

# Response of White and Yellow Popcorn Hybrids to Glyphosate, Enlist DUO, or XtendiMax

\*Ethann Barnes<sup>1</sup>, Nevin Lawrence<sup>1</sup>, Stevan Knezevic<sup>1</sup>, Amit Jhala<sup>1</sup>

<sup>1</sup>University of Nebraska-Lincoln, Lincoln, NE

E-mail: ethann.barnes@unl.edu

## INTRODUCTION

### Popcorn production

- Nebraska is the number one producer of popcorn in the United States.
- Nebraska produces more than 160 million kg on 30,000 hectares (45% of the United States' supply (NASS 2016)).

### New herbicides

- New corn and soybean traits have allowed for greater use of TIR1 auxin receptor containing herbicides across the United States.
- Herbicide misapplication and off target movement is a major concern.
- Popcorn can be more sensitive herbicides than field corn (Edenfield and Allen 2005).
- The sensitivity of popcorn to glyphosate, Enlist DUO, and XtendiMax has not been assessed.



Figure 1. Left: Normal brace root formation. Right: Brace root malformation following the application of XtendiMax

## OBJECTIVE

**Objective:** Determine the effects of glyphosate (Durango), glyphosate + 2,4-D choline (Enlist DUO), or dicamba (XtendiMax) on the injury, above ground biomass, and yield of white and yellow popcorn.

**Hypothesis:** White popcorn will be more sensitive than yellow and an early application will result in greater damage.

## MATERIALS AND METHODS

### Herbicides and rates

Glyphosate [2160 g ae ha<sup>-1</sup>](0.25X, 0.125X, 0.063X, 0.031X)

Enlist DUO [2200 g ae ha<sup>-1</sup>](0.25X, 0.125X, 0.063X, 0.031X)

XtendiMax [560 g ae ha<sup>-1</sup>](2X, 1X, 0.5X, 0.25X)

### Application timing

Applied at the V5 corn growth stage on June 14<sup>th</sup>

Applied at the V8 corn growth stage on June 29<sup>th</sup>

### Popcorn hybrids

Conagra VWP111 (white)

Conagra VYP315 (yellow)

- The experiment was conducted near Clay Center, NE at UNL's South Central Ag Lab
- Visual estimates of popcorn injury 21 DAT, biomass reduction 91 DAT, and yield (Seefeldt et al. 1995)
- Four-parameter log logistic function was fitted to the data in R:  
 $f(x) = c + [d - c] / [1 + \exp(b(\log(x) - \log(e)))]$
- b is the lower limit, c is the upper limit, d is the slope, e is the ED<sub>50</sub> (effective dose that results in 50%)
- Data that did not significantly differ between any model parameter or ED<sub>5</sub> (effective herbicide dose that results in 5% popcorn injury, biomass reduction, or yield loss) were combined

## RESULTS AND DISCUSSION

Figure 2. White hybrid, 21 DAT Glyphosate 0.125X (275 g ha<sup>-1</sup>) at V5



Figure 3. Yellow hybrid, 21 DAT Enlist DUO 0.25X (550 g ha<sup>-1</sup>) at V5



Figure 4. Ear malformation Enlist DUO 0.031X (68.6 g ha<sup>-1</sup>)



Figure 5. Yellow hybrid, 21 DAT XtendiMax 2X (1120 g ha<sup>-1</sup>) at V5



Figure 6. Popcorn brace root malformation following the application of XtendiMax



## RESULTS AND DISCUSSION

Figure 7.

