

Introduction

- Carinata (*Brassica carinata* (A.) Braun) is an oilseed crop that is currently being developed for biofuel production (Bouaid et al. 2009; Cardone et al. 2003).
- Southeastern growers have been interested in growing carinata as a winter crop because of industry demand.
- It is necessary to characterize herbicide tolerance of carinata to manage weeds effectively with minimal crop injury.
- Preliminary screenings conducted in 2018 identified candidate herbicides for safe use in carinata crops.

Objective and Hypothesis

- Objective: Assess the safety of select preemergence and postemergence herbicides and varying rates on carinata seedling establishment and plant growth.
- Hypothesis: These prescreened herbicides should cause no major injury at labeled rates.

Materials and Methods

- Locations: Salisbury and Hookerton, North Carolina and Jay, Florida
- Herbicides:
 - Diuron (Direx)
 - Napropamide (Devrinol)
 - Clomazone (Command)
 - Simazine (PrincepL), NIS (Induce)
 - Clopyralid (Stinger)
- Rates of 0.25X, 0.5X, 1X, 2X, 4X, and 8X of recommended label rates for each herbicide were used in either preemergence and postemergence applications (Table 1)
- Preemergence treatments were applied at planting
- Postemergence treatments were applied at the 4-6 leaf stage, 4 weeks after planting (WAP)
- Visual injury ratings were taken four weeks after planting and compared to a non-treated, weed-free check
- Harvest was conducted with a small plot combine and yields were adjusted to 8% moisture, then relative yield was calculated based on the non-treated, weed-free check
- Data were analyzed using SAS, means were separated by Tukey's Honestly Significant Difference ($\alpha=0.05$)

Table 1: Grams of active ingredient per hectare for label rate (1X) of each herbicide

Herbicide	Application Timing	Rates (g a.i. ha ⁻¹)
Diuron	PRE	1122
Clomazone	PRE	105
Napropamide	PRE	2244
Simazine	POST	1122
Clopyralid	POST	841

