

Effect of S-metolachlor and Flumioxazin on Sweetpotato Treated with and without Activated Charcoal Applied through Transplant Water

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Introduction

- North Carolina farmers grow over 41,000 ha of sweetpotato annually, worth over \$350 million.
- Flumioxazin is used on approximately 95% of the sweetpotato hectareage in North Carolina (K.M. Jennings, personal communication).
- S-metolachlor is used on 50% of North Carolina sweetpotato hectareage (2019 non-published survey, Smith and Moore).
- Growers have depended on flumioxazin and S-metolachlor as integral components of their weed control program, especially for Palmer amaranth (Meyers et al. 2010).
- Some growers have expressed concerns about the effect of flumioxazin and S-metolachlor on sweetpotato storage root formation, yield and quality.
- Yelverton et al (1992) reported that activated charcoal reduced phytotoxicity caused by imazaquin and chlorimuron in tobacco.
- In 2020, a committee of growers and faculty concluded that a study evaluating activated charcoal to safen herbicides in sweetpotato should be a high priority. Thus, a study was conducted with the following objectives.

Objectives

- Determine if flumioxazin can be injurious to sweetpotato, and cause reductions in storage root yield and quality.
- Determine whether activated charcoal can act as a safener for flumioxazin and S-metolachlor in sweetpotato.

Materials and Methods

- Field studies were conducted in Clinton, NC in 2021 and 2022.
- Study design was a five (herbicide) by two (charcoal) factorial with randomized complete block design with four replications.
- **Factor one:** no herbicide, flumioxazin pretransplant (0.1 or 0.2 kg ai ha⁻¹), S-metolachlor (1.61 kg ai ha⁻¹) pretransplant or 0 d after transplanting (DAP)
- **Factor two:** 'Covington' sweetpotato nonrooted cuttings transplanted with or without activated charcoal (0.9 kg ha⁻¹) mixed with the transplant water.
- All treatments maintained weed-free throughout the season via hand weeding.
- Visual Injury and stunting ratings taken at 1, 2, 4, and 8 wk after treatment.
- Storage roots were graded by hand into canner, no. 1, and jumbo grades at harvest. Marketable yield calculated as the sum of no. 1 and jumbo grades.
- Root length to width ratio (LWR) calculated by dividing no. 1 root length by width using optical grader (Exeter Engineering, Exeter CA) data to quantify root shape.
- Data subjected to ANOVA in SAS v. 9.4 using PROC MIXED with Tukey's HSD for mean separation at $\alpha = 0.05$.

Results

Figure 1. Effect of treatments on sweetpotato yield.

