Effects of micro-rates of 2,4-D and dicamba on lettuce

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Background

- Herbicide drift has always been a primary challenge of growing specialty crops in the Midwest, but the issue has grown increasingly urgent due to the recent commercialization of dicamba- and 2,4-D-resistant soybeans.
- Herbicide injury, yield loss, and economic damage varies by crop type and growth stage, environmental conditions, and herbicide type and effective rate.
- While there has been some research on off-target herbicide injury in vegetable crops, most is limited to injury ratings and is not always paired with an estimate of yield loss. The objective of this research project is to:
- **Quantify injury and yield loss from sub-lethal rates of 2,4-D and dicamba for lettuce at various growth stages.**

Study Approach

- Drift study was conducted in the weed science greenhouse in Lincoln, NE.
- Simulated drift rates for lettuce included 0, 1/4, 1/10, 1/50, 1/100, 1/500, 1/1,000, and 1/10,000x the labeled rates of dicamba (560 g ae ha^{-1}) and 2,4-D (1066 g ae ha^{-1}).
- Drift application was conducted at 2 growth stages (seedling and mature) using the spray chamber.
- Visual ratings were taken at 3, 7, 14, and 22 days after treatment (DAT).
- Extra 6 replications of 'Green Forest' lettuce were treated at the mature stage with rates of dicamba and sent for residue testing at 3, 7, and 16 DAT
- Yield data included the weight of harvested heads.
- Using % injury and calculated % yield loss relative to the controls, a log-logistic regression model was used to estimate doses causing visual injury and yield loss.

Results

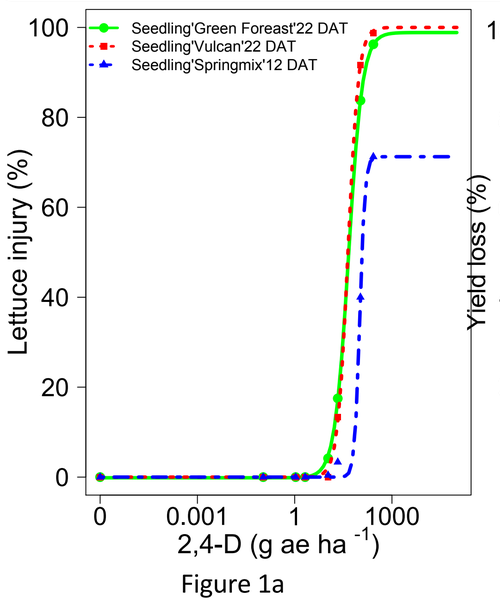


Figure 1a

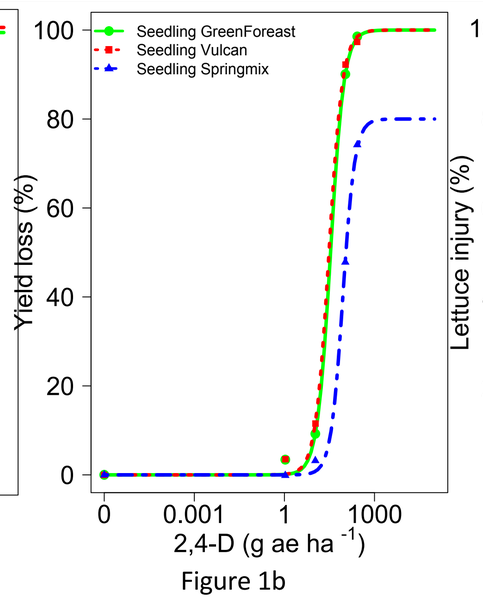


Figure 1b

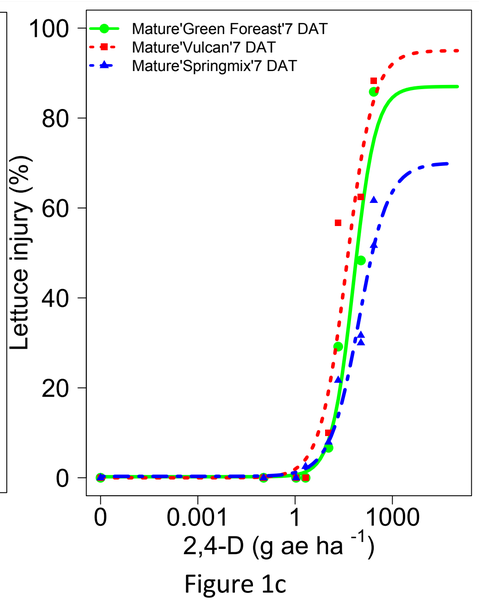


Figure 1c

Stage	Lettuce	%Yield loss	%Injury	2,4-D Labeled Rate (ED) (1066 g/ha)
Seedling	Green Forest	20%	10%	16.90 (1.5%)
	Vulcan	20%	10%	16.90 (1.5%)
	Spring mix	20%	<5%	46.73 (4.4%)
Mature	Green Forest	100%	10%	11.48 (1%)
	Vulcan	100%	10%	4.91 (0.5%)
	Spring mix	100%	10%	9.46 (0.9%)

Table 1: 2,4-D dose-response on three lettuces varieties at two different growth stages, ED value showed the rate with respect to % yield loss and % injury