Results

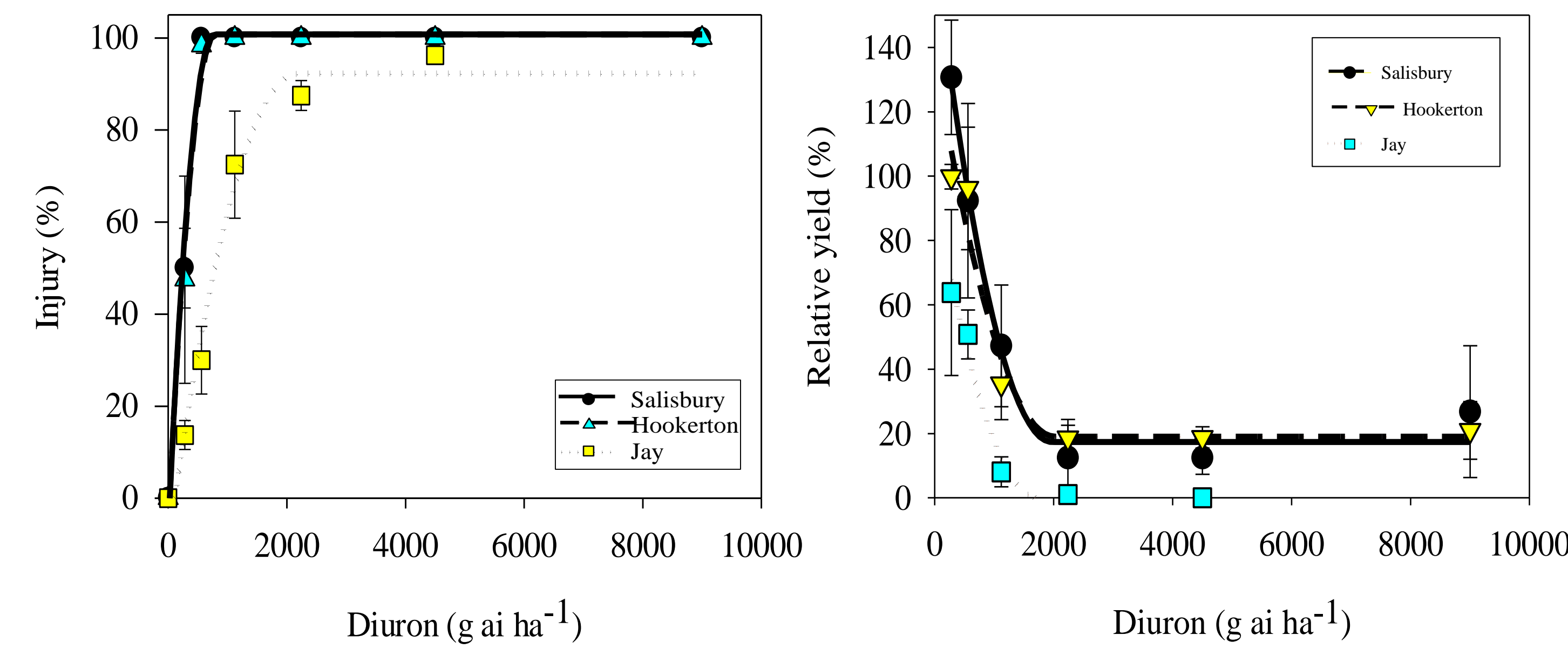


Figure 1. Visual rating of crop injury at various application rates 4 weeks after treatment (left) and resulting relative yield (right). Error bars indicate standard error of the mean (S.E.M.).

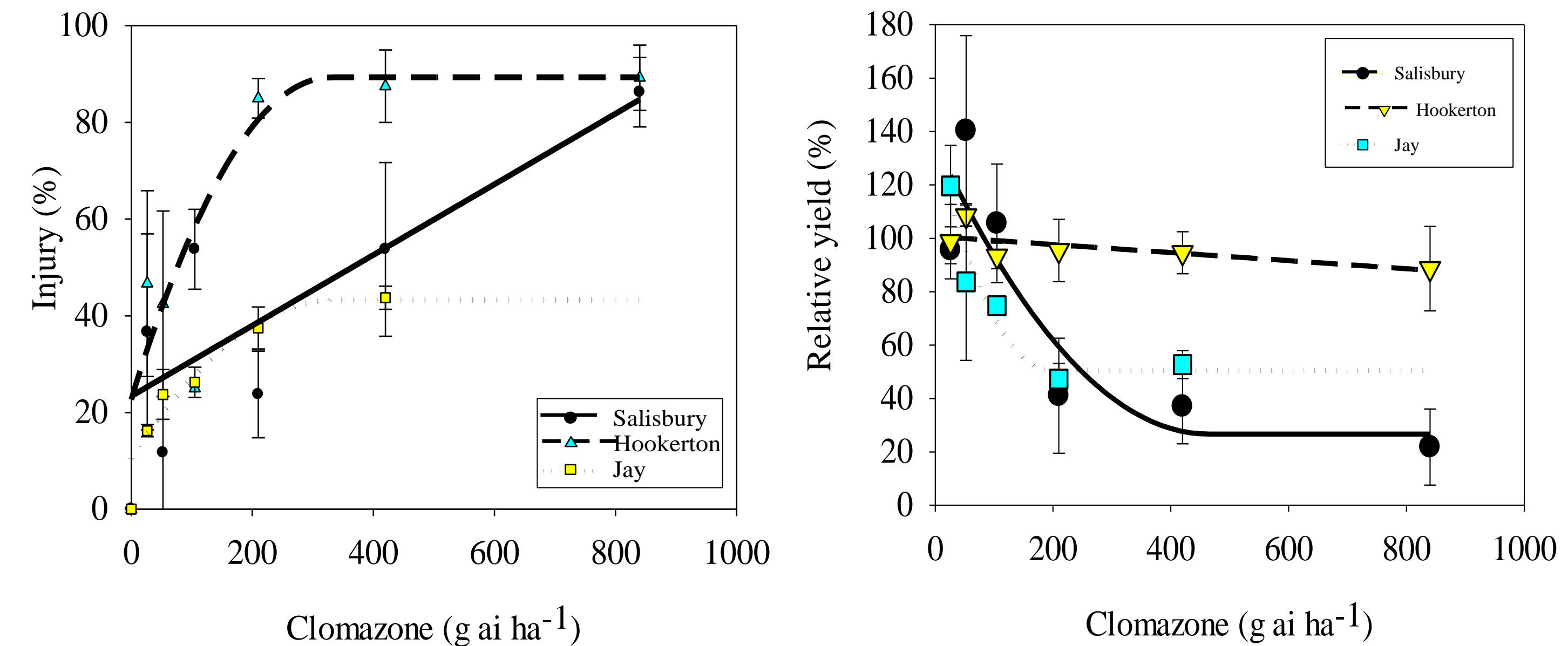


Figure 2. Visual rating of crop injury at various application rates 4 weeks after treatment (left) and resulting relative yield (right). Error bars indicate standard error of the mean (S.E.M.).

