Herbicide injury from dicamba and 2,4-D: How much is too much in lettuce and pumpkins?

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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.

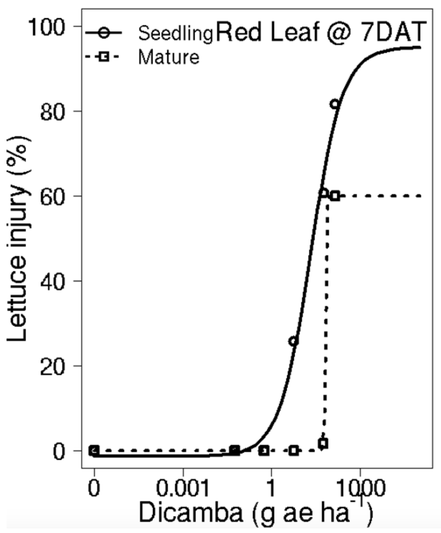
Herbicide injury, yield loss, and economic damage varies by crop type and growth stage, environmental conditions, and herbicide type and effective rate. While there has been some research on off-target herbicide injury in vegetable crops, most is limited to injury ratings and is not always paired with an estimate of yield loss. The objective of this research project is to:

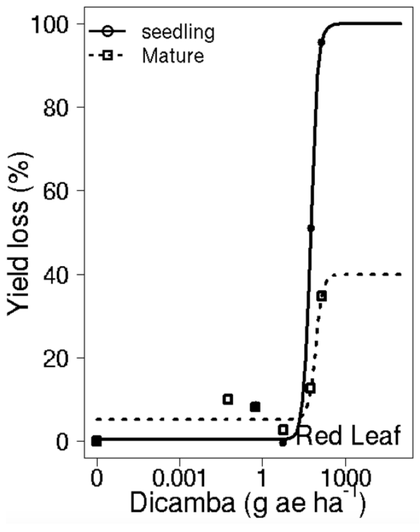
Quantify injury and yield loss from sub-lethal rates of dicamba and 2,4-D for lettuce and pumpkins at various growth stages.

Study Approach

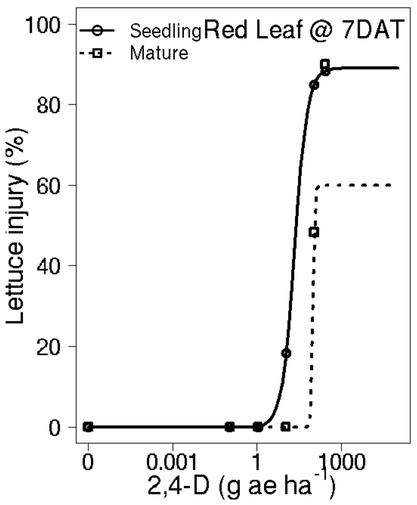
- Conducted a greenhouse study (lettuce) and field study (pumpkin) in Lincoln, NE.
- Simulated drift rates for lettuce included 0, 1/4, 1/10, 1/100, 1/1,000, and 1/10,000x the labeled rates of dicamba and 2,4-D (560 g ae ha^{-1}).
- Simulated drift rates for pumpkin included 0, 1/4, 1/10, 1/50, 1/100, and 1/500x labeled rates.
- Took visual ratings at 3, 7, 14, and 21 days after treatment (DAT). Recorded yield at harvest and calculated % yield loss relative to the controls. A log-logistic regression model was used to estimate doses causing visual injury and yield loss.

