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

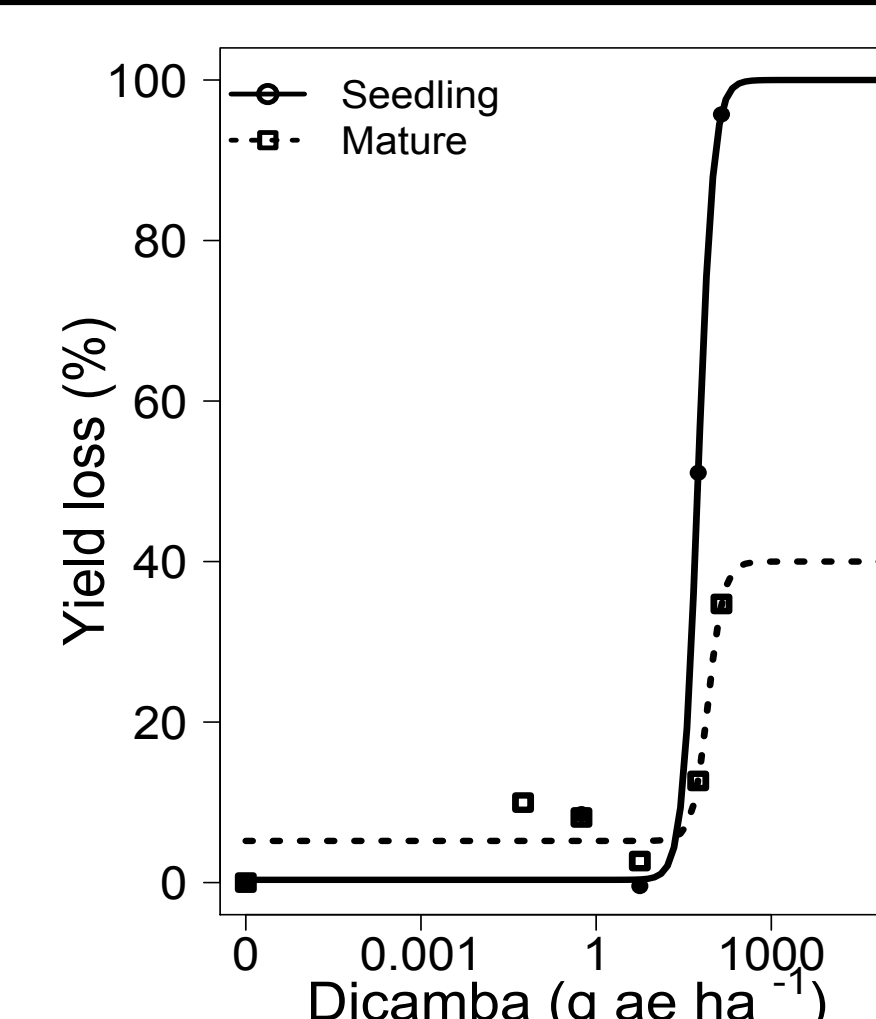