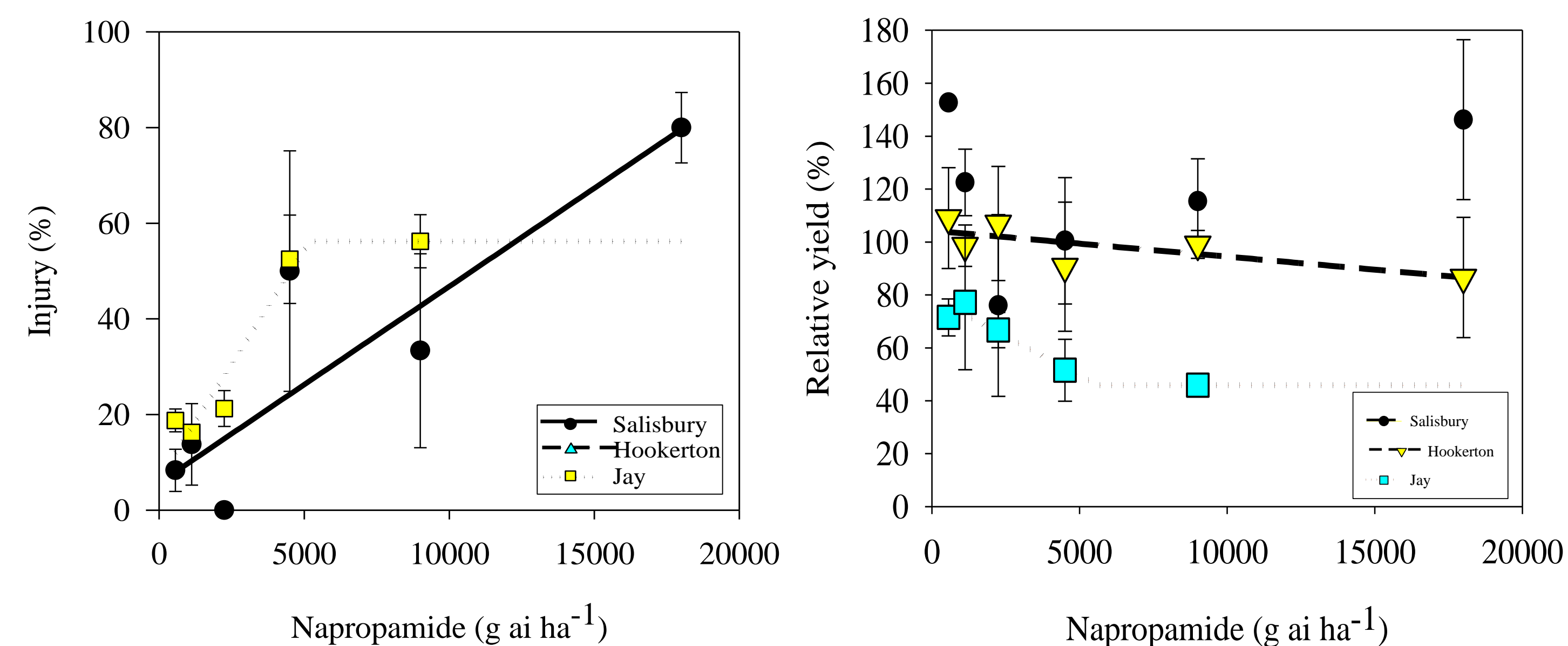


Figure 3. Visual rating of crop injury at various application rates 4 weeks after treatment (left) and resulting relative yield (right). Error bars indicate standard error of the mean (S.E.M.). Hookerton injury removed due to frost damage.