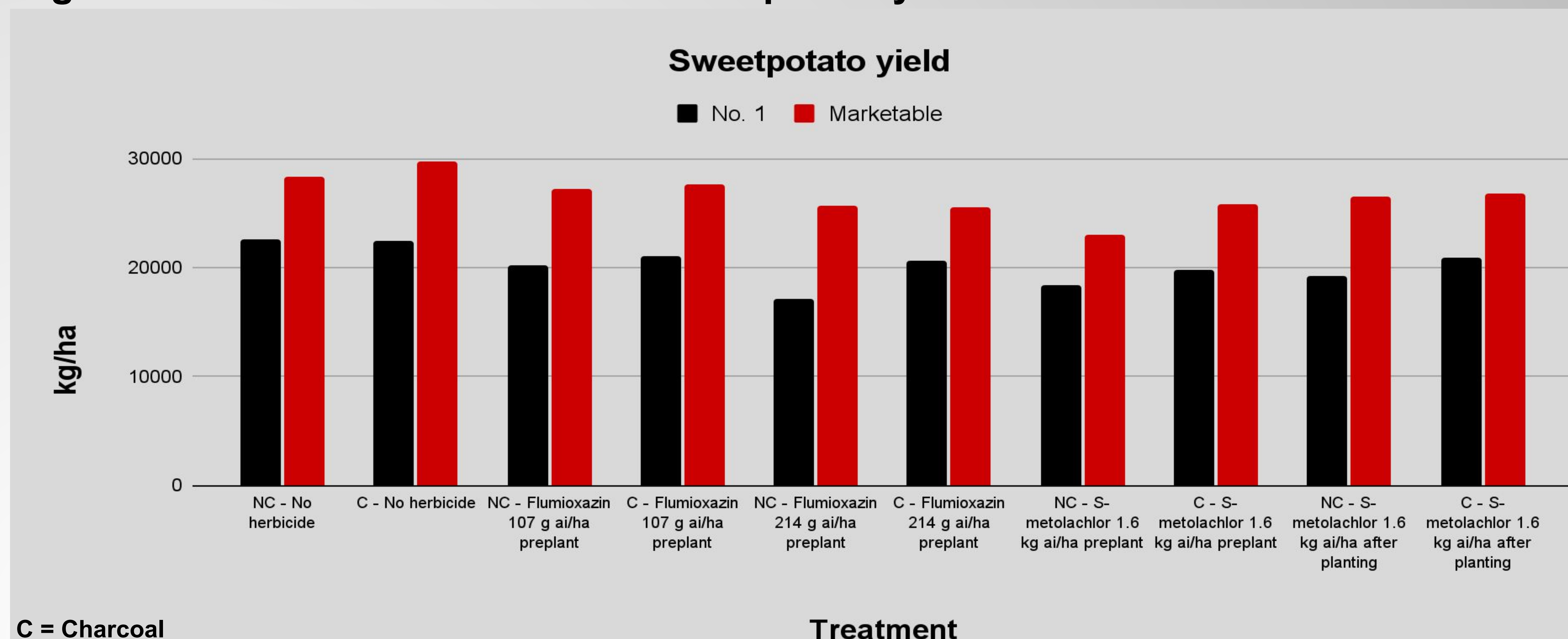


Table 1. Effect of treatments on LWR.

Herbicide	LWR	
	2021	2022
None	1.75 a	2.06
Flumioxazin 107 g ai ha ⁻¹	1.70 a	2.05
Flumioxazin 214 g ai ha ⁻¹	1.68 a	2.02
S-metolachlor 1.6 kg ai ha ⁻¹ before planting	1.55 b	1.99
S-metolachlor 1.6 kg ai ha ⁻¹ after planting	1.56 b	2.08

- No visual injury or stunting observed in 2021 or 2022.
- No differences in no. 1 and marketable yield (Figure 1).
- Interaction present between herbicide and LWR which was assessed by year.
- Both S-metolachlor treatments reduced LWR in 2021 compared to non-treated check, but flumioxazin did not (Table 1).
- No reduction of LWR from any treatment in 2022 (Table 1).
- No effect from charcoal on yield or LWR (data not shown).

Conclusions

- S-metolachlor rates were 2x recommended rates, yet did not affect yield. The effect on LWR is likely due to the rate selected and high rainfall after application in 2021.
- Flumioxazin had no effect on yield or LWR at up to a 2X rate.
- Activated charcoal had no effect in this study.
- Flumioxazin and S-metolachlor are safe for continued use in sweetpotato production systems when used according to labeled instructions.

Future Research

- Research is needed to better determine the potential of activated charcoal mixed with transplant water as a safener in sweetpotato, perhaps by using more injurious herbicides.

Literature Cited

Meyers SL, Jennings KM, Schultheis JR, Monks DW. (2010) Evaluation of flumioxazin and S-metolachlor rate and timing for Palmer amaranth (*Amaranthus palmeri*) control in sweetpotato. *Weed Technol* no period 24:495-503
Yelverton FH, AD Worsham, GF Peedin (1992) Activated charcoal reduces tobacco (*Nicotiana tabacum*) injury from soil-applied herbicides. *Weed Technol* 6:310-316