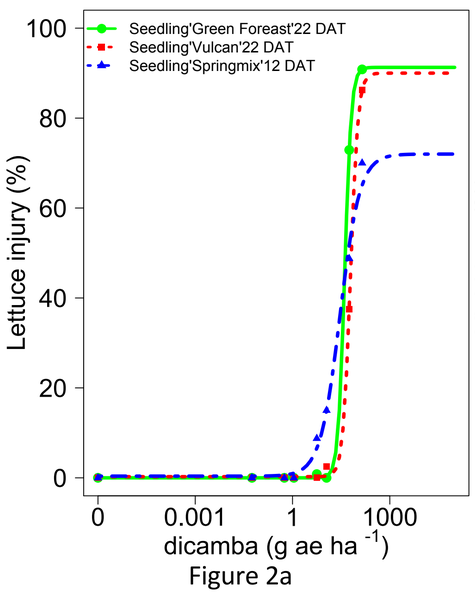


Figure 2a

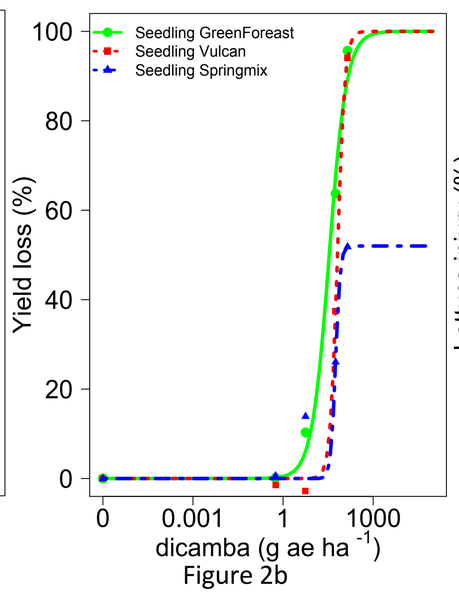


Figure 2b

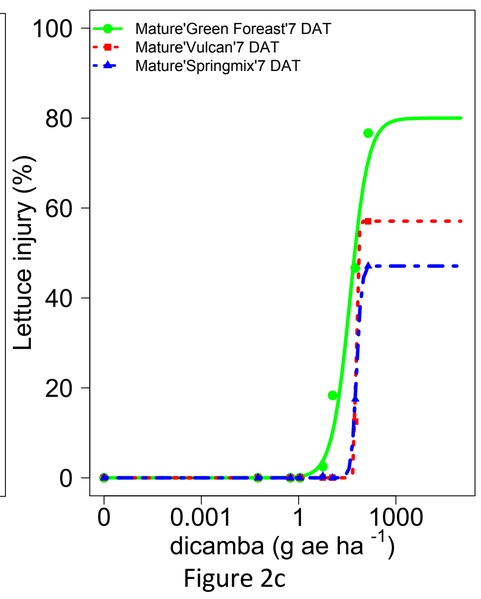
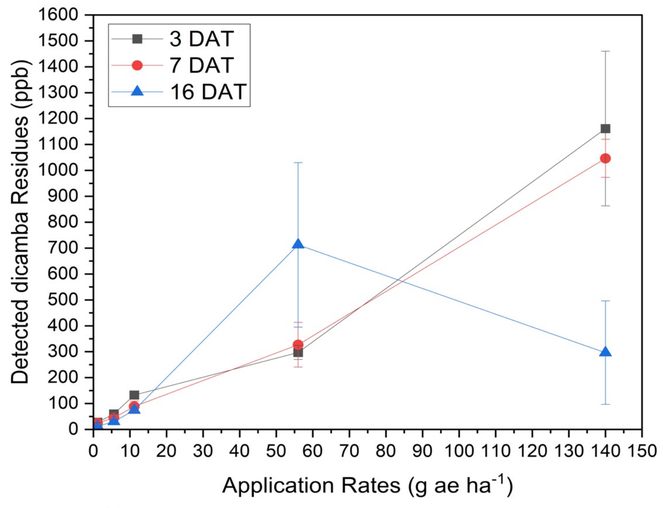


Figure 2c

Stage	Lettuce	%Yield loss	%Injury	Dicamba Labeled Rate (ED) (560 g/ha)
Seedling	Green Forest	20%	<5%	13.77 (2.5%)
	Vulcan	20%	20%	43.90 (7.8%)
	Spring mix	20%	>50%	55.95 (10%)
Mature	Green Forest	100%	10%	9.43 (1.7%)
	Vulcan	100%	10%	52.82 (9.5%)
	Spring mix	100%	10%	41.91 (7.5%)

Table 2: 2,4-D dose-response on three lettuces varieties at two different growth stages, ED value showed the rate with respect to % yield loss and % injury



Dicamba drift on mature 'Green Forest' lettuce

Residue test showed the detection were persistent within 7 DAT

Conclusion

- All Lettuce varieties were highly susceptible to 2,4-D and dicamba.
- Injury and yield loss varies among lettuce varieties.
- Due to lettuce were large at the mature stage with short window (7DAT) to harvest, lettuce weight were highly variable and yield loss failed to fit the dose-response model but any injury >10% would result in 100% yield loss.
- Yield loss in spring mix could occur up to 20% even when no visual injury was detected.
- Within 7 DAT, the detection of dicamba residue was stable. We suggest corelate the detected rate to estimate actual drift rate.

Acknowledgements

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