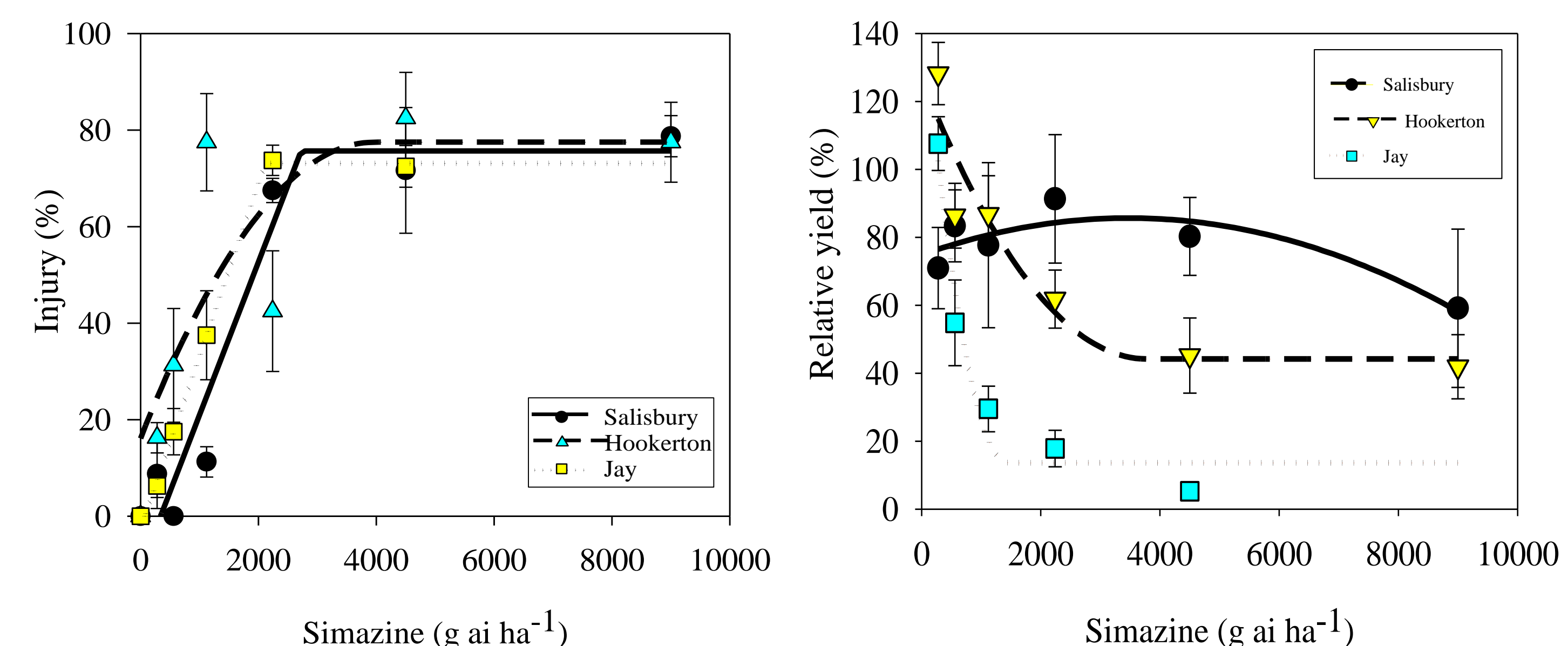


Figure 4. Visual rating of crop injury at various application rates 4 weeks after treatment (left) and resulting relative yield (right). Error bars indicate standard error of the mean (S.E.M.).

