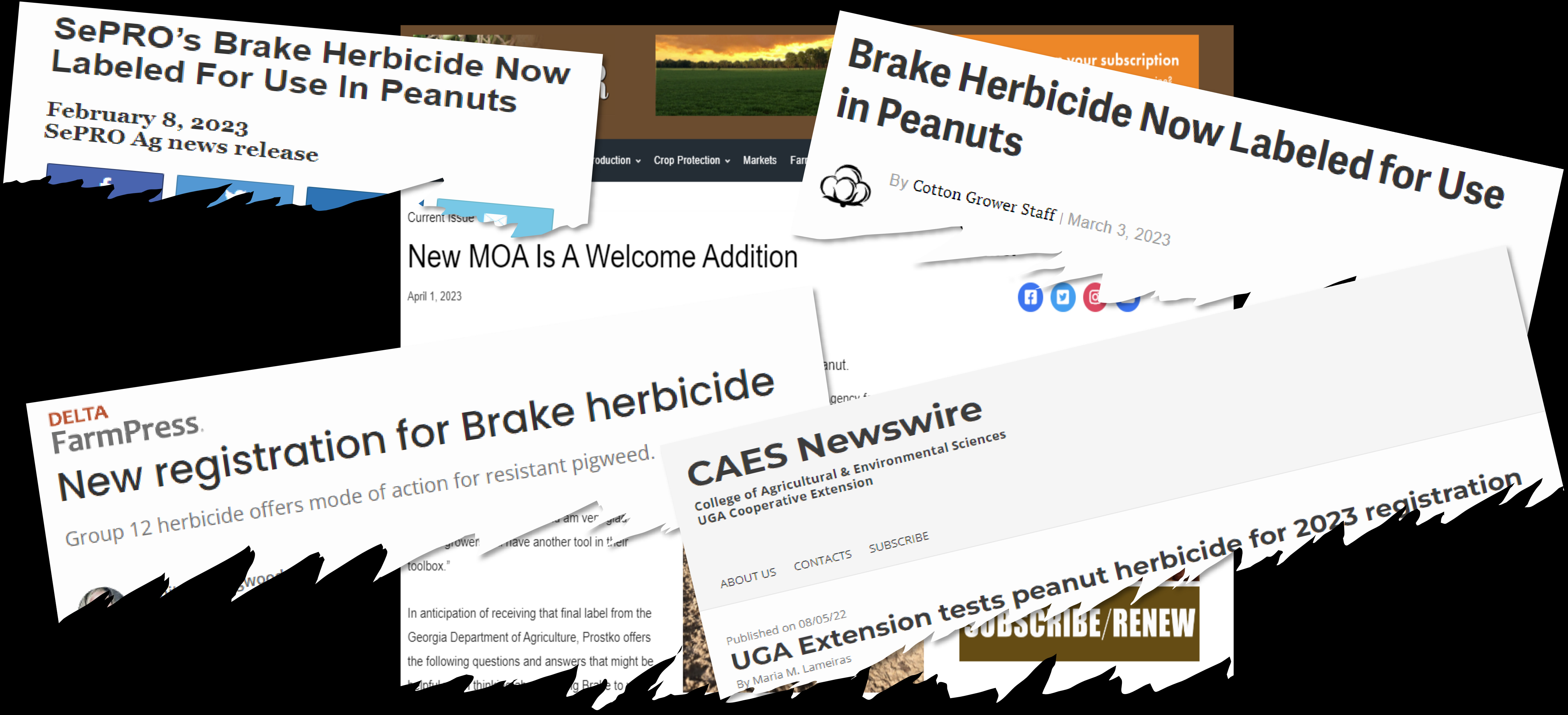
Peanut Response to Delayed Timings of Fluridone (Brake®) and Trifludimoxazin (Rexovor®)

Nicholas J. Shay & Eric P. Prostko
Dept. Crop & Soil Sciences

UNIVERSITY OF GEORGIA

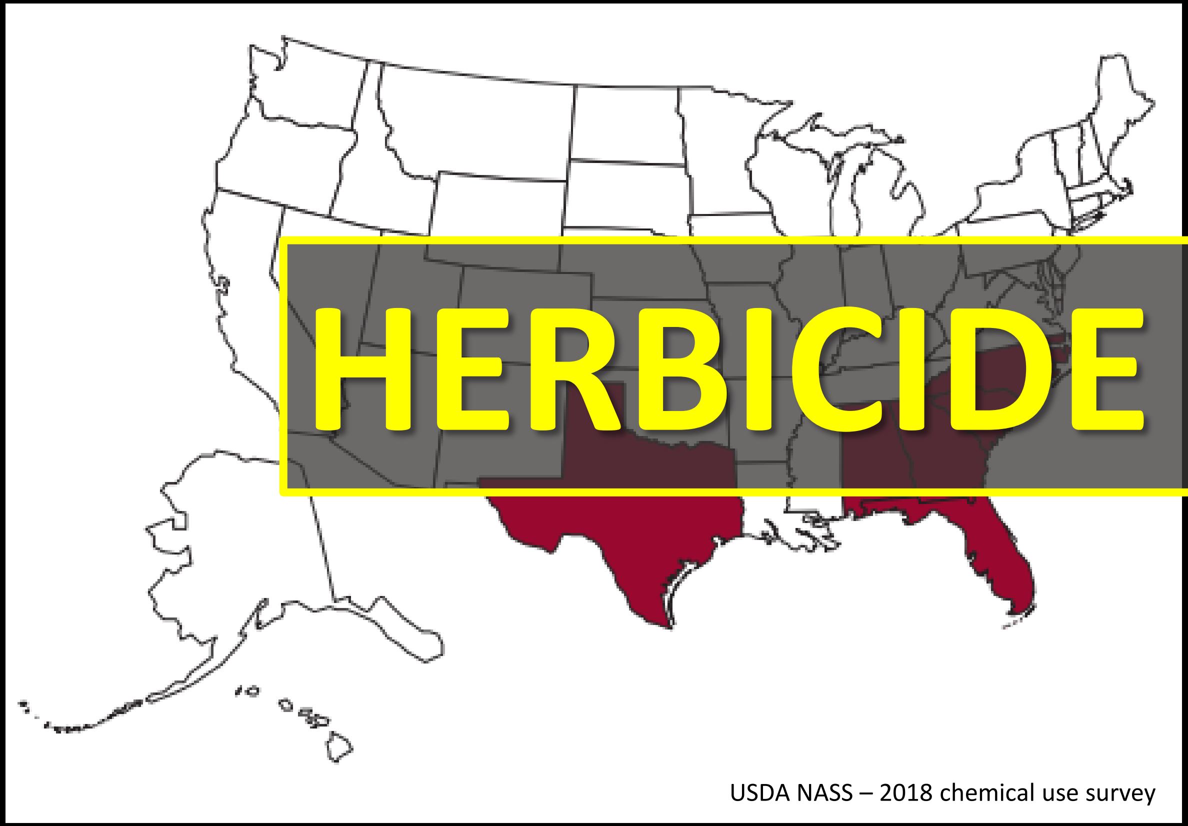
Introduction:

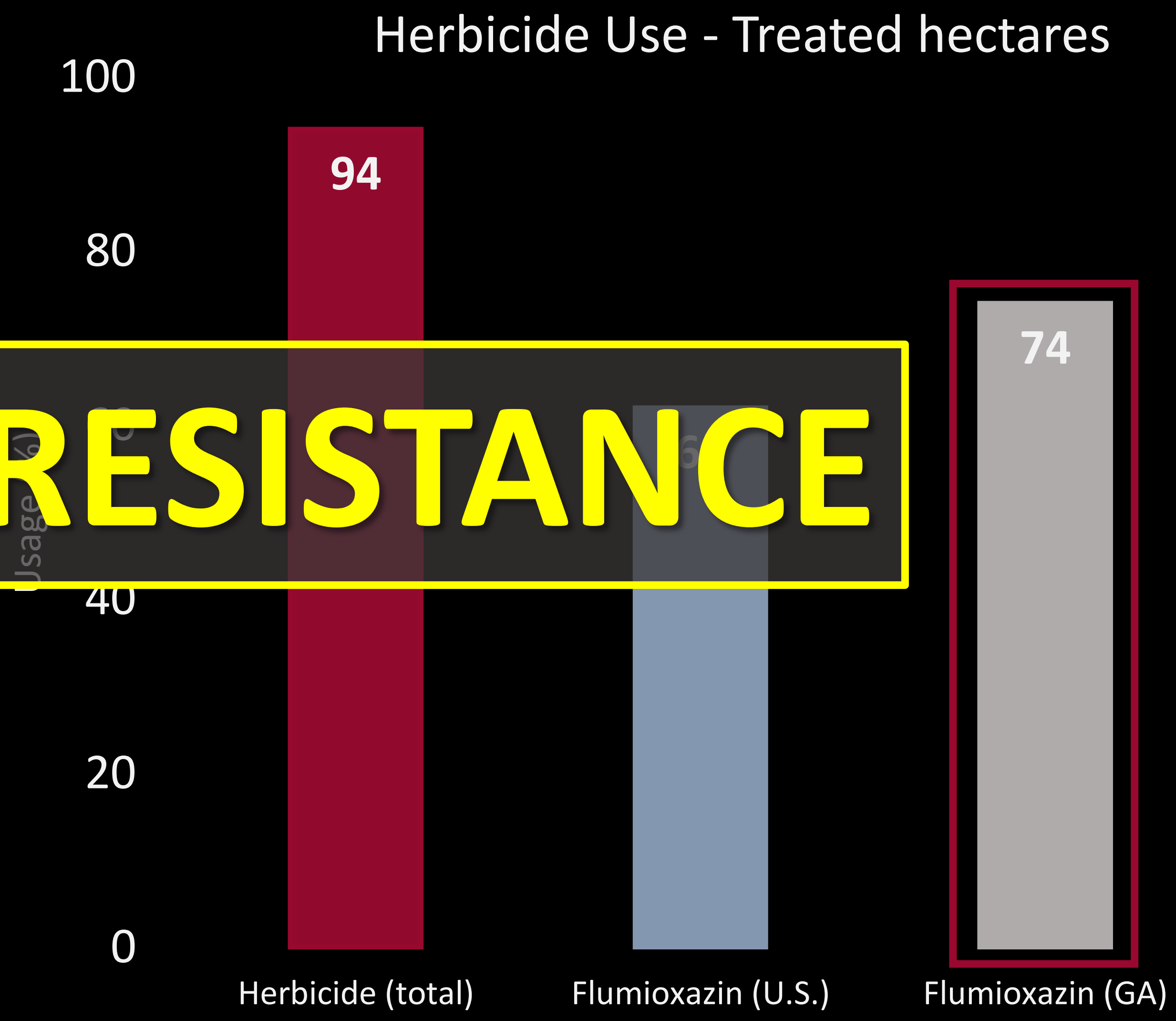
Brake® registration 2023



Introduction:

The case for new herbicides





HERBICIDE RESISTANCE

Introduction:

The case for new herbicides

Confirming resistance to PPO-inhibiting herbicides applied preemergence and postemergence in a Georgia Palmer amaranth population

Taylor Randell-Singleton[1], Lavesta C. Hand[2], Jenna C. Vance[3], Hannah E. Wright-Smith[4] and A. Stanley Culpepper[5]

[1]Graduate Research Assistant, Department of Crop and Soil Science, University of Georgia, Tifton, GA, USA; [2]Assistant Professor, Department of Crop and Soil Science, University of Georgia, Tifton, GA, USA; [3]Research Professional, Department of Crop and Soil Science, University of Georgia, Tifton, GA, USA; [4]Assistant Professor, Department of Horticulture, University of Arkansas, Little Rock, AR, USA and [5]Professor, Department of Crop and Soil Science, University of Georgia, Tifton, GA, USA

Abstract

Herbicides that inhibit protoporphyrinogen oxidase (PPO) are used in more than 40 agronomic and specialty crops across Georgia to manage weeds through residual and postemergence (POST) control. In 2017, a population of Palmer amaranth exhibiting reduced sensitivity to POST applications of PPO-inhibiting herbicides was identified by the University of Georgia. Seed were collected from the site along with a known sensitive population; distance between the samples was 200 m, increasing the likelihood of similar environmental and genetic characteristics. To quantify sensitivity for both preemergence (PRE) and POST uses, 21 greenhouse dose-response assessments were conducted from 2017 to 2022. After conducting initial rate-response studies, 13 doses per herbicide were chosen for the POST experiment; field use rates of fomesafen (420 g ai ha^{-1}), lactofen (219 g ai ha^{-1}), acifluorfen (420 g ai ha^{-1}), and trifludimoxazin (25 g ai ha^{-1}) ranging from 0× to 4× the field use rate for the susceptible population, and 0× to 40× for the suspect population were applied. Herbicide treatments included adjuvants and were applied to plants 8 to 10 cm in height. Relative resistance factors (RRFs) were calculated for control ratings, mortality, and biomass, and ranged from 105 to 318, 36 to 1,477, 215 to 316, and 9 to 49 for fomesafen, lactofen, acifluorfen, and trifludimoxazin, respectively. In the PRE experiment, herbicide applications included five to nine doses of fomesafen (1× = 210 g ai ha^{-1}), flumioxazin (1× = 57 g ai ha^{-1}), oxyfluorfen (1× = 561 g ai ha^{-1}), and trifludimoxazin (1× = 38 g ai ha^{-1}); doses ranged from 0× to 6× for the suspect population and 0× to 2× for the susceptible population. Visual control, mortality, and biomass RRFs ranged from 3 to 5 for fomesafen, 21 to 31 for flumioxazin, 6 to 22 for oxyfluorfen, and 8 to 38 for trifludimoxazin. Results confirm that a Georgia Palmer amaranth population is resistant to PPO-inhibiting herbicides applied both PRE and POST.

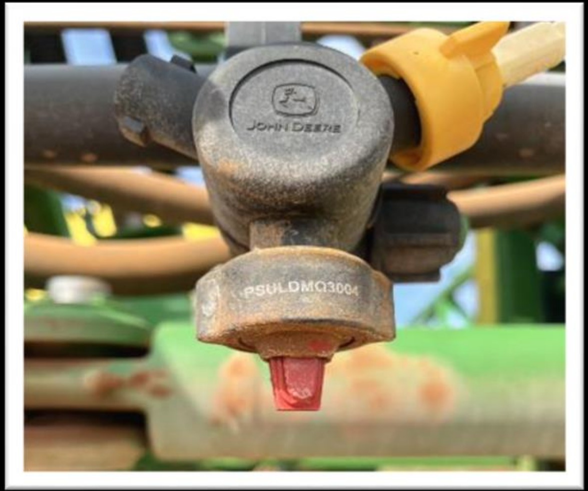
Introduction:
Brake®

Fluridone

- WSSA Group # 12
  Phytoene Desaturase Inhibitor
- Application method: PRE
- "Apply behind the planter (i.e. at planting) or within **36 hours** after planting."

Introduction:

Reasons for delayed herbicide applications



- Weather
- Equipment failures
- Operational/labor constraints
- Injury

Johnson et al. 2006

Introduction:
Rexovor®

Fluridone

- WSSA Group # 12
  Phytoene Desaturase Inhibitor
- Application method: PRE
- "Apply behind the planter (i.e. at planting) or within **36 hours** after planting."

Trifludimoxazin

- Rexovor® (BASF)
- WSSA Group # 14
  Protoporphyrinogen Oxidase Inhibitor
- Application method: PRE

Objective

Evaluate peanut response to delayed timings of fluridone and trifludimoxazin.

H_o: Delayed applications, regardless of timing, will have no effect on peanut density, growth, and yield.

