

Response of Multiple Plant Species to Sub-Labeled Doses of Herbicides

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Introduction

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TRANSCRIPT

August 21, 2018 · 5:02 AM ET
Heard on Morning Edition

MERRIT KENNEDY



The vines at Pheasant Ridge Winery near Lubbock, Texas, were devastated by drift from the herbicide 2,4-D in 2015.
Merrit Kennedy/NPR

On the High Plains in West Texas, hot winds blast through cotton fields as far as the eye can see.

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Figure 1. Thoroughly cleaning a sprayer after pesticide application is necessary to avoid potential off-target contamination. Just one drop of dicamba can cause visible injury to three acres of crops.

Think Your Sprayer's Clean? Think Again

JUNE 6, 2018

Clyde Ogg - Pesticide Safety Extension Educator | Greg Puckett - Extension Assistant | Cheryl Alberts - Pesticide Safety Education Program Project Coordinator

To examine sensitive plant injury to several different herbicides when applied at low rates

Materials & Methods

- Pesticide Application Technology Laboratory
 - University of Nebraska Lincoln, West Central Research and Extension Center.
North Platte, Nebraska
- 13 Species
- 14 Herbicides
 - 10% and 1% of regular field use rate



Plant Species Tested



Soybean (*Glycine max*)

Watermelon (*Citrullus lanatus*)

Cotton (*Gossypium hirsutum*)

Green bean (*Phaseolus vulgaris*)

Tomato (*Solanum lycopersicum*)

Tobacco (*Nicotiana tabacum*)

Sweet Potato (*Ipomoea batatas*)

Bell Pepper (*Capsicum annuum*)

Grape (*Vitis labrusca*)

Peanut (*Arachis hypogaea*)

Rose (*Rosa* spp.)

Sugar Beet (*Beta vulgaris*)

Squash (*Cucurbita pepo*)



Herbicides Tested

Herbicide	Active ingredient	Field use rate kg a.i. ha ⁻¹	Mode of Action
1. 2,4-D Choline ^b	2,4-D choline	2.02 ^a	Synthetic auxin
2. Enlist Duo ^b	2,4-D choline + glyphosate (dimethylammonium salt)	4.17 ^a	Synthetic auxin + amino acid synthesis inhibition
3. XtendiMax ^d	Dicamba	1.06 ^a	Synthetic auxin
4. Facet ^c	Quinclorac	0.56	Synthetic auxin/Unknown
5. Grandstand ^b	Triclopyr	0.05	Synthetic auxin
6. Starane Ultra ^b	Fluroxypyr	0.28	Synthetic auxin
7. Milestone ^b	Aminopyralid	0.17	Synthetic auxin
8. Stinger ^b	Clopyralid	1.60	Synthetic auxin
9. Tordon K ^b	Picloram	1.07	Synthetic auxin
10. Durango DMA ^b	glyphosate (dimethylamine salt)	2.70 ¹	Amino acid synthesis inhibition
11. Liberty ^c	Glufosinate	1.25	Glutamine synthesis inhibition
12. Balance Pro ^d	Isoxaflutole	0.20	Pigment inhibition
13. Reflex ^e	Fomesafen	0.80	Cell membrane disruptor
14. Warrant ^d	Acetochlor	2.40	Long-chain fatty acid inhibition

^aKg a.e. ha⁻¹ ^bDow Agrosiences, Indianapolis, IN, USA ^cBASF Corporation, Florham Park, NJ, USA ^dBayer AG, Monheim am Rein, Germany ^eSyngenta, Basel, Switzerland