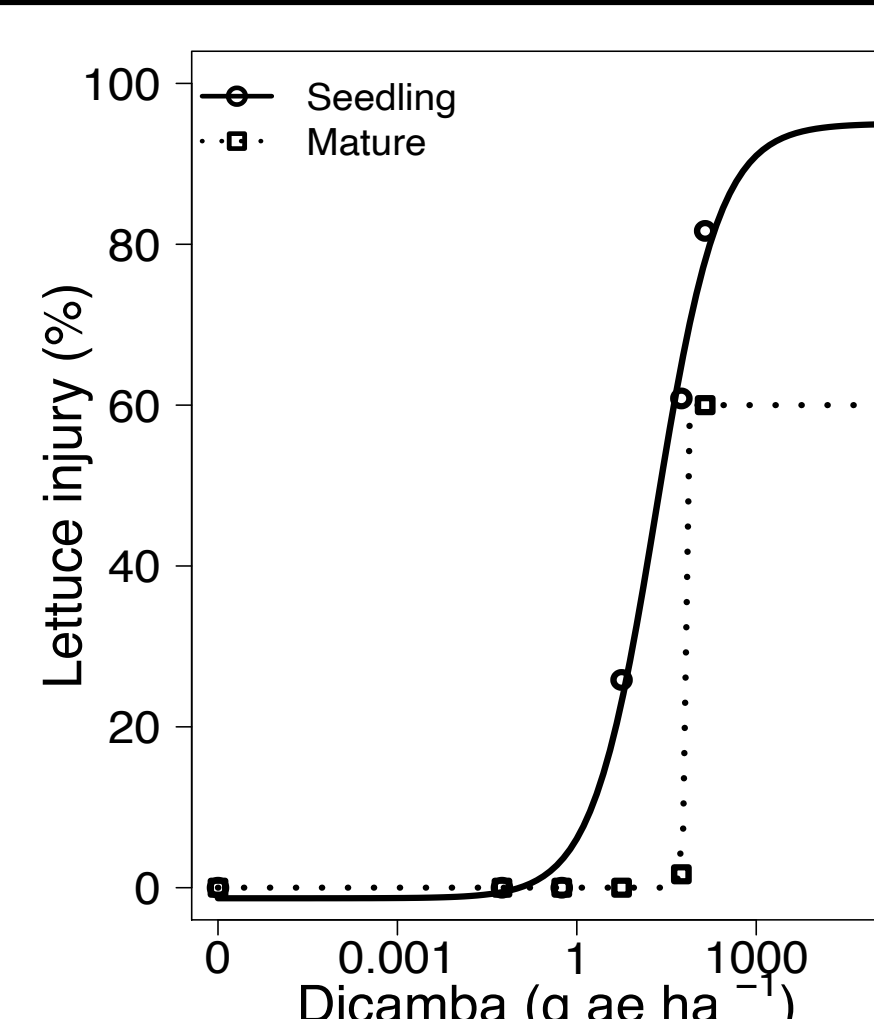
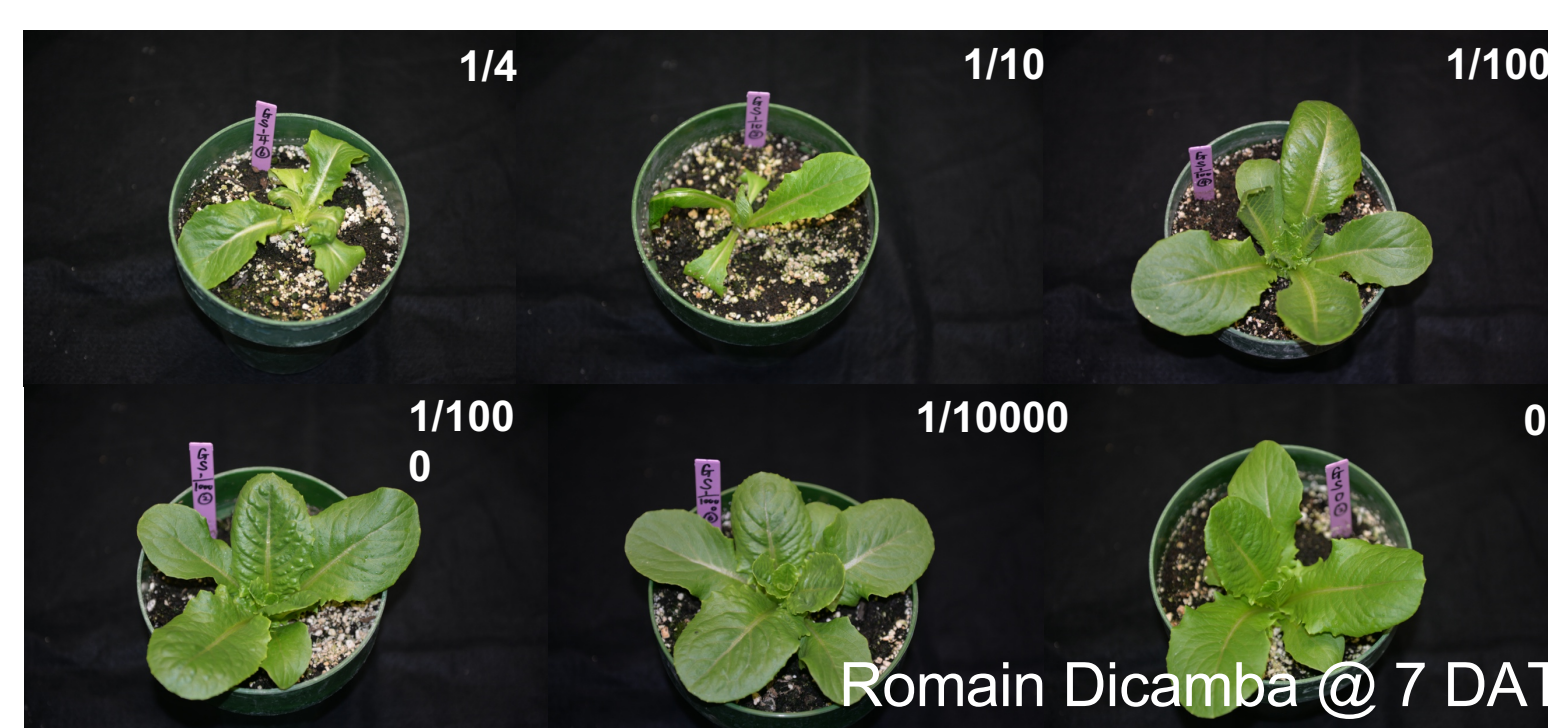