Results continued

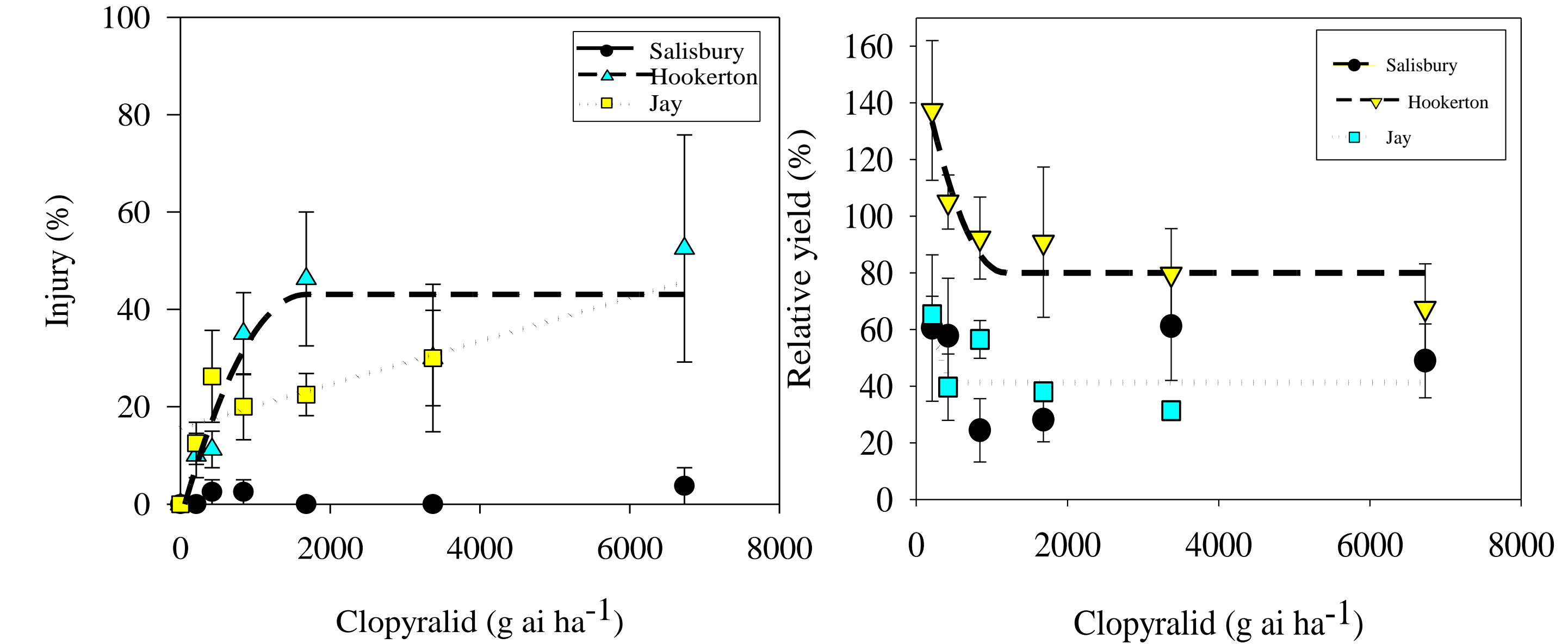


Figure 5. Visual rating of crop injury at various application rates 4 weeks after treatment (left) and resulting relative yield (right). Error bars indicate standard error of the mean (S.E.M.).

Conclusions

- Diuron caused high injury even at rates below the recommended label rate at both locations. This injury led to lowered yields. Diuron could be used for control of volunteer carinata in rotational crops.
- Clomazone had much higher injury in Salisbury. Established plants that exhibited high injury expressed injury as bleaching, chlorosis, and plant stunting. Yield reductions were low when applications remained below the label rate for every location. If clomazone were to be used for preemergence weed control in carinata, this will require that growers understand the risk, but transient nature, of the pigment loss that plants could exhibit.
- Carinata from Hookerton was heavily injured by frost, so higher levels of injury seen were not reflective of herbicide damage and removed from the analysis. At rates below the label rate, injury and yield reductions were low, so napropamide could be explored further as a preemergence herbicide that would provide good weed control. However, major southern row crops, including corn, cotton, soybean, peanut, and sorghum are not included on the napropamide label, which could be problematic for southern growers.
- In all locations, as simazine rates increase, injury increased rapidly. Carinata was not able to recover from the high levels of injury, resulting in relative yield losses from 20% to 95%. Simazine could be used to control volunteer carinata in rotational crops.
- Clopyralid caused minor injury to carinata, even at the highest rates. Yield was greatly affected by this herbicide in Salisbury, NC and Jay, FL. Although this herbicide caused low injury, its efficacy for winter weed control may be limited if used alone.

Implications

- This research of preemergence and postemergent herbicide tolerance will give farmers herbicide regimens to allow the reduction in physical, environmental, and economic constraints in order to produce *Brassica carinata* for renewable fuels and bioproducts in the southeastern United States.