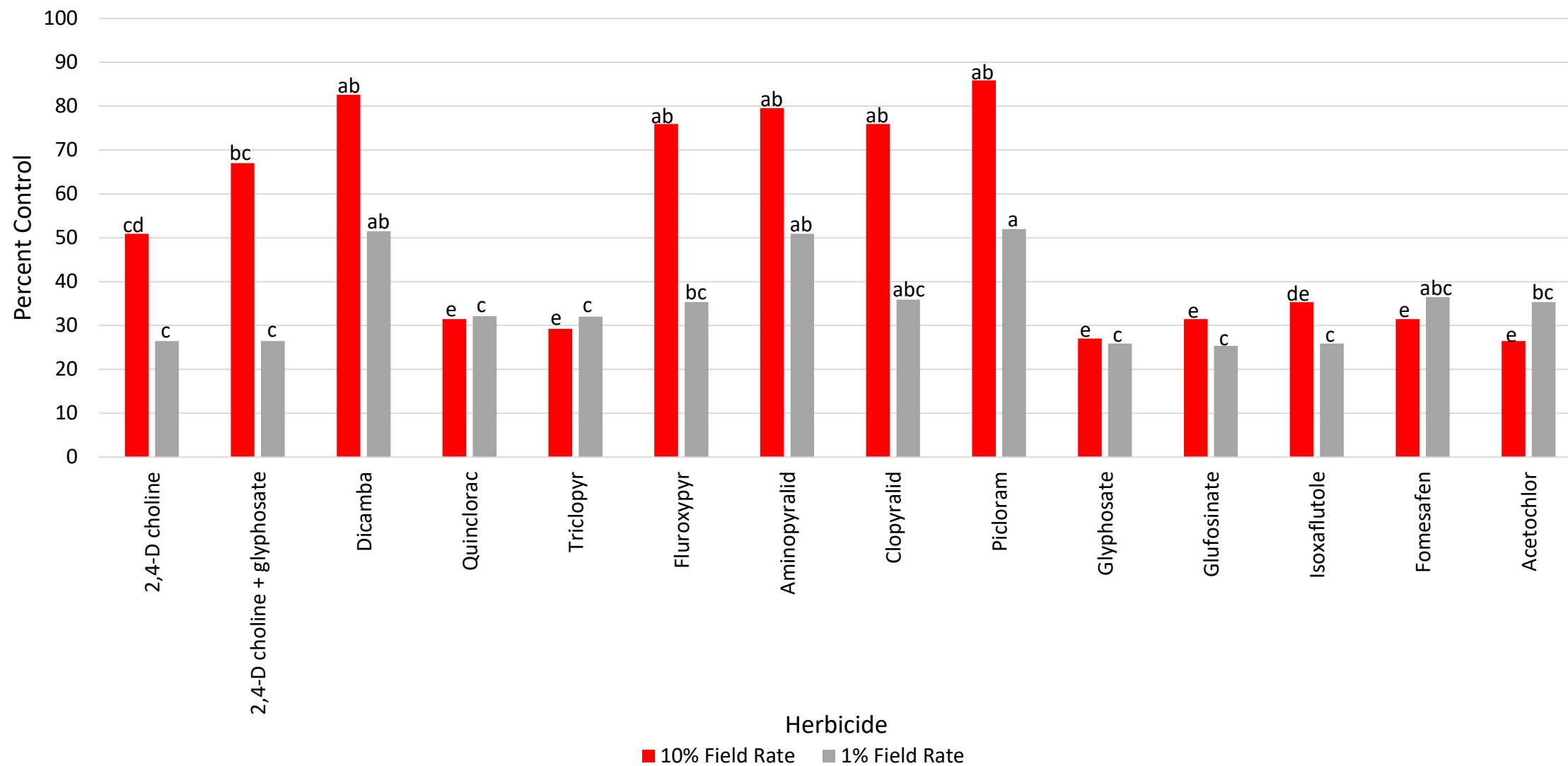
Application Parameters and Data Collection

- Treatments applied using three nozzle enclosed track sprayer
- AIXR11004 nozzles on 50 cm spacing
- Pressure: 276 kPa
- Speed: 19.2 km h⁻¹
- Carrier volume: 94 L ha⁻¹
- Ratings at 7, 14, 21, and 28 DAT
- Pictures taken 5, 7, 14, 21 and 28 DAT
- At 28 DAT, plants severed at soil surface and weighed
- Plants dried to a constant mass, and dry weights recorded
- Data were subjected to ANOVA using SAS Enterprise Guide 6.1.
Means were separated within each species and application percent rate using Tukey HSD at alpha level = 0.05



