE in combination caused significant injury 1 and 2 weeks after emergence from 3-9 % in both years (Figure 1,2)
- 2 weeks after emergence in 2009, dimethenamid and rimsulfuron were found to cause significant injury at 5% whereas in 2008 they were not significant (Figure 2)
- Imazosulfuron in both 2008 and 2009 was found to significantly reduce total tuber yield (Figure 3, 4)
- Although *S*-metolachlor + linuron caused injury in 2008, yield reductions only resulted when fb a POST application (Figure 3)

Conclusion

- Mini-tuber varieties respond similarly to different herbicides
- Imazosulfuron causes yield reductions when applied to mini-tubers
- POST applications of rimsulfuron with or without metribuzin following PRE applied *S*-metolachlor + linuron resulted in yield reductions
- Root or shoot growth inhibitors reduced yields when growing conditions were cooler than normal
- Metribuzin, linuron and rimsulfuron applied PRE alone are safe for application to potato mini-tubers

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