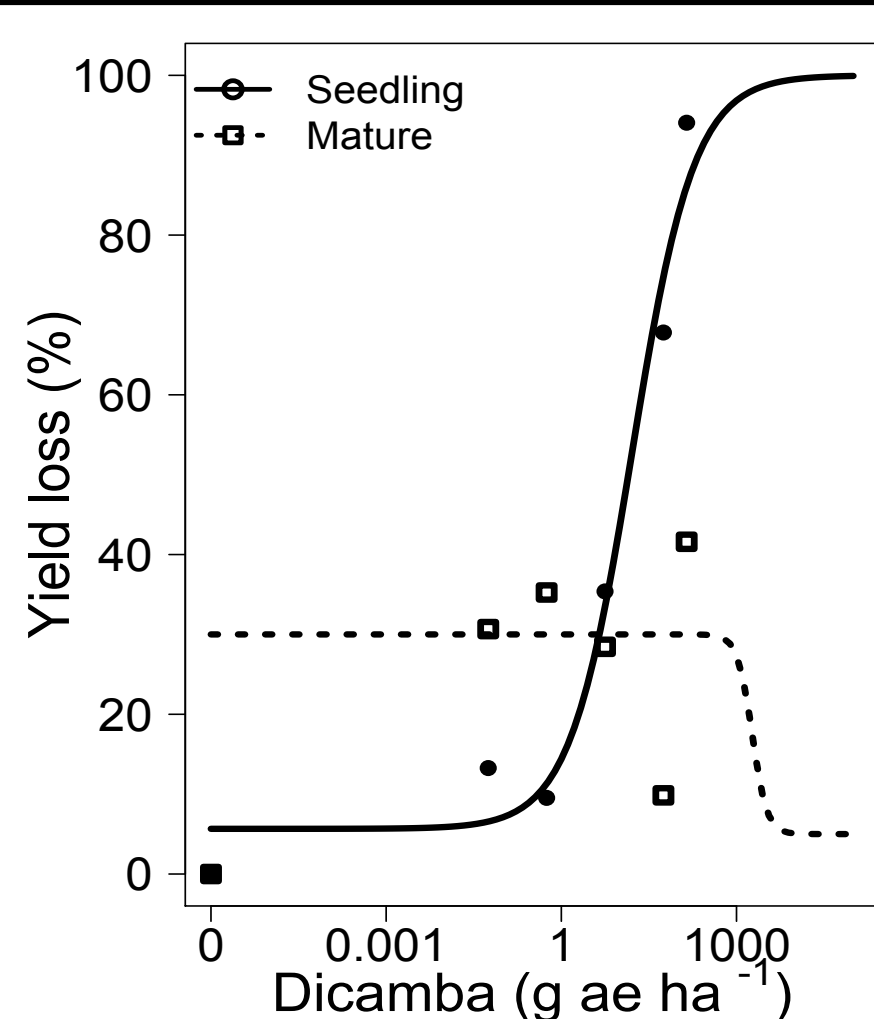
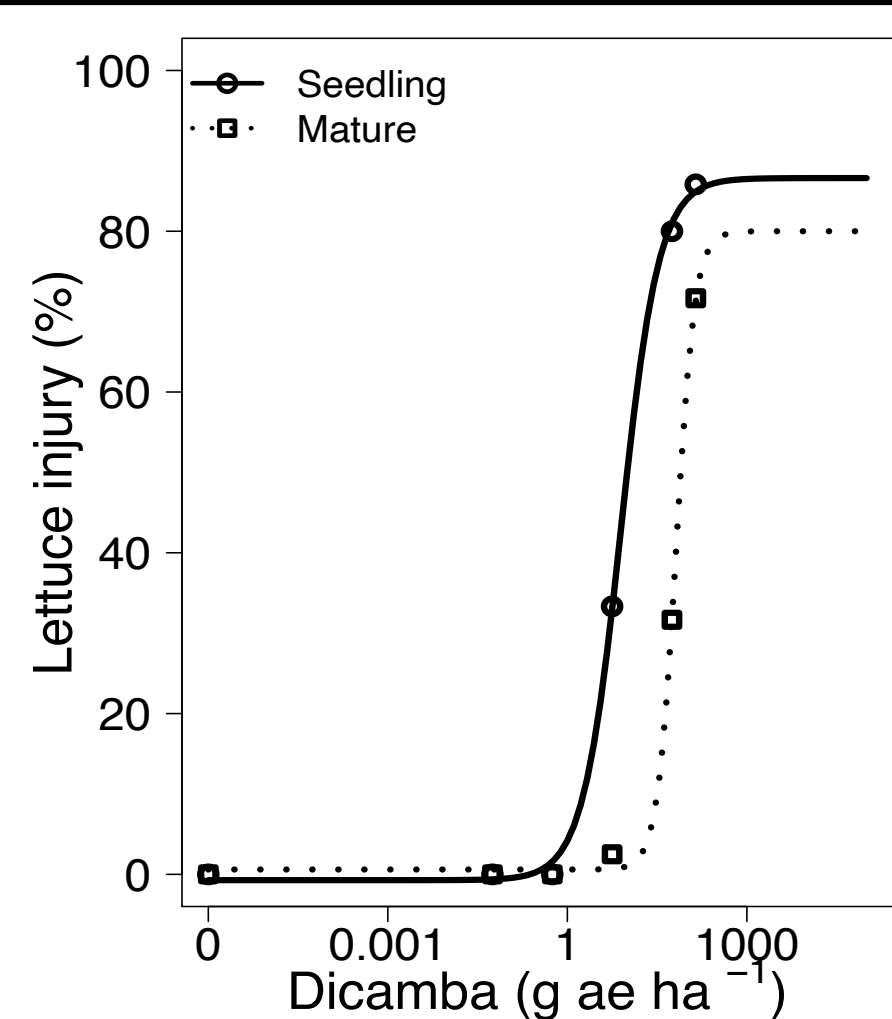
Quantify injury and yield loss from sub-lethal rates of dicamba and 2,4-D for lettuce at various growth stages.