Results – Soybean

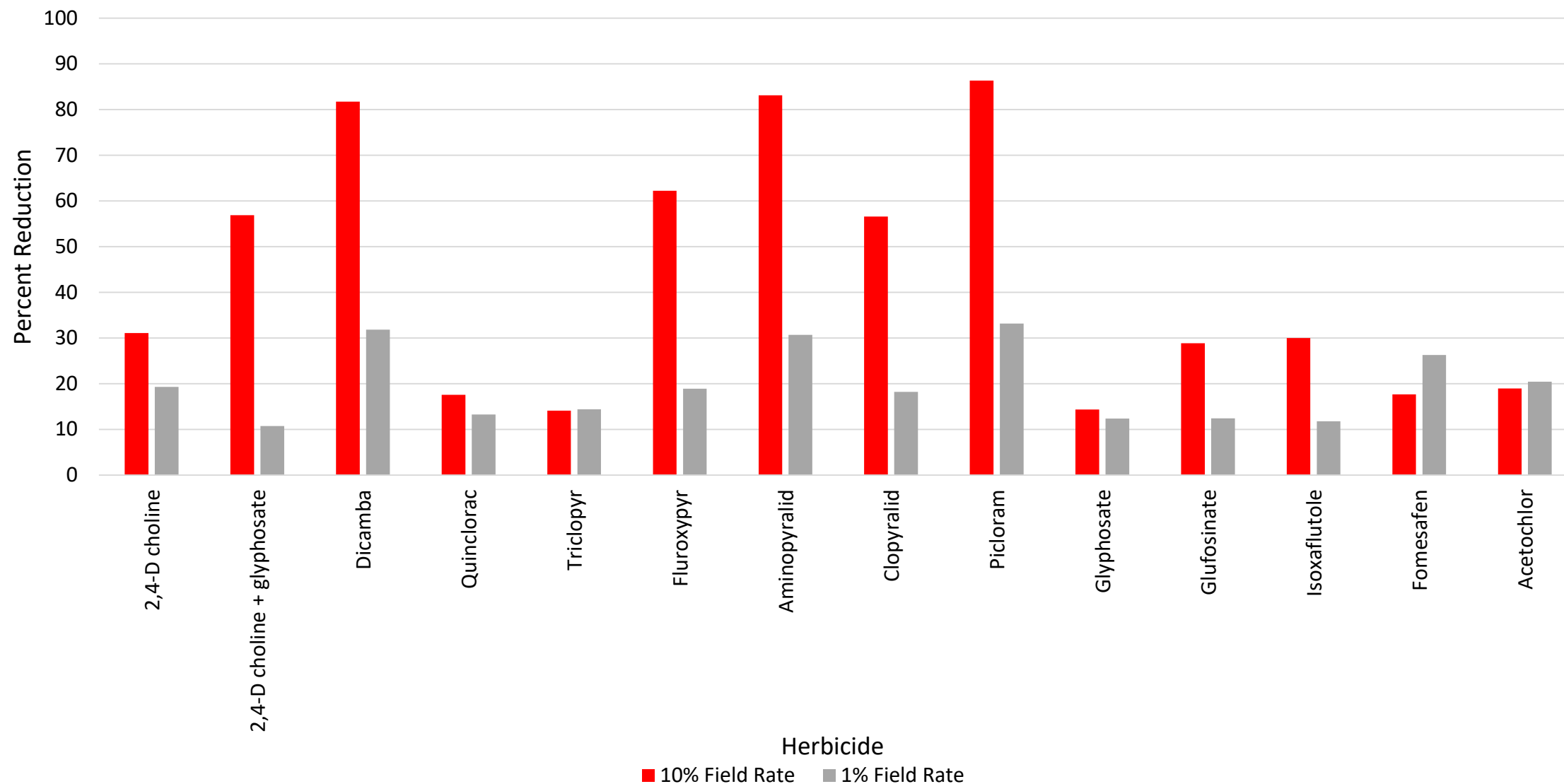
Visual Ratings 28 DAT - Soybean^a



^aMeans followed by the same letter within a column are not different (Tukey HSD, $\alpha = 0.05$). 10% and 1% Field Rate analyzed separately.

Results – Soybean

Dry Weight Percent Reduction - Soybean



Results – Soybean 10% Field Rate



2,4-D choline



2,4-D choline +
glyphosate



Dicamba



Quinclorac



Triclopyr



Fluroxypyr



Aminopyralid



Clopyralid



Picloram



Glyphosate



Glufosinate



Isoxaflutole



Fomesafen



Acetochlor

Results – Soybean 1% Field Rate



2,4-D choline



2,4-D choline +
glyphosate



Dicamba



Quinclorac



Triclopyr



Fluroxypyr



Aminopyralid



Clopyralid



Picloram



Glyphosate



Glufosinate



Isoxaflutole

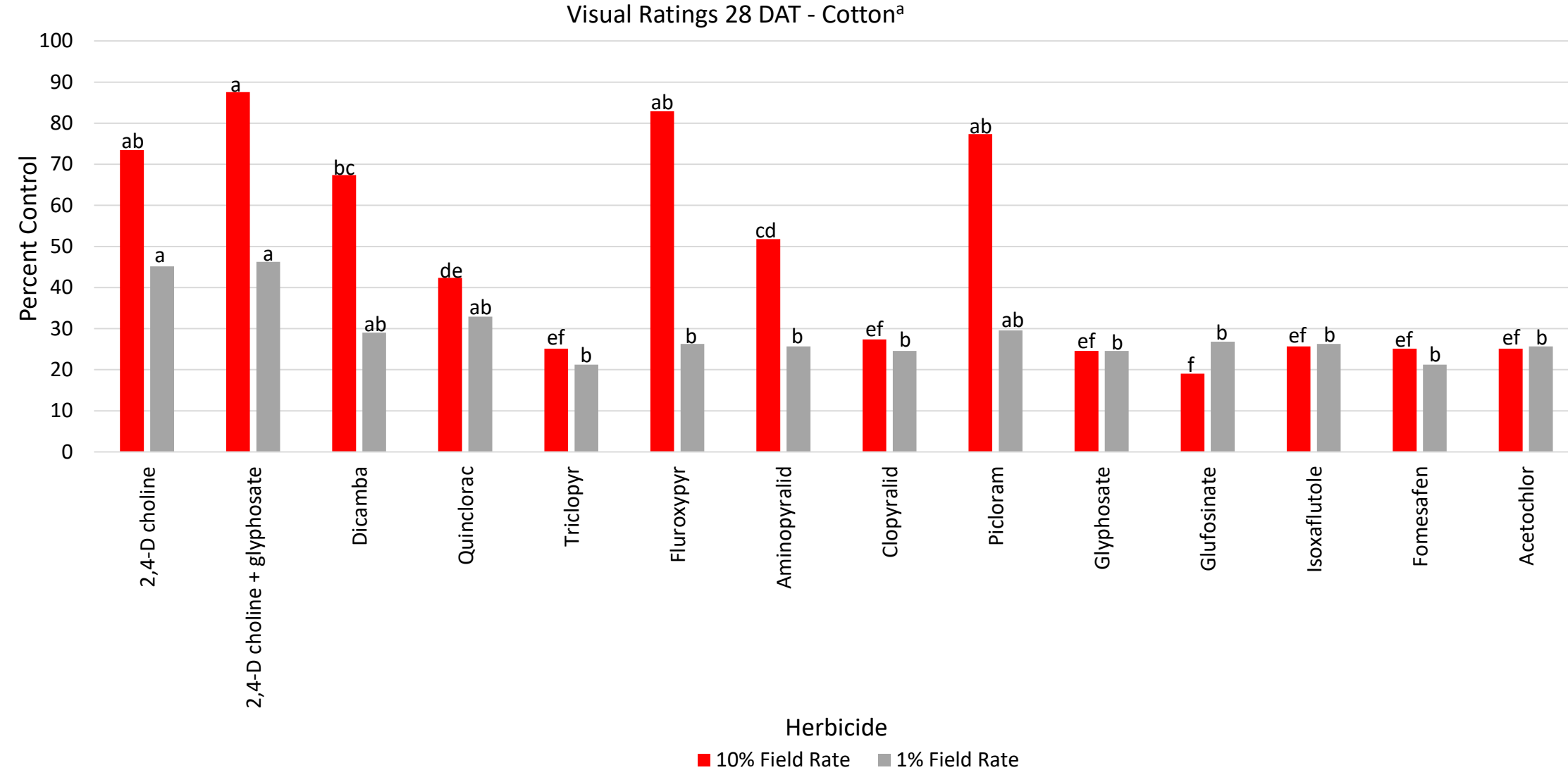


Fomesafen



Acetochlor

Results – Cotton



^aMeans followed by the same letter within a column are not different (Tukey HSD, $\alpha = 0.05$). 10% and 1% Field Rate analyzed separately.

Results – Cotton 10% Field Rate



2,4-D choline



2,4-D choline +
glyphosate



Dicamba



Quinclorac



Triclopyr



Fluroxypyr



Aminopyralid



Clopyralid



Picloram



Glyphosate



Glufosinate



Isoxaflutole



Fomesafen



Acetochlor



Results – Cotton 1% Field Rate



2,4-D choline



2,4-D choline +
glyphosate



Dicamba



Quinclorac



Triclopyr



Fluroxypyr



Aminopyralid



Clopyralid



Picloram



Glyphosate



Glufosinate



Isoxaflutole



Fomesafen

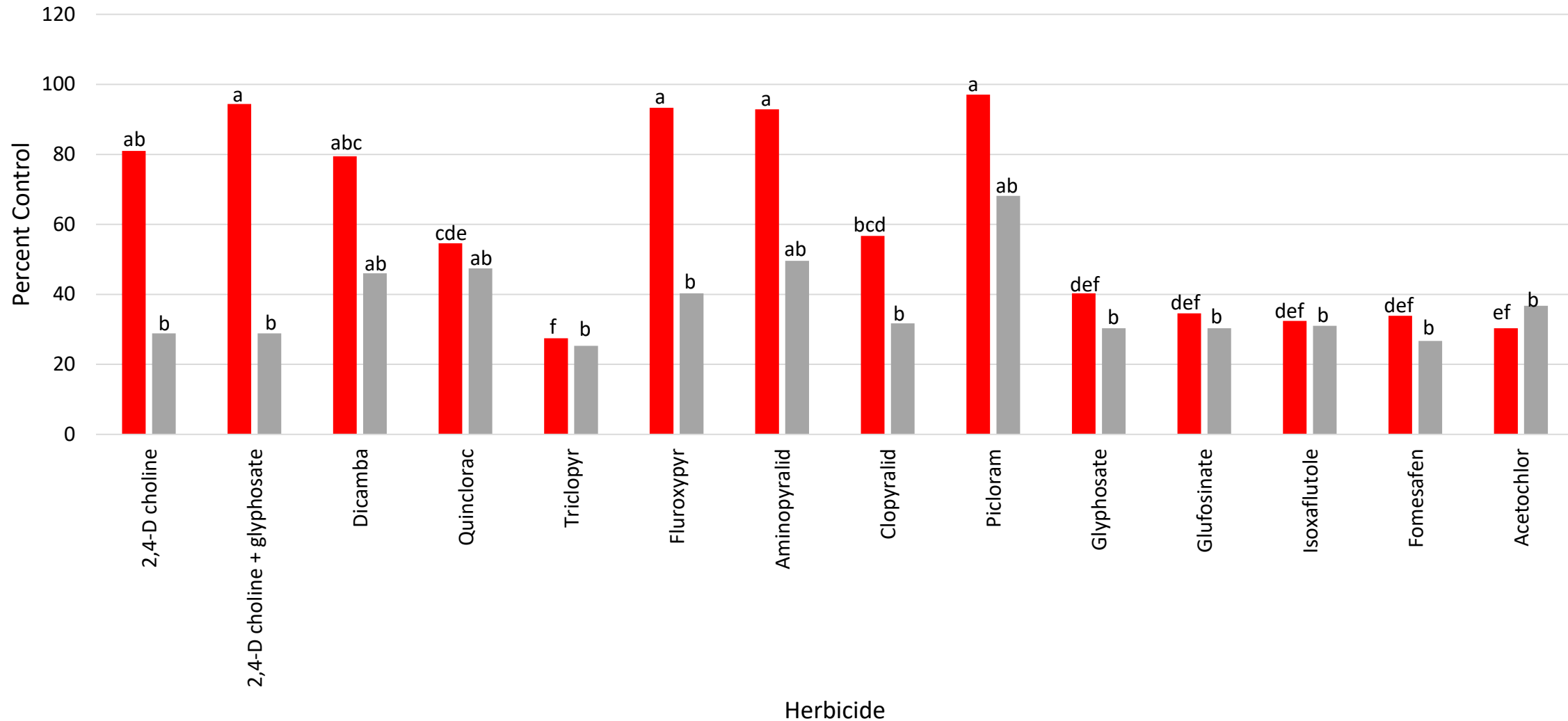


Acetochlor



Results – Tomato

Visual Ratings 28 DAT – Tomato ^a



^aMeans followed by the same letter within a column are not different (Tukey HSD, $\alpha = 0.05$). 10% and 1% Field Rate analyzed separately.

Results – Tomato 10% Field Rate



2,4-D choline

2,4-D choline +
glyphosate

Dicamba

Quinclorac

Triclopyr

Fluroxypyr

Aminopyralid



Clopyralid

Picloram

Glyphosate

Glufosinate

Isoxaflutole

Fomesafen

Acetochlor



Results – Tomato 1% Field Rate



2,4-D choline

2,4-D choline +
glyphosate

Dicamba

Quinclorac

Triclopyr

Fluroxypyr

Aminopyralid



Clopyralid

Picloram

Glyphosate

Glufosinate

Isoxaflutole

Fomesafen

Acetochlor



Results – Grape 10% Field Rate



2,4-D choline



2,4-D choline +
glyphosate



Dicamba



Quinclorac



Triclopyr



Fluroxypyr



Aminopyralid



Clopyralid



Picloram



Glyphosate



Glufosinate



Isoxaflutole



Fomesafen



Acetochlor



Results – Grape 1% Field Rate



2,4-D choline

2,4-D choline +
glyphosate

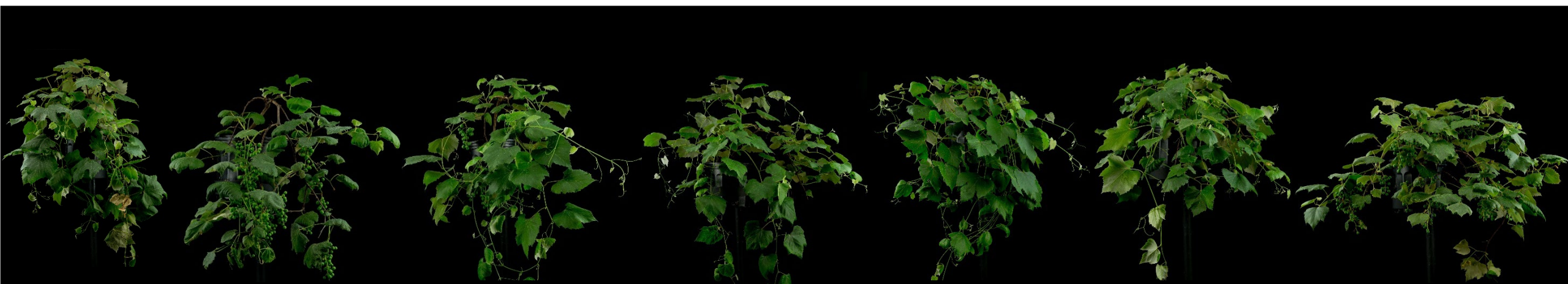
Dicamba

Quinclorac

Triclopyr

Fluroxypyr

Aminopyralid



Clopyralid

Picloram

Glyphosate

Glufosinate

Isoxaflutole

Fomesafen

Acetochlor

Results – Rose 10% Field Rate



2,4-D choline

2,4-D choline +
glyphosate

Dicamba

Quinclorac

Triclopyr

Fluroxypyr

Aminopyralid



Clopyralid

Picloram

Glyphosate

Glufosinate

Isoxaflutole

Fomesafen

Acetochlor



Results – Rose 1% Field Rate



2,4-D choline

2,4-D choline +
glyphosate

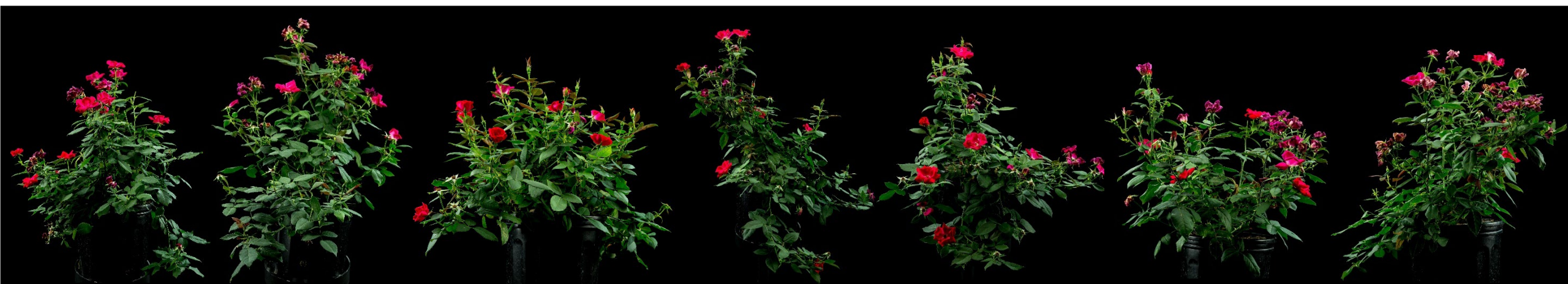
Dicamba

Quinclorac

Triclopyr

Fluroxypyr

Aminopyralid



Clopyralid

Picloram

Glyphosate

Glufosinate

Isoxaflutole

Fomesafen

Acetochlor

Results – Sweet Potato 10% Field Rate



2,4-D choline



2,4-D choline +
glyphosate



Dicamba



Quinclorac



Triclopyr



Fluroxypyr



Aminopyralid



Clopyralid



Picloram



Glyphosate



Glufosinate



Isoxaflutole



Fomesafen



Acetochlor

Results – Sweet Potato 1% Field Rate



2,4-D choline



2,4-D choline +
glyphosate



Dicamba



Quinclorac



Triclopyr



Fluroxypyr



Aminopyralid



Clopyralid



Picloram



Glyphosate



Glufosinate



Isoxaflutole



Fomesafen



Acetochlor

Results – Tobacco 10% Field Rate



2,4-D choline



2,4-D choline +
glyphosate



Dicamba



Quinclorac



Triclopyr



Fluroxypyr



Aminopyralid



Clopyralid



Picloram



Glyphosate



Glufosinate



Isoxaflutole



Fomesafen



Acetochlor



Results – Tobacco 1% Field Rate



2,4-D choline

2,4-D choline +
glyphosate

Dicamba

Quinclorac

Triclopyr

Fluroxypyr

Aminopyralid



Clopyralid

Picloram

Glyphosate

Glufosinate

Isoxaflutole

Fomesafen

Acetochlor

Results – Squash 10% Field Rate



2,4-D choline



2,4-D choline +
glyphosate



Dicamba



Quinclorac



