Desiccation and yield of three black bean varieties

Amanda M. Goffnett and Christy L. Sprague

Department of Plant, Soil and Microbial Sciences

Michigan State University, East Lansing, MI

www.MSUweeds.com

Introduction

- The recent development of Type II upright black beans allows for a one pass direct cut harvest.
- Preharvest-herbicide applications are used to desiccate green tissue and weeds that can interfere with direct harvest.
- Color retention of black beans has been a major concern for the canning industry and may be influenced by variety, planting date or outside factors.
- Preharvest herbicides can differ in their effectiveness, activity speed, and could potentially impact yield, seed quality, and color retention.

Objective

- Evaluate the effects of preharvest treatments on the desiccation and yield of three black bean varieties for two different planting dates and application timings.

Materials and Methods

Experiment design

- Field trials conducted at the Saginaw Valley Research and Extension Center near Richville, MI in 2013
- Two planting dates
  - June 13, 2013
  - June 26, 2013
- Split-split plot design, 4 replications
- Main plot: Three black (Type II) bean varieties
  - 'Zorro' – standard MI grown variety
  - 'B10244' – potential new MSU release
  - 'Eclipse' – standard ND and MN grown variety

Desiccation treatments

- Sub-plot: Two application timings
  - Early: 50% pod yellowing
  - Standard: 80% pod yellowing
- Sub-sub plot: Three herbicide treatments
  - Paraquat (0.56 kg ha^{-1}) + NIS (0.25% v/v)
  - Saflufenacil (0.05 kg ha^{-1}) + MSO (1% v/v) + AMS
  - Glyphosate (0.84 kg a.e. ha^{-1}) + AMS (2% w/w)

Data collection and analysis

- Desiccation evaluated 3, 7, and 14 DAT
- Yield was obtained through direct harvest
  - Yield was adjusted to 18% moisture
- Data were analyzed using PROC Mixed & ANOVA in SAS
- Means were separated with Fisher's protected $LSD_{(0.05)}$

Results and Discussion

Early Planted

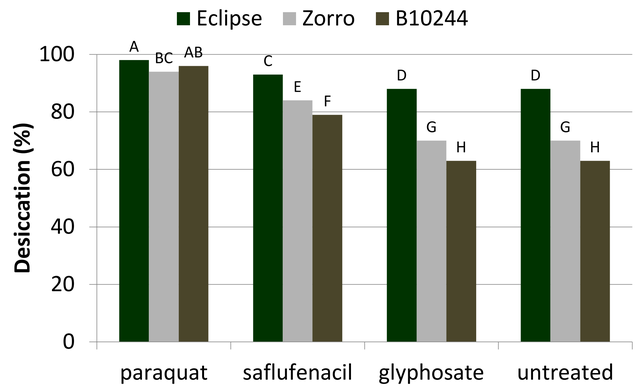

Figure 1. Desiccation of three black bean varieties 3 DAT from treatment applied at 50% yellowing (Early).

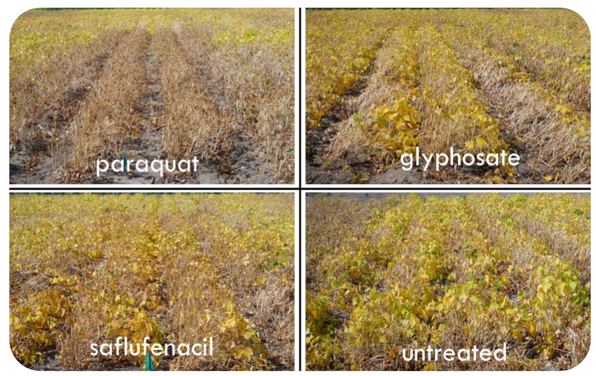

Figure 2. Desiccation 3 DAT for different preharvest herbicide treatments applied at 50% yellowing

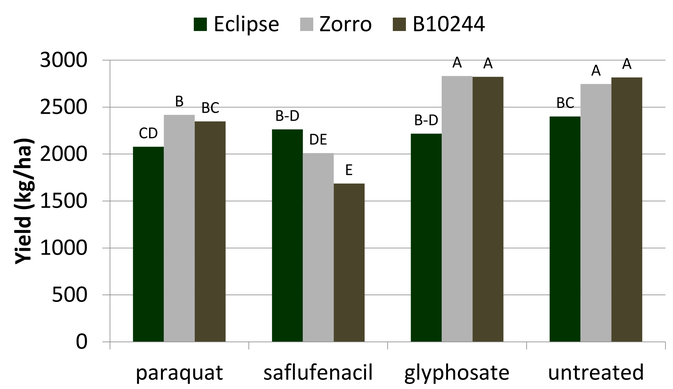

Figure 3. Yield of three black bean varieties from various herbicides applied early for the early planting date.

- The early application of paraquat provided the most rapid desiccation (> 96%) for 'Eclipse' and 'B10244', 3 DAT (Figure 1).
- By 7 DAT, all early herbicide treatments provided greater desiccation than the untreated counterparts (data not shown).
- Desiccation was similar for the standard application timing, except when glyphosate was applied to 'Zorro' in which desiccation was lower, 3 DAT (data not shown).
- By 7 DAT, black bean desiccation was greater than 95% for both application timings.
- Early applications of paraquat and saflufenacil resulted in lower yields for 'Zorro' and 'B10244' (Figure 3).
- Overall yield was lowest for 'Eclipse' (Figure 3).

Late Planted

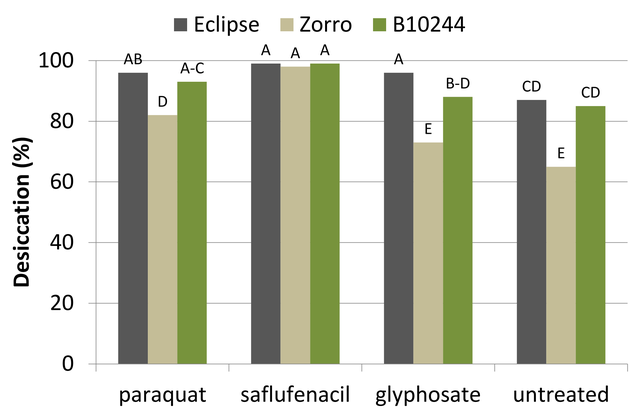

Figure 4. Desiccation of three black bean varieties 7 DAT from treatments applied at 50% yellowing (Early).

- At the early application timing, saflufenacil provided the greatest desiccation at 3 and 7 DAT (Figure 4).
- Desiccation of black beans was slower with glyphosate and did not provide any advantage to dry down compared with the untreated 7 DAT for 'Zorro' and 'B-10244' at the early application timing (Figure 4).
- All herbicide treatments applied at the standard timing provided excellent black bean desiccation (data not shown).
- Similar to the early planting, early applications of paraquat and saflufenacil resulted in lower yields.
- Overall yield was lowest for 'Zorro' in the second planting.

Conclusions

- All three preharvest herbicide treatments provided excellent desiccation when applied to dry beans that were at 80% yellow pod (standard).
- Early applications of paraquat and saflufenacil quickly dessicate dry beans which may lead to reductions in yield; however, this can vary by black bean variety.
- We are currently examining whether early preharvest herbicide applications are impact color retention of black beans after canning.

Acknowledgements

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