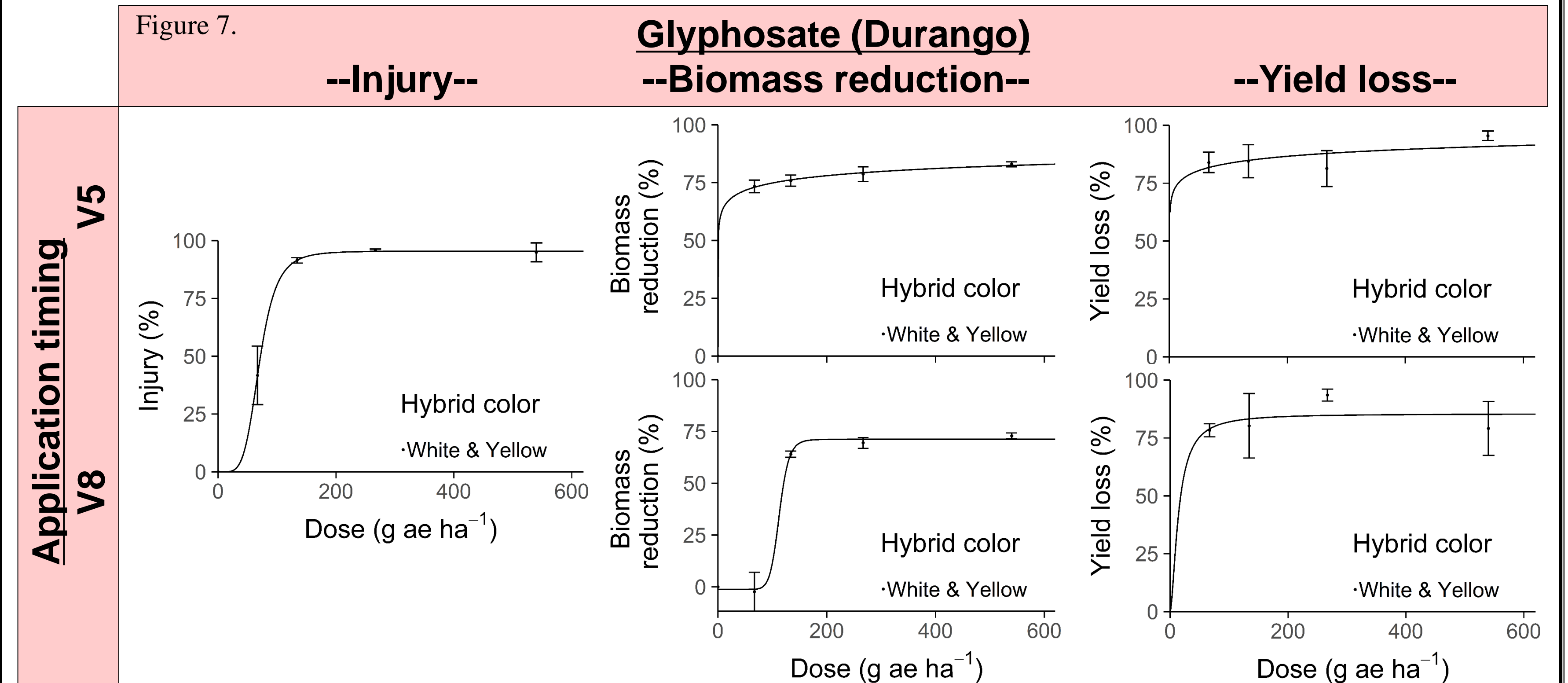