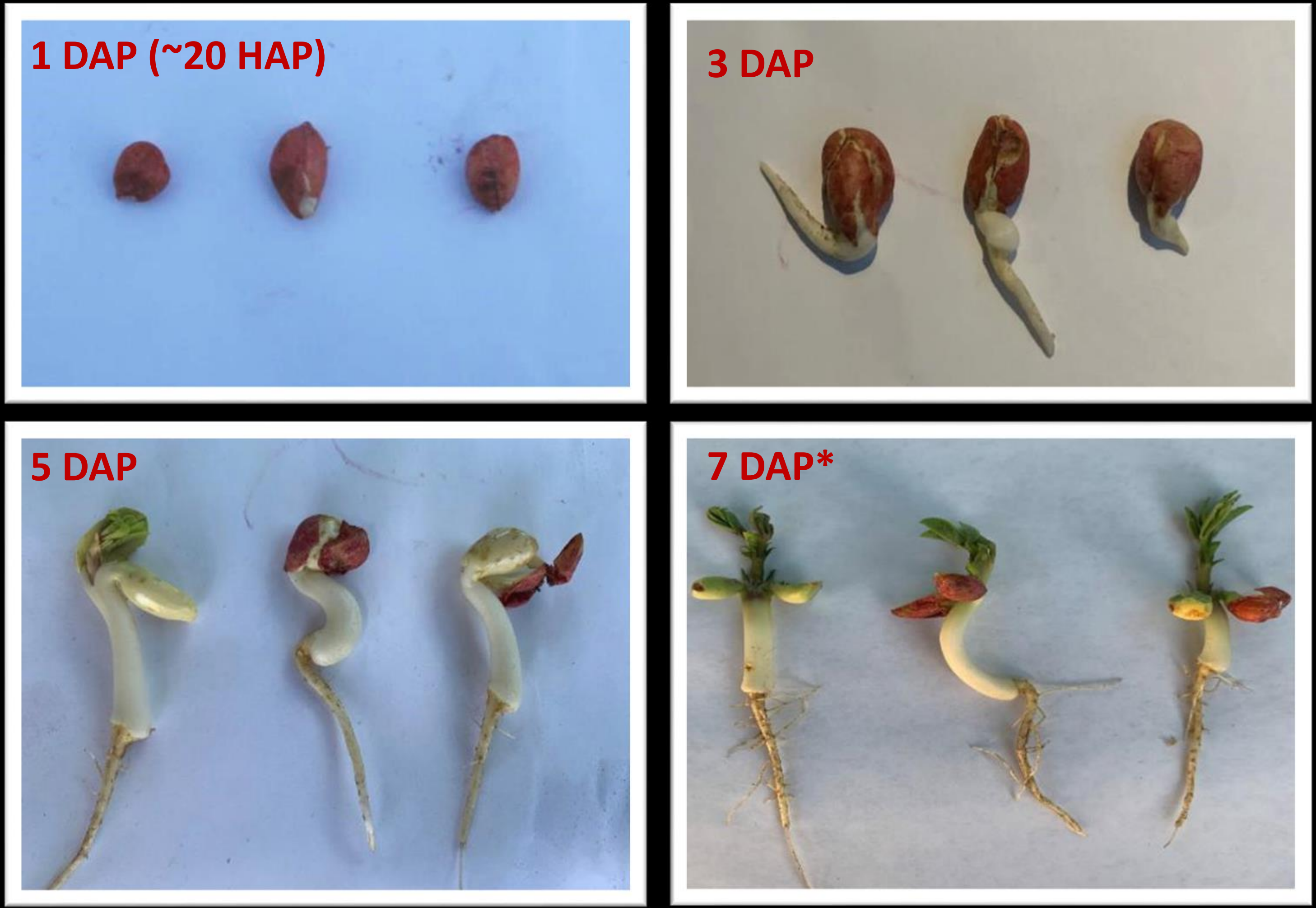
Methods:

Experimental Design

- Experimental Period: 2022 – 2023
- Location: Ponder Farm; Ty Ty, GA
  - Dothan/Tifton sand
- Peanut cultivar:
  - GA-06G
- RCB design; 4 replications
  - 3x4 factorial arrangement
- Treatments:
  - NTC
  - Fluridone: 126 g ai ha^{-1}
  - Trifludimoxazin: 37 g ai ha^{-1}
  - Timing: 1, 3, 5, 7 DAP
- Data analyzed in SAS 9.4 (Cary, NC)
  - PROC GLIMMIX
  - Tukey-HSD (*P* = 0.10) Pairwise comparison

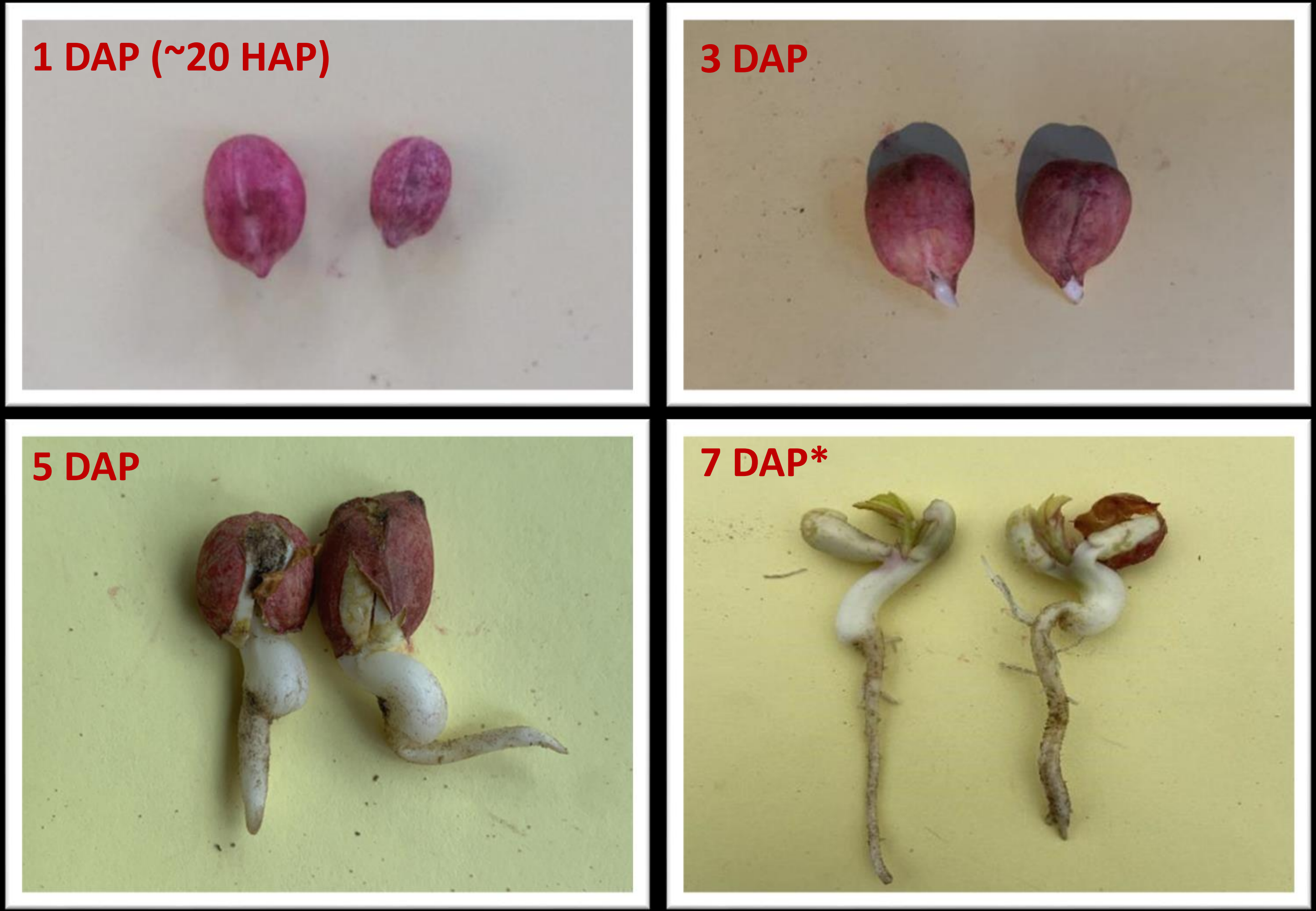
UNIVERSITY OF GEORGIA EXTENSION

Timing - 2022



*7 DAP: >50% GROUND CRACKING; 20-25% GREEN PLANT TISSUE EXPOSED.

Timing - 2023



*7 DAP: 50% GROUND CRACKING, <10% GREEN TISSUE EXPOSED.