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, 1/100, 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 stage (seedling and mature) using the spray chamber.
- Visual ratings was taken at 3, 7, 14, and 21 days after treatment (DAT).
- Lettuce was harvested dried to constant weight as the yield data
- Using yield data 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 Romain lettuce:

1.4% of labeled rate = 50% visual injury 7 DAT = 35% yield loss

• Dicamba drift on mature Romain lettuce:

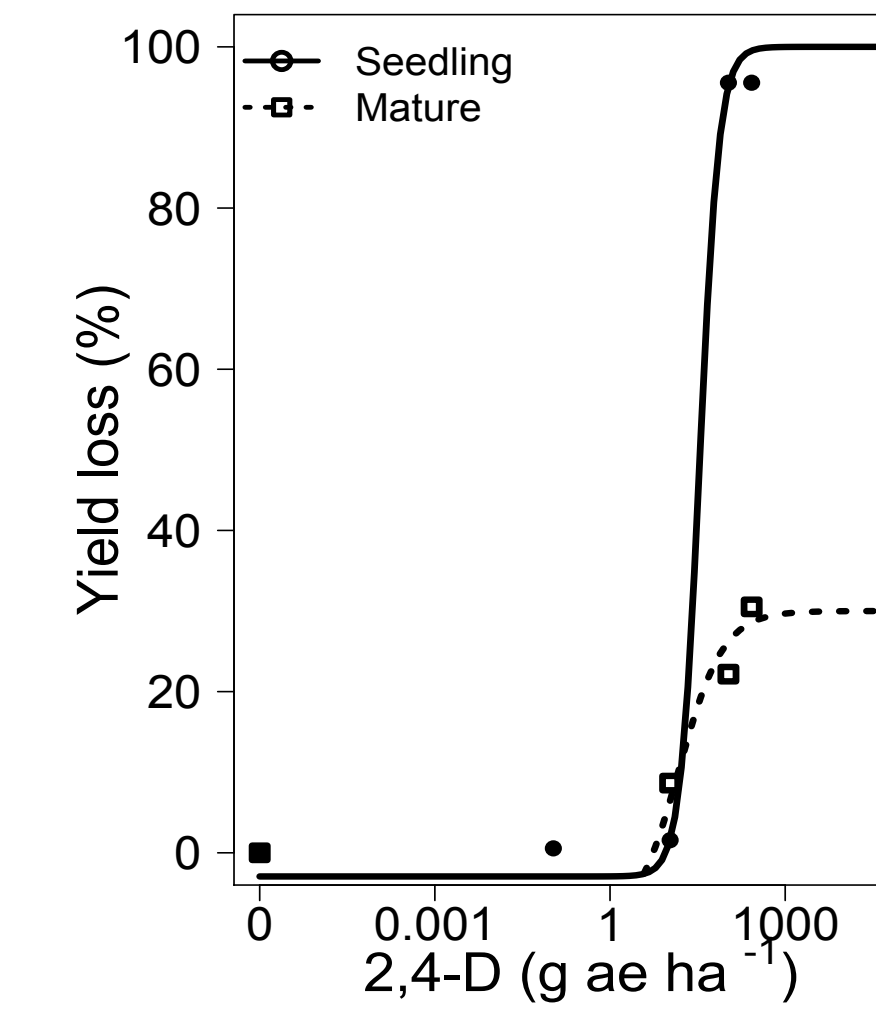
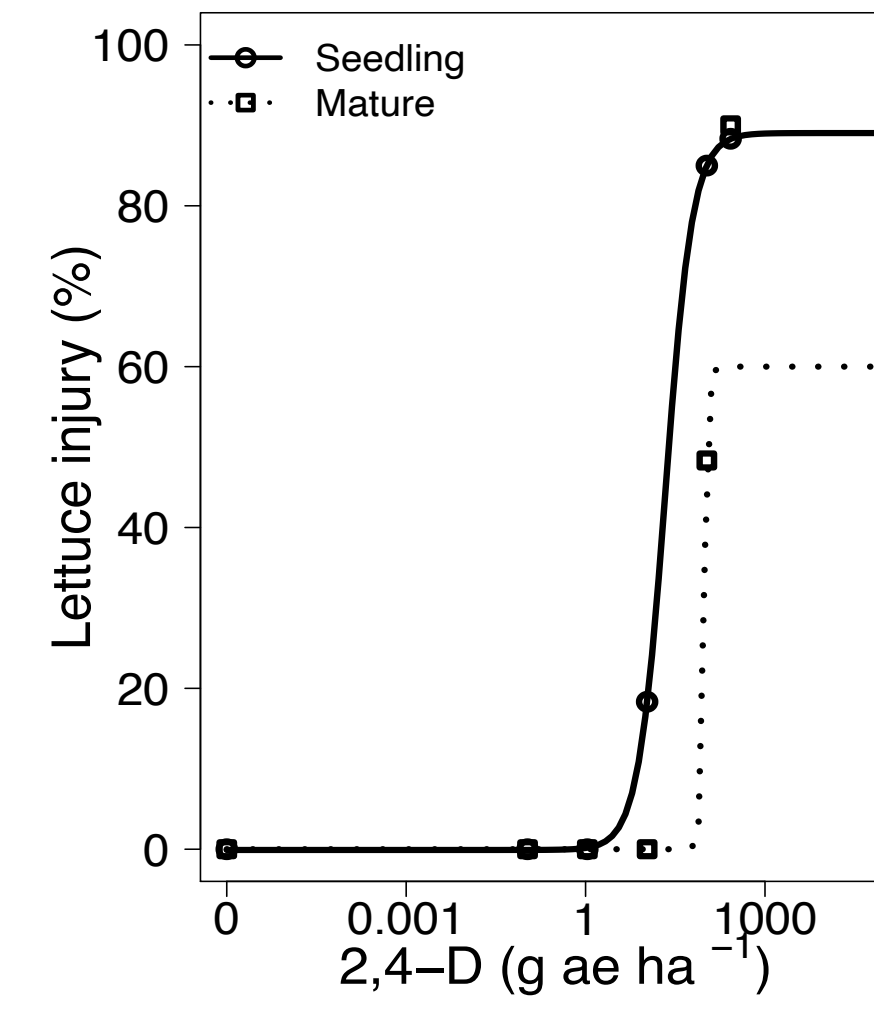
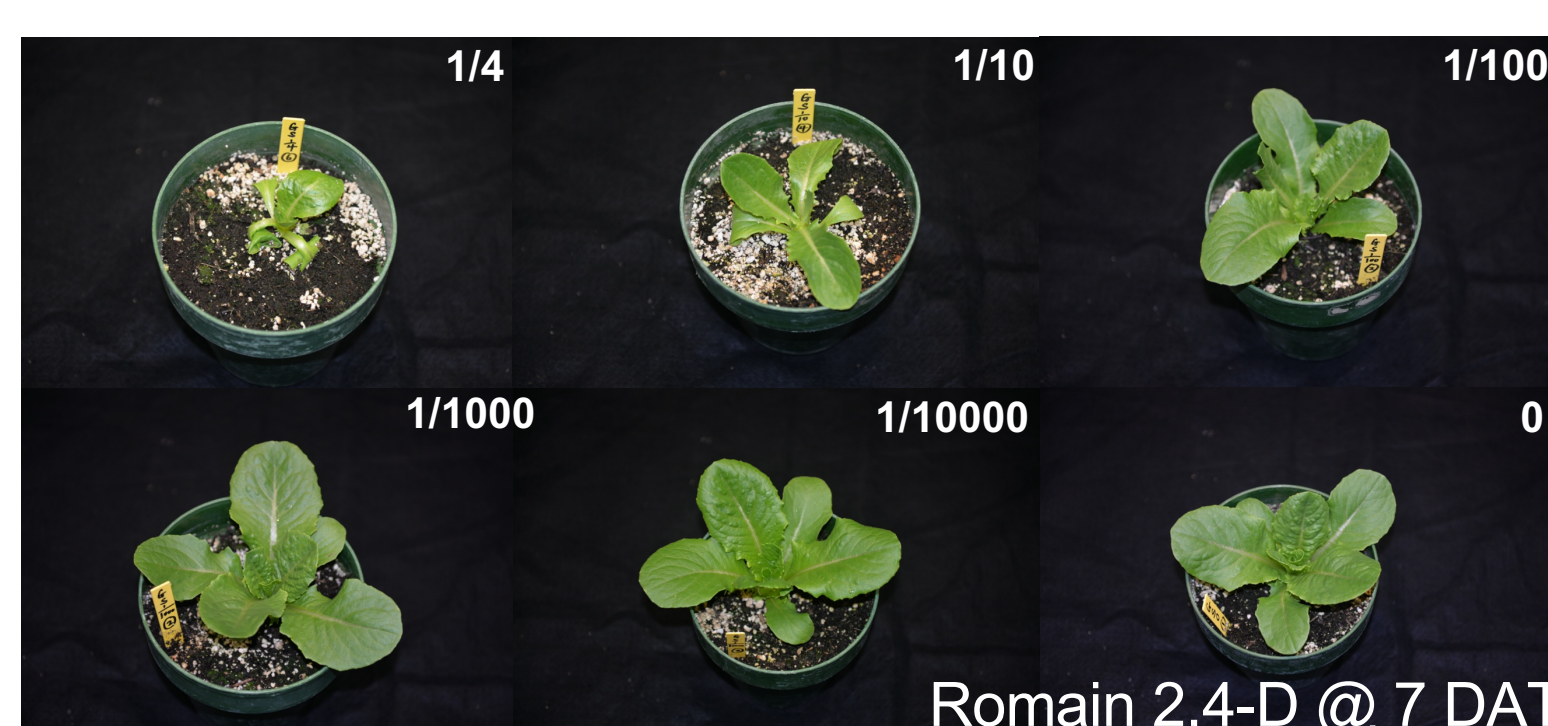
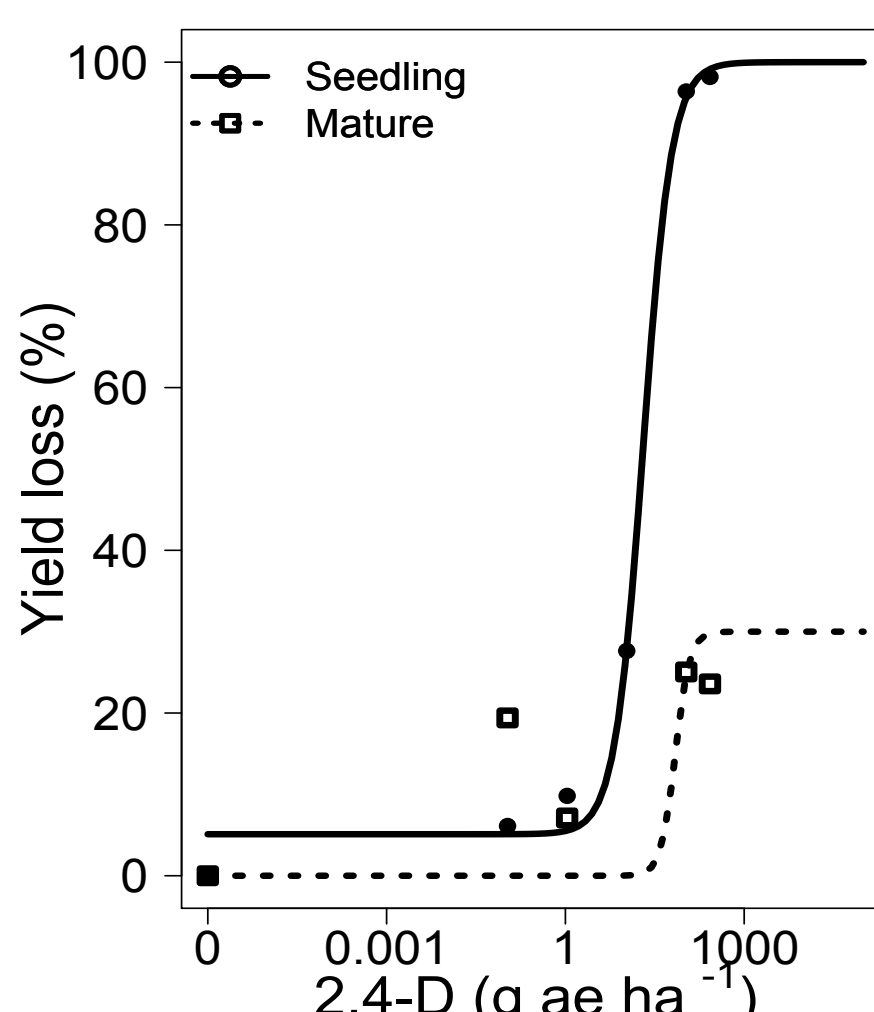
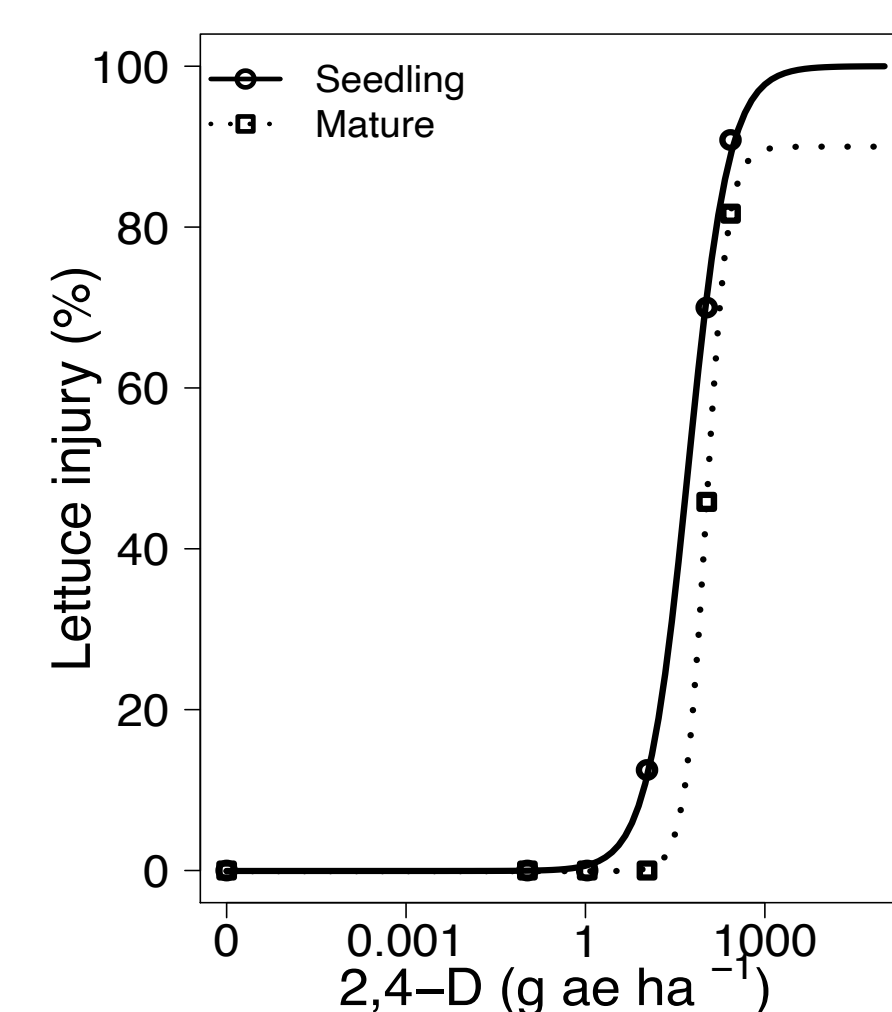
1.75x of labeled rate = 10% yield loss (regression curve does not fit suggests hormesis occur)

• Dicamba drift on seedling Vulcan lettuce:

5% of labeled rate = 50% visual injury 7 DAT = 10% yield loss

• Dicamba drift on mature Vulcan lettuce:

8% of labeled rate = 10% yield loss
16% of labeled rate = 50% yield loss



• 2,4-D drift on seedling Romain lettuce:

1% of labeled rate = 10% visual injury 7 DAT = 20% yield loss

• 2,4-D drift on mature Romain lettuce:

4% of labeled rate = 10% visual injury 7 DAT = 10% yield loss

• 2,4-D drift on seedling Vulcan lettuce:

2% of labeled rate = 50% visual injury 7 DAT = 10% yield loss

• 2,4-D drift on mature Vulcan 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)

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