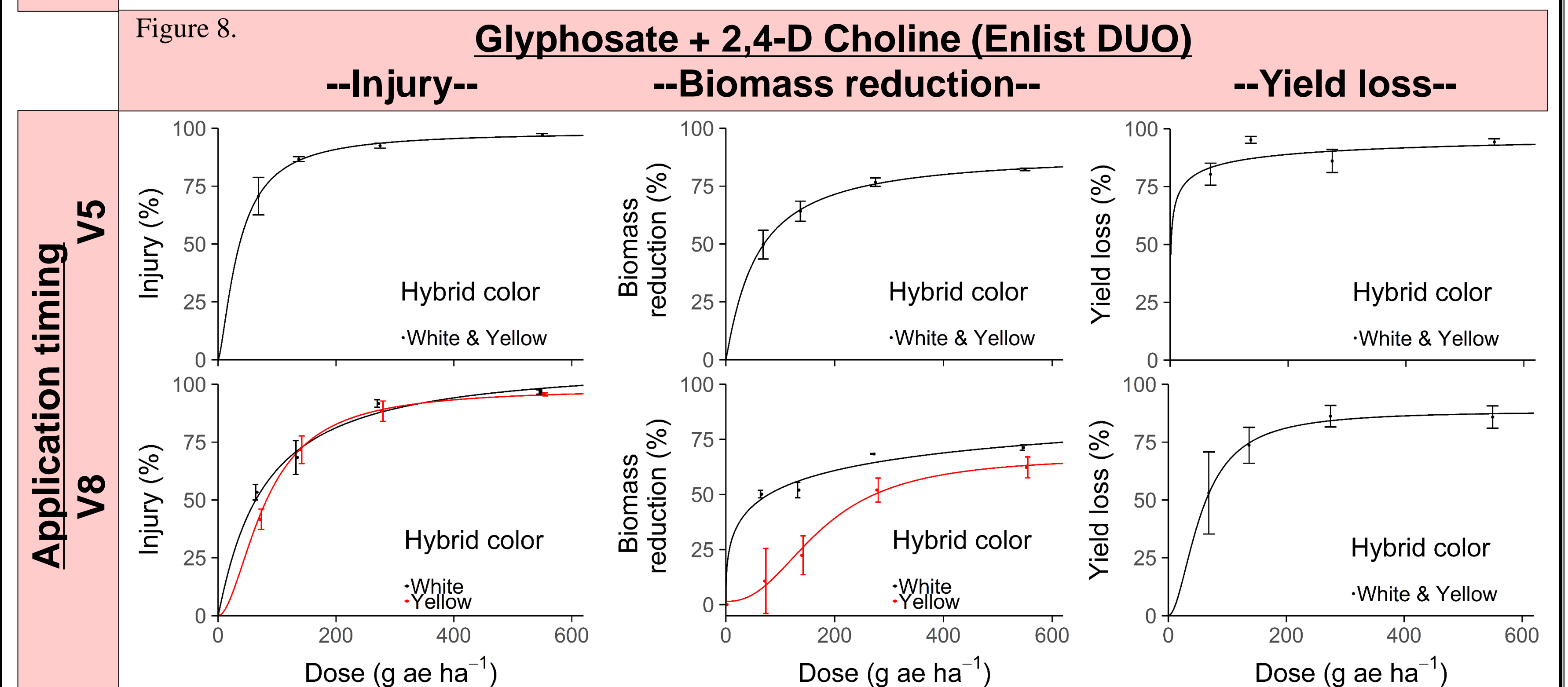


Figure 8.



### Dicamba (XtendiMax) --Injury--

Figure 9.

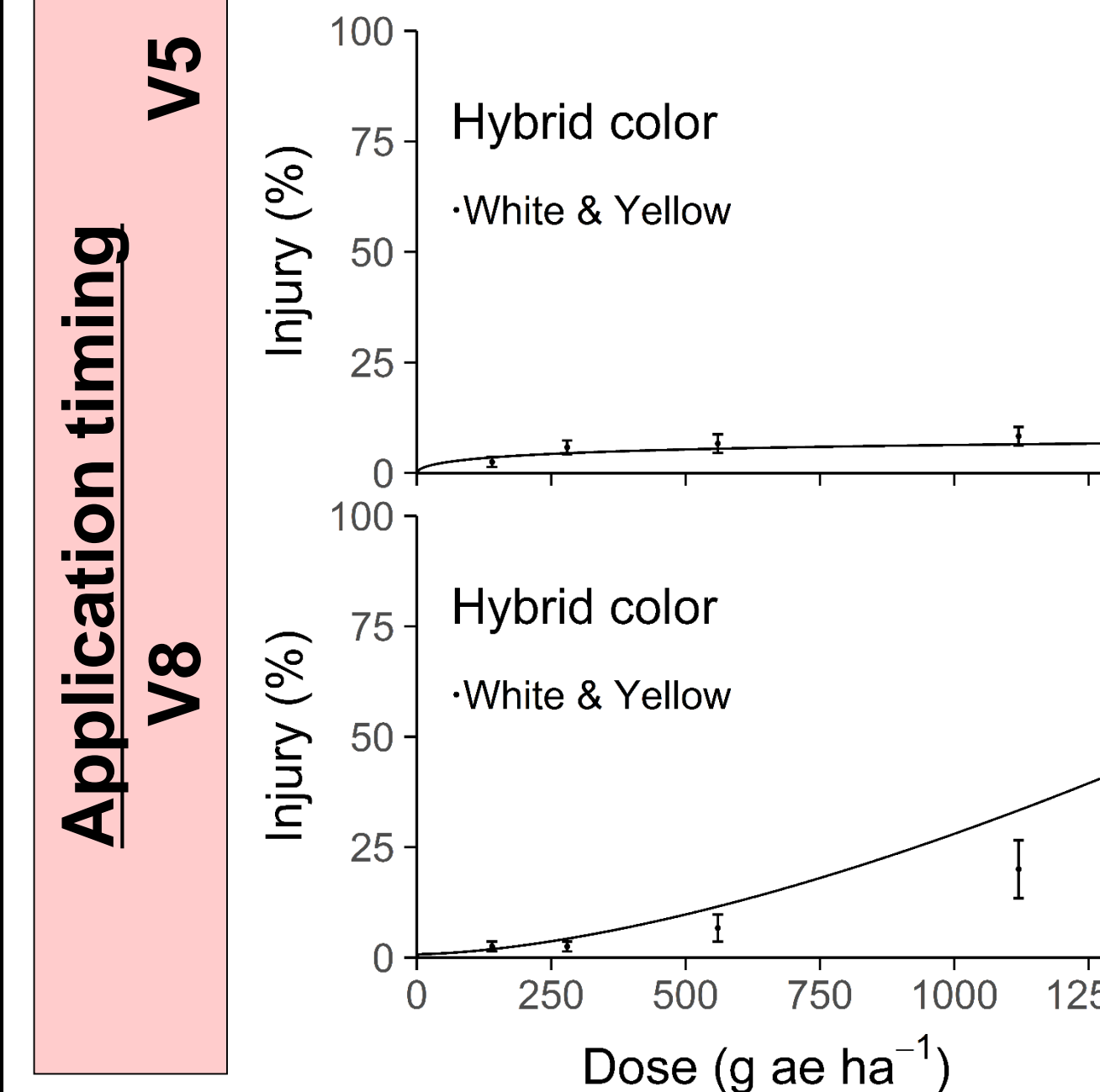


Table 1. Effective dose of herbicide that results in 5% popcorn injury, biomass reduction, and yield loss

	timing	hybrid	g ae ha <sup>-1</sup>		
			glyphosate	Enlist DUO	XtendiMax
Injury	V5	yellow	38.6	4.6	44.9
	V5	white		16.3	906.5
Biomass reduction	V8	yellow	97.5	4.8	
	V8	white		0.1	
Yield loss	V5	yellow	0.001	0.001	-
	V5	white		-	-
	V8	yellow	33.0	11.56	-
	V8	white		-	-

- White and yellow hybrids were equally sensitive to glyphosate (Durango) and dicamba (XtendiMax)
- Yellow hybrid was less sensitive to glyphosate + 2,4-D choline (Enlist Duo)

## CONCLUSIONS

- Application at V5 resulted in more injury and higher biomass and yield reduction than V8 application
- Low doses of glyphosate (Durango) and glyphosate + 2,4-D choline (Enlist DUO) resulted in high injury, biomass reduction, and yield loss

### Future research

- Study will be repeated in 2018
- Determine the basis for sensitivity between different hybrids

## LITERATURE CITED

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