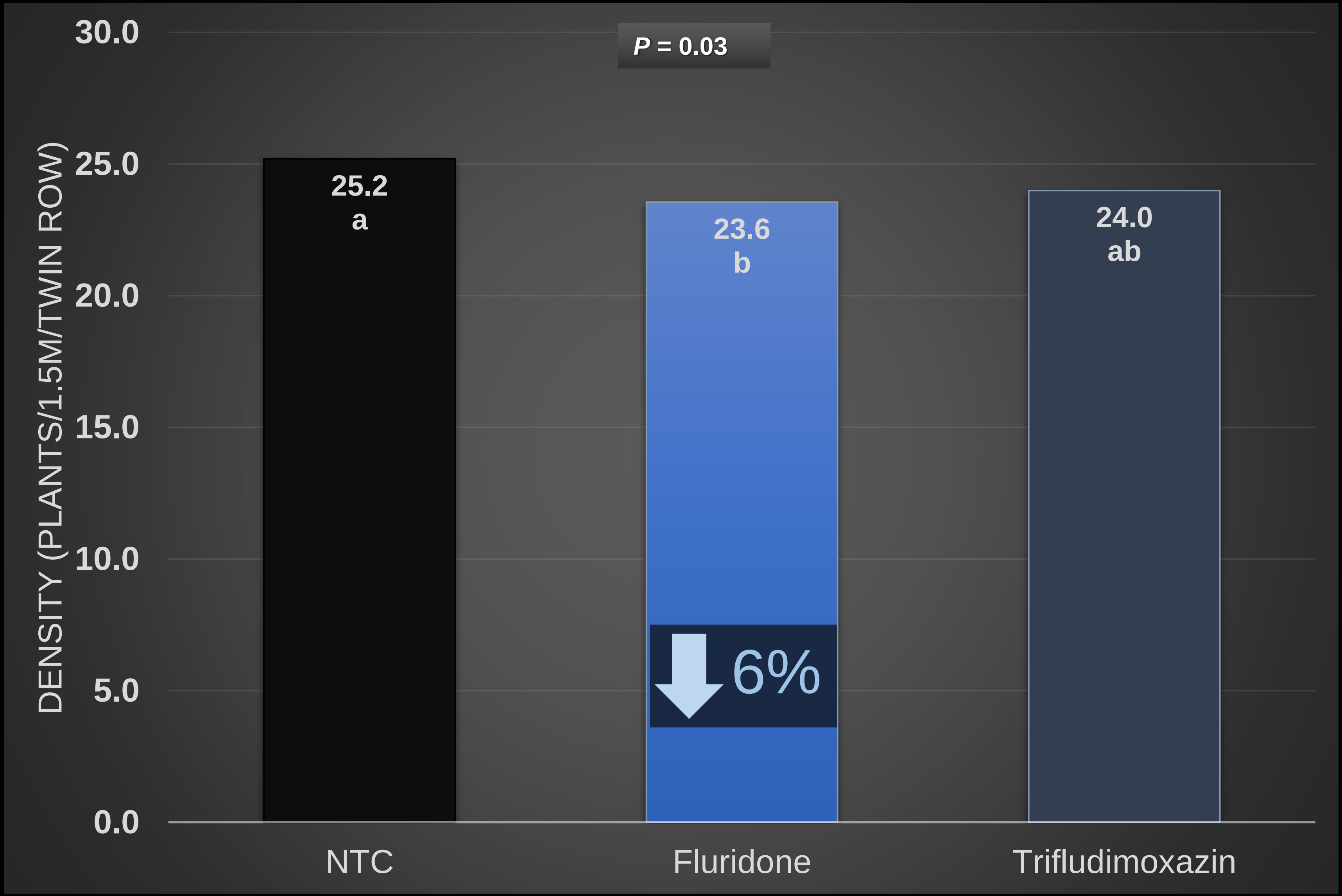
Results

<u>RESPONSE VARIABLES:</u>

- Density (stand)
- Stunting
- Herbicide symptomology
- Height
- Width
- Yield

Results:

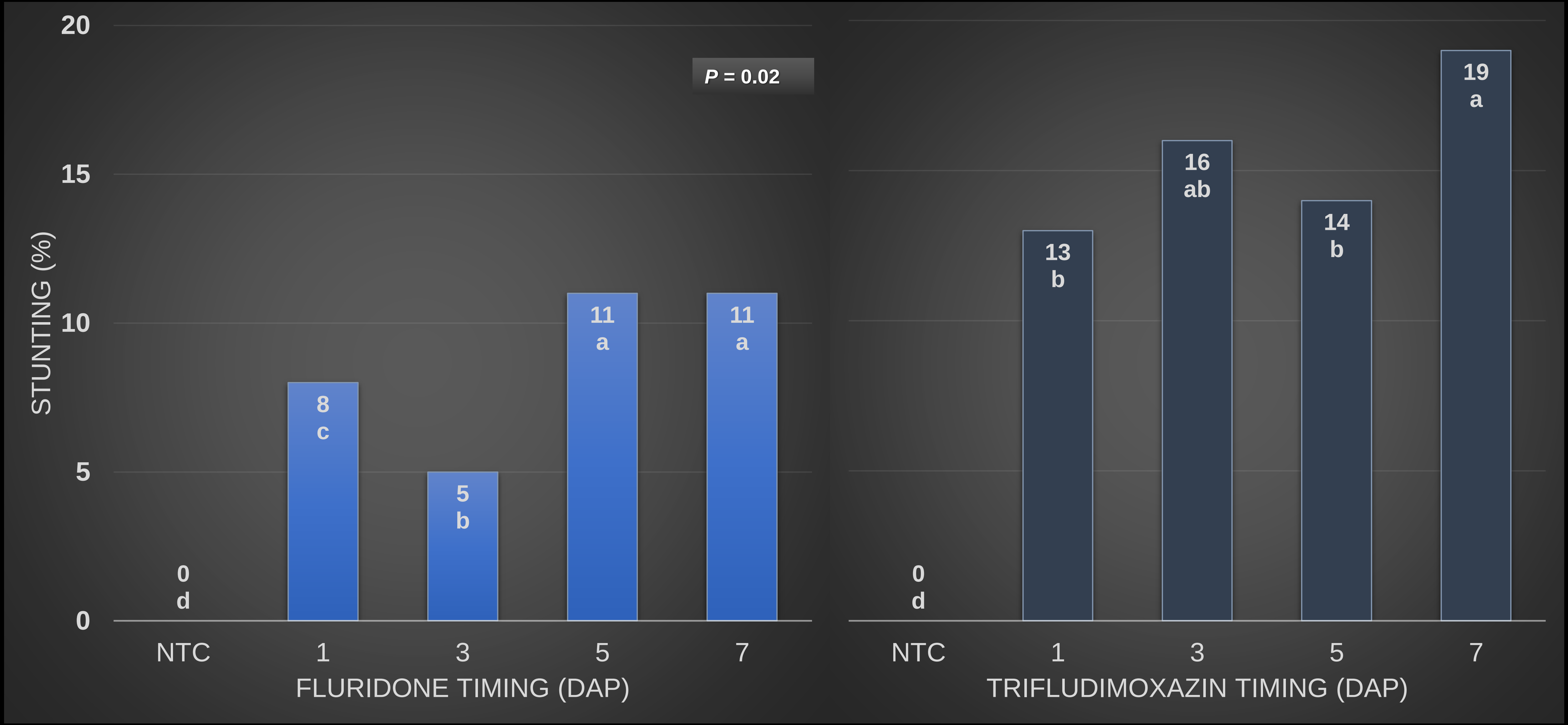
Peanut density 13 DAP following fluridone and trifludimoxazin (2022-2023)



*Columns with letter separation are significantly different at ($P < 0.1$)

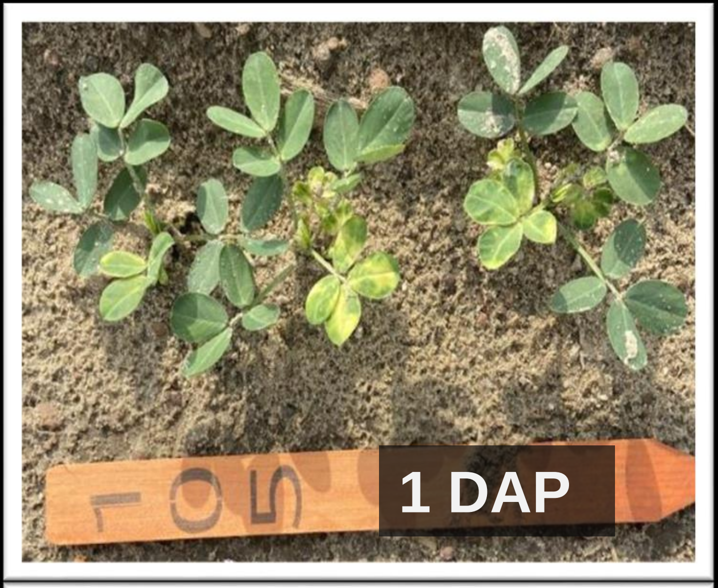
Results:

Peanut stunting 13 DAP following fluridone and trifludimoxazin @ 1, 3, 5, 7 DAP (2022-2023)



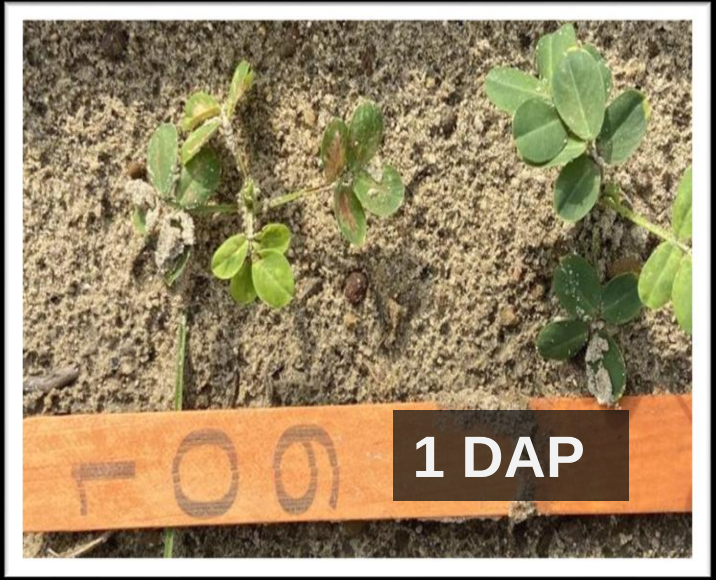
*Columns with letter separation are significantly different at ($P < 0.1$)