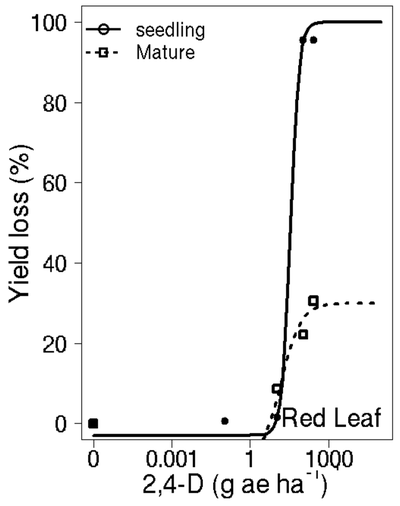
Results



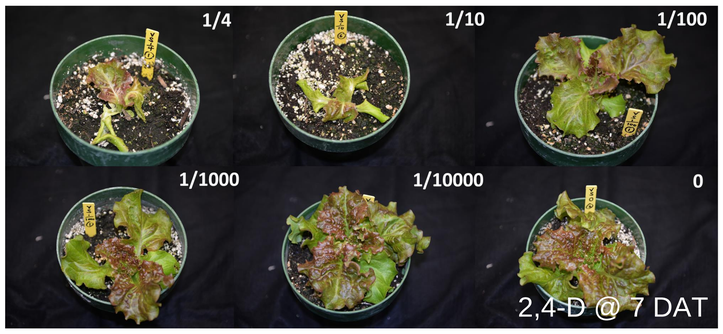


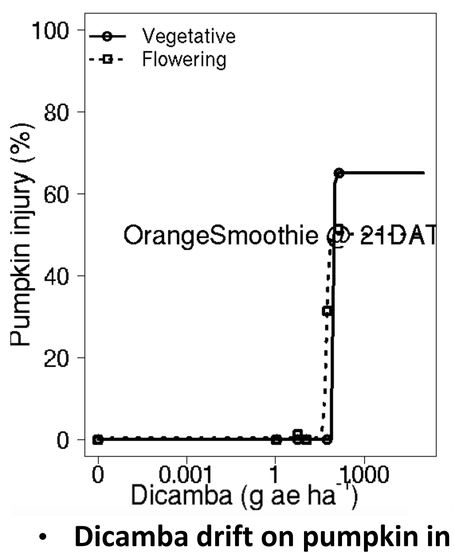
- **Dicamba drift on seedling red leaf lettuce:**
  5% of labeled rate = 50% visual injury 7 DAT = 10% yield loss
- **Dicamba drift on mature red leaf lettuce:**
  8% of labeled rate = 10% yield loss
  16% of labeled rate = 50% yield loss

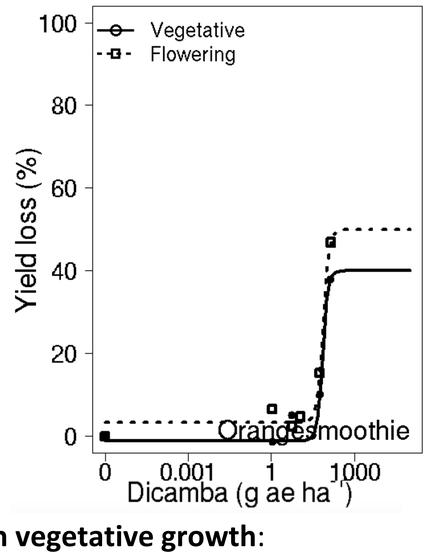




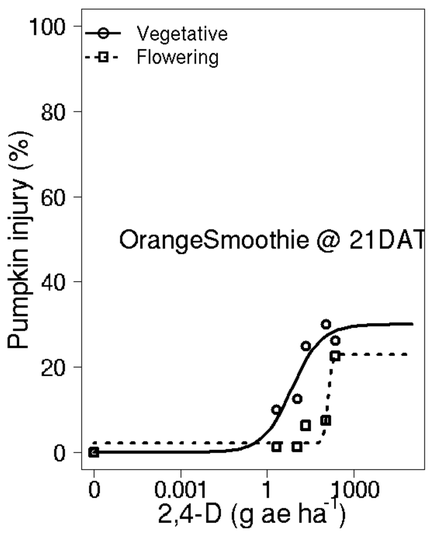
- **2,4-D drift on seedling red leaf lettuce:**
  2% of labeled rate = 50% visual injury 7 DAT = 10% yield loss
- **2,4-D drift on mature red leaf lettuce:**
  8% of labeled rate = 10% visual injury 7 DAT
  0.2% of labeled rate = 10% yield loss (suggests yield loss can occur even when symptoms are not visible)

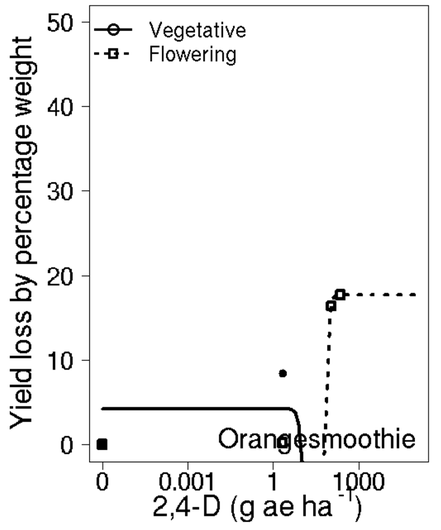






- **Dicamba drift on pumpkin in vegetative growth**:
  18% of label rate = 10% visual injury 21 DAT
  8% of label rate = 10% yield loss
- **Dicamba drift on flowering pumpkin:**
  7.5% of label rate = 10% visual injury 21 DAT = 10% yield loss





- **2,4-D drift on pumpkin in vegetative growth:** 0.05% of 2,4-D label rate = 10% visual injury 21 DAT

Acknowledgements

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