Results:
Fluridone

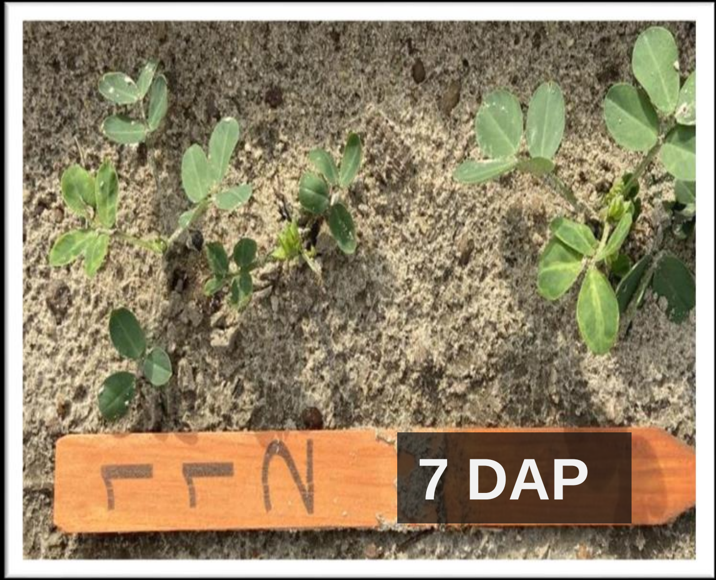


13 DAP; May 15, 2023

Results:
Trifludimoxazin

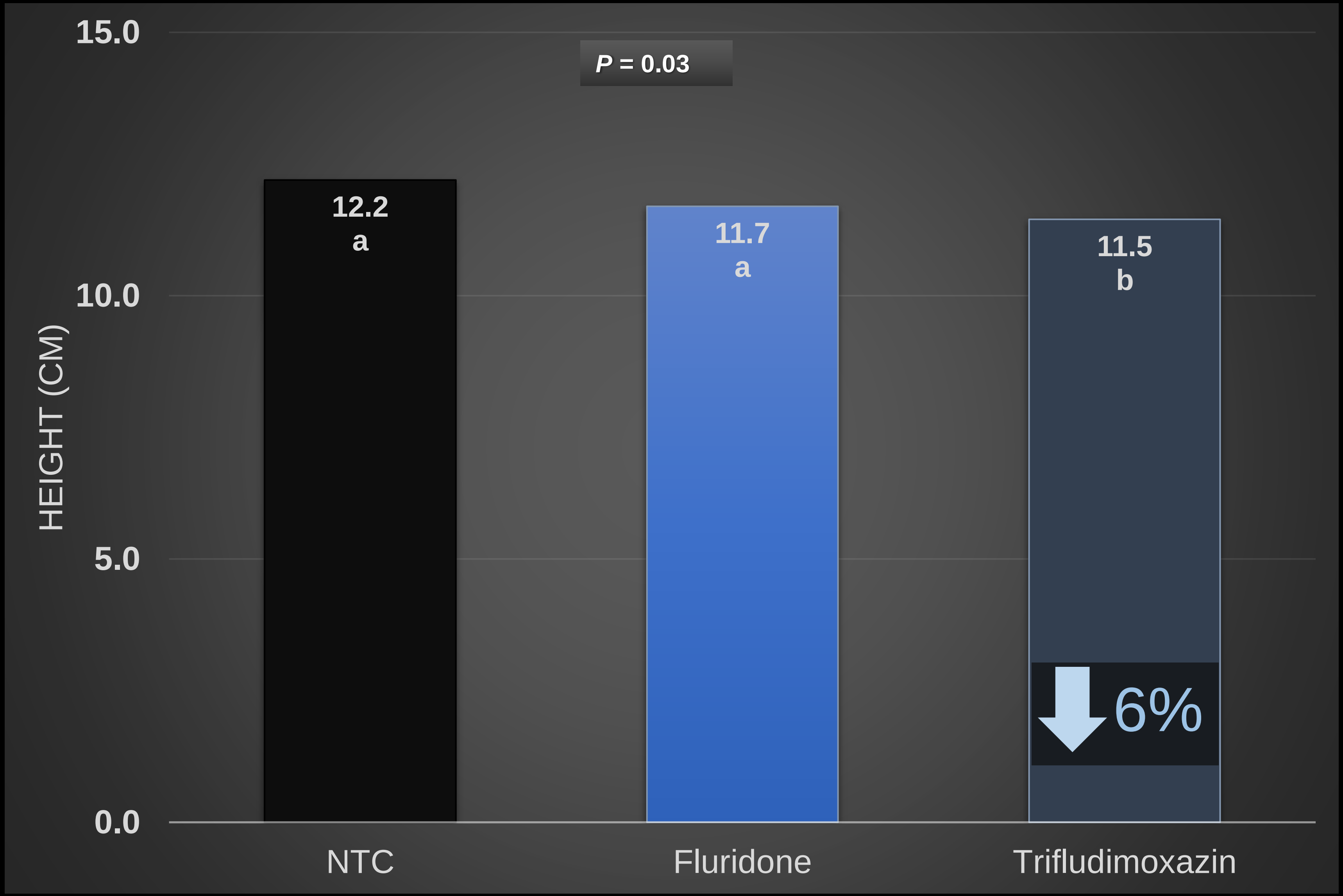


13 DAP; May 15, 2023



Results:

Peanut height 30 DAP following fluridone and trifludimoxazin (2022-2023)



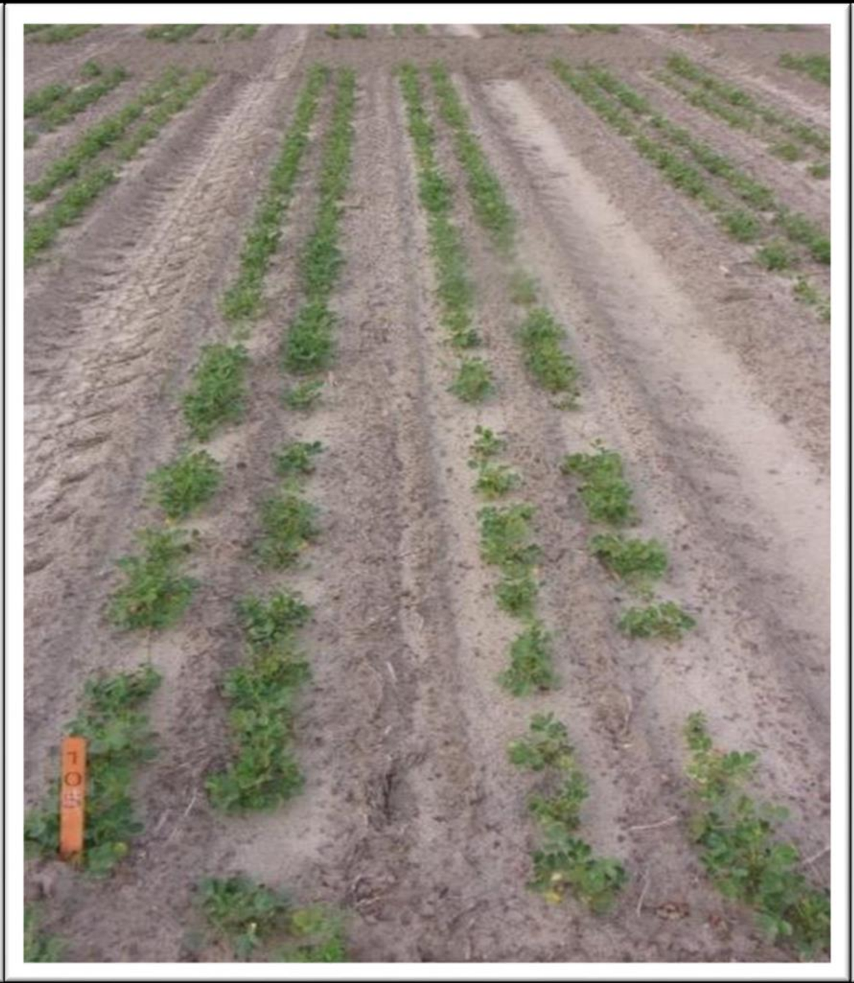
*Columns with letter separation are significantly different at ($P < 0.1$)

Results:

Fluridone

NTC

1 DAP

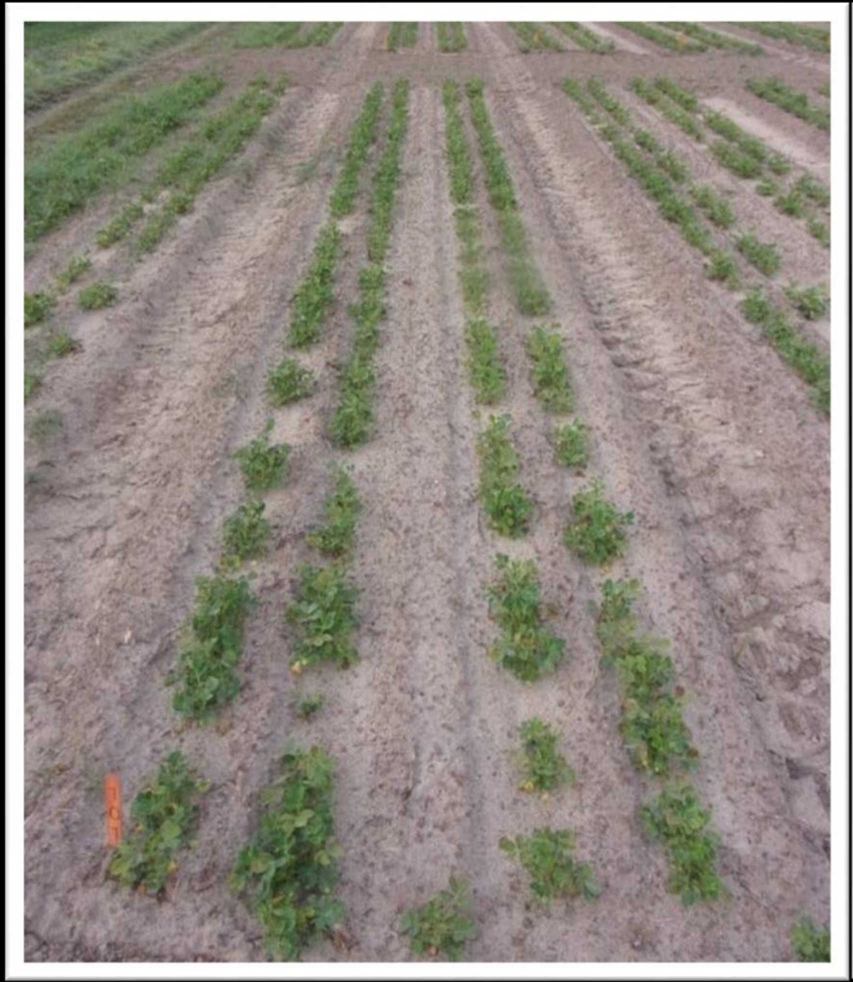


7 DAP

30 DAP; May 31, 2023

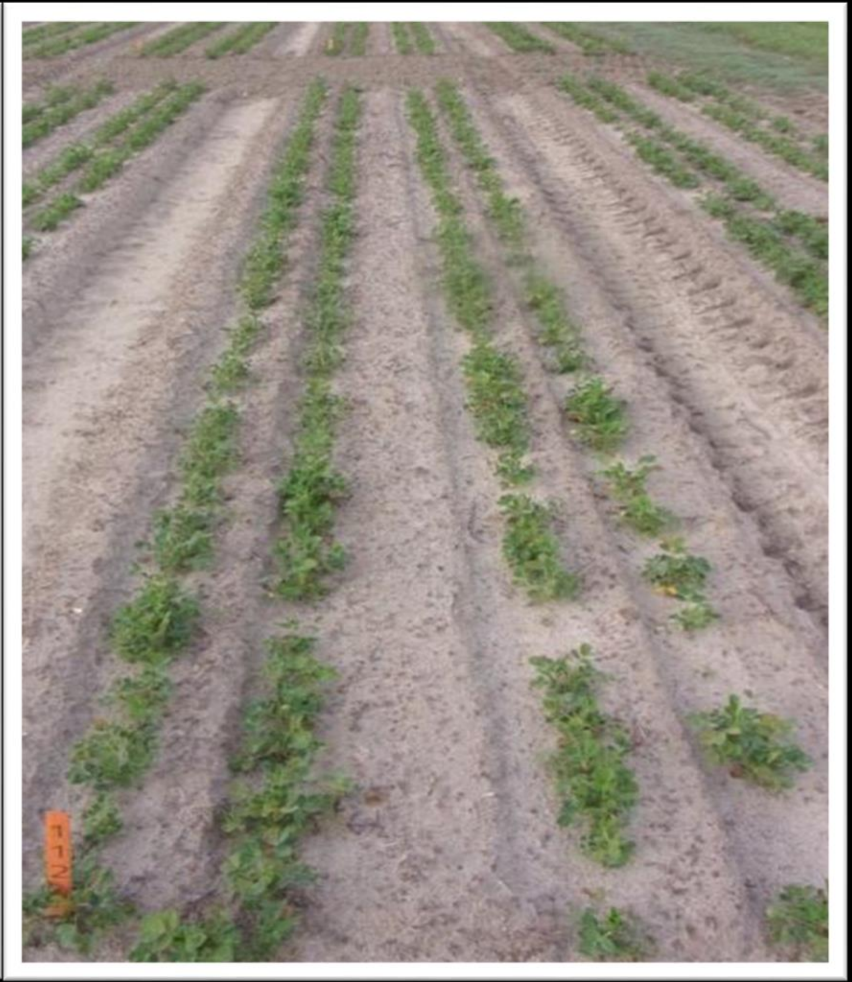
Results:
Trifludimoxazin

NTC



1 DAP

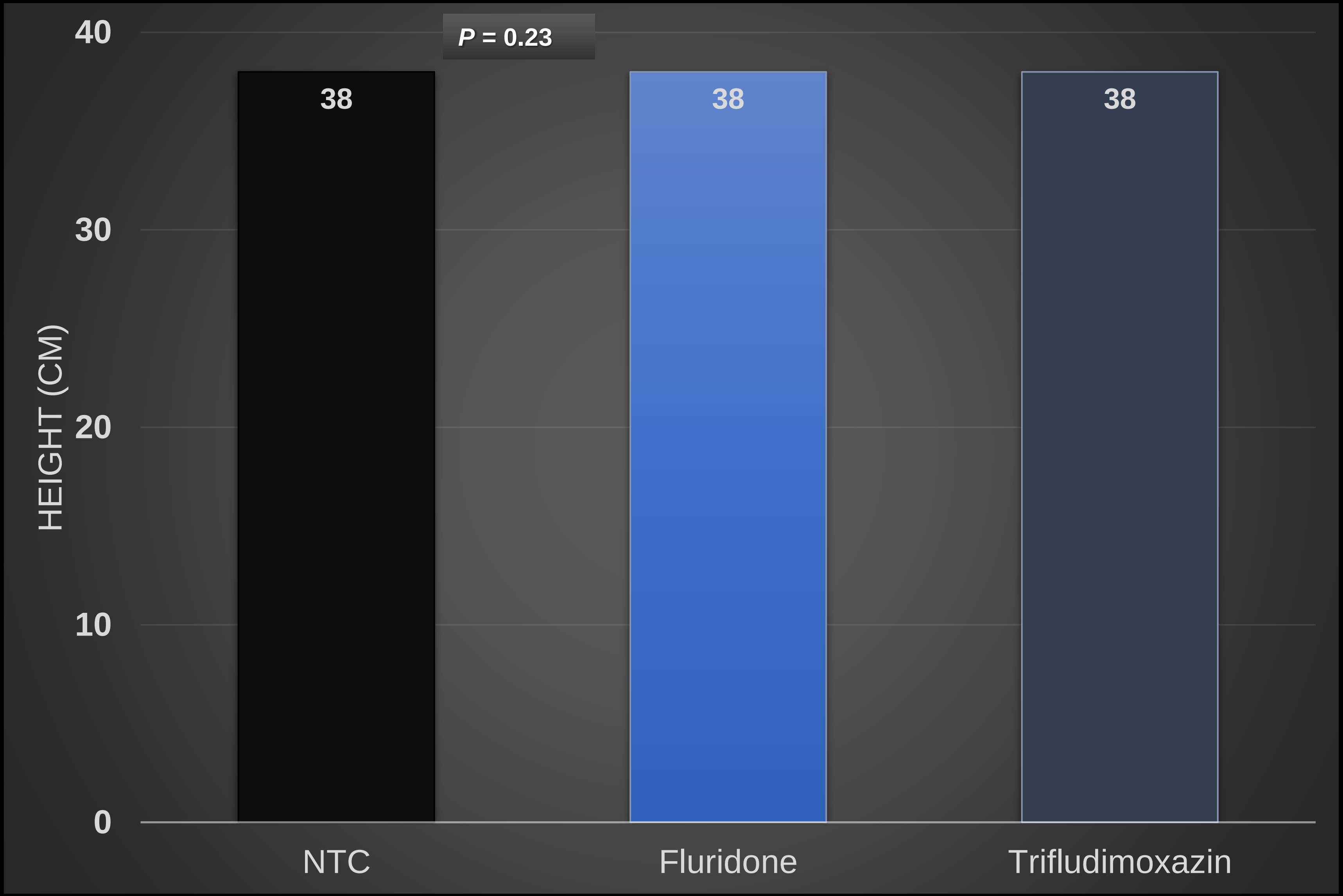
7 DAP



30 DAP; May 31, 2023

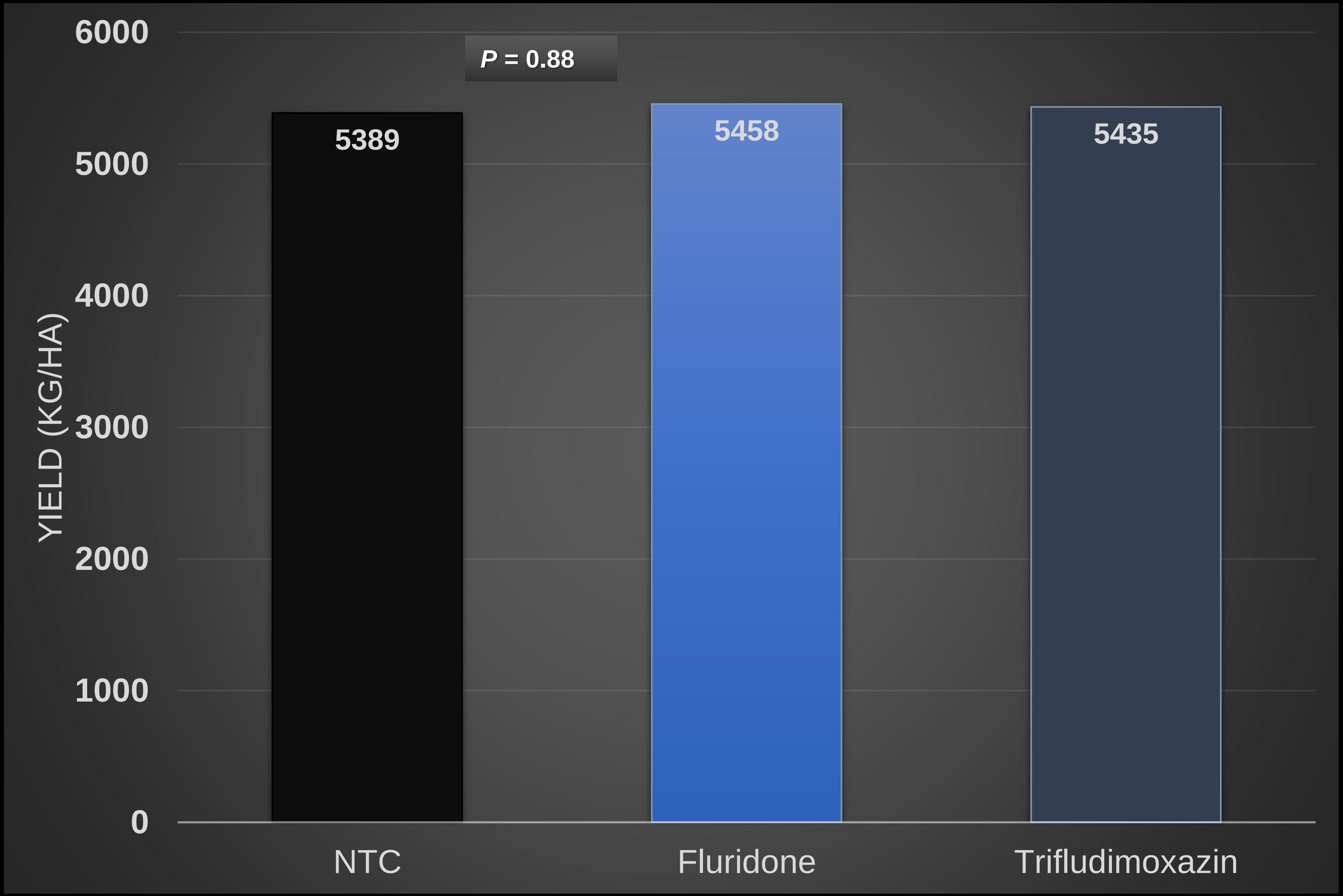
Results:

Peanut height 80 DAP following fluridone and trifludimoxazin (2022-2023)



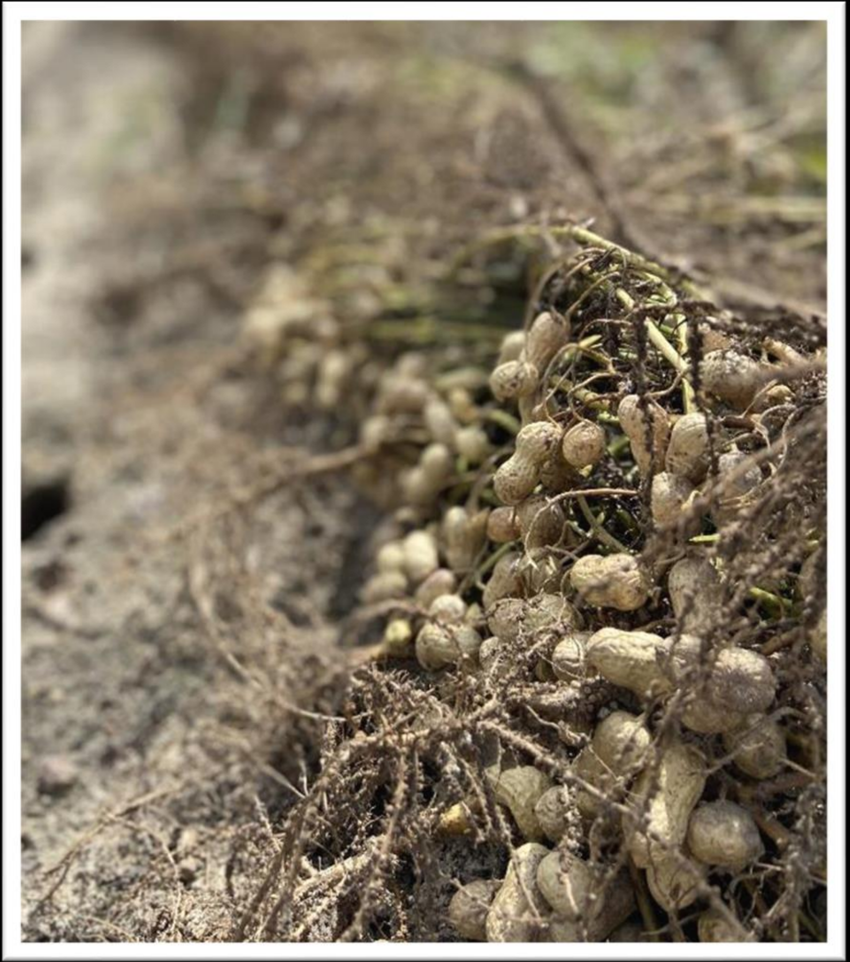
Results:

Peanut yield following fluridone and trifludimoxazin (2022-2023)



Conclusions:

- **Density:**
  - Fluridone – slight decrease (6%)
  - Trifludimoxazin – no effect
- **Increased visual injury with delayed applications**
- **Plant height:**
  - **30 DAP:** Fluridone = no effect; Trifludimoxazin 6% reduction
  - **80 DAP:** no effect regardless of herbicide or timing
- **No effect on yield**

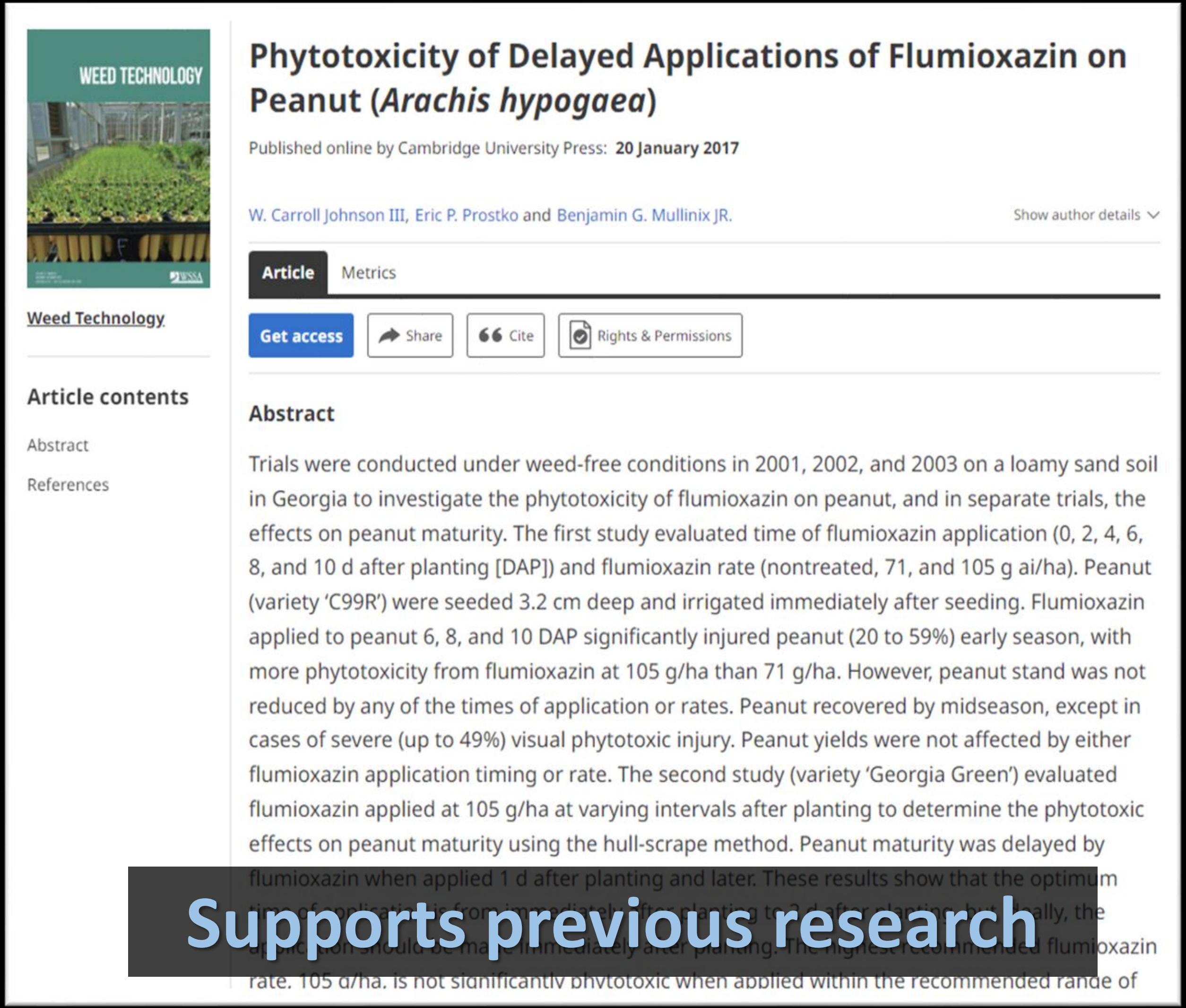


- **Overall Takeaway:**

  Peanuts were tolerant to applications of fluridone and trifludimoxazin up to 7 DAP without negatively impacting yield.

Previous research

Future work:



WEED TECHNOLOGY

Weed Technology

Article contents

Abstract

References

Phytotoxicity of Delayed Applications of Flumioxazin on Peanut (*Arachis hypogaea*)

Published online by Cambridge University Press: **20 January 2017**

W. Carroll Johnson III, Eric P. Prostko and Benjamin G. Mullinix JR.

Show author details

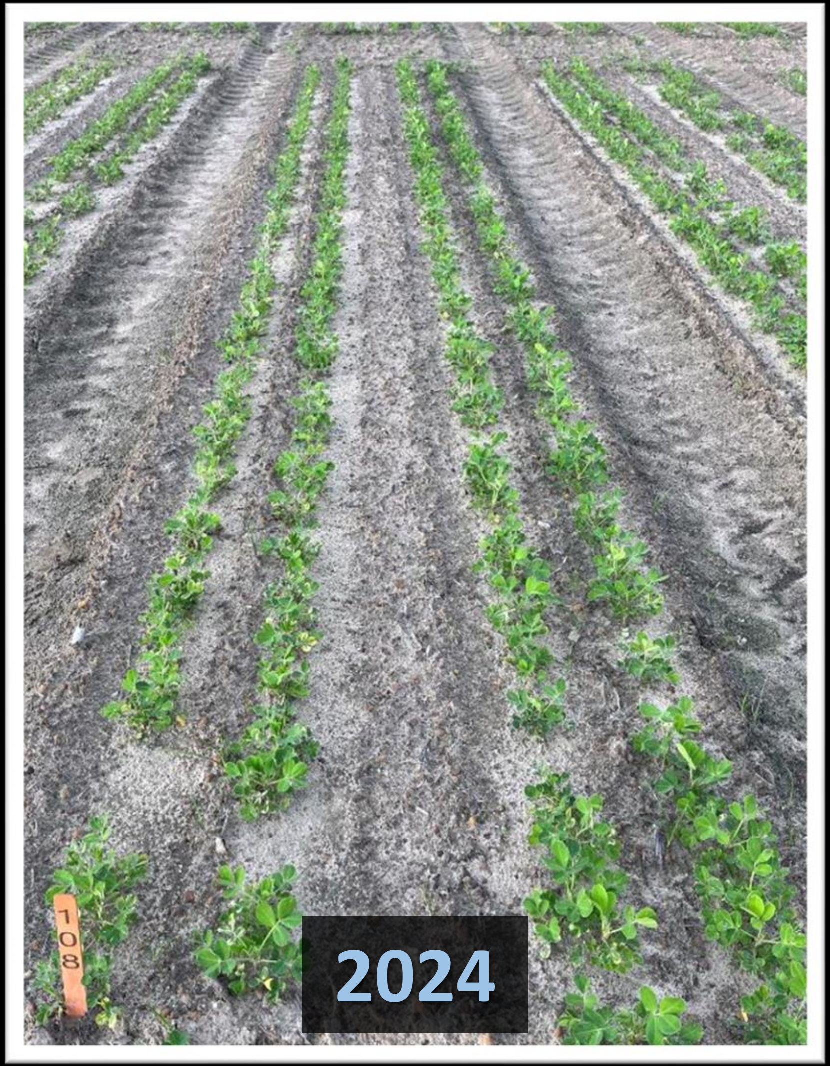
Article Metrics

Get access Share Cite Rights & Permissions

Abstract

Trials were conducted under weed-free conditions in 2001, 2002, and 2003 on a loamy sand soil in Georgia to investigate the phytotoxicity of flumioxazin on peanut, and in separate trials, the effects on peanut maturity. The first study evaluated time of flumioxazin application (0, 2, 4, 6, 8, and 10 d after planting [DAP]) and flumioxazin rate (nontreated, 71, and 105 g ai/ha). Peanut (variety 'C99R') were seeded 3.2 cm deep and irrigated immediately after seeding. Flumioxazin applied to peanut 6, 8, and 10 DAP significantly injured peanut (20 to 59%) early season, with more phytotoxicity from flumioxazin at 105 g/ha than 71 g/ha. However, peanut stand was not reduced by any of the times of application or rates. Peanut recovered by midseason, except in cases of severe (up to 49%) visual phytotoxic injury. Peanut yields were not affected by either flumioxazin application timing or rate. The second study (variety 'Georgia Green') evaluated flumioxazin applied at 105 g/ha at varying intervals after planting to determine the phytotoxic effects on peanut maturity using the hull-scrape method. Peanut maturity was delayed by flumioxazin when applied 1 d after planting and later. These results show that the optimum time of application is from immediately after planting to 2 d after planting but ideally, the application should be made immediately after planting. The highest recommended flumioxazin rate, 105 g/ha, is not significantly phytotoxic when applied within the recommended range of

Supports previous research



Thank you

UNIVERSITY OF GEORGIA

Crop & Soil Sciences

Acknowledgements

Dr. Eric Prostko

Dr. Chad Abbott

Charlie Hilton

Tim Richards

Dewayne Dales

GEORGIA WEED SCIENCE

nicholas.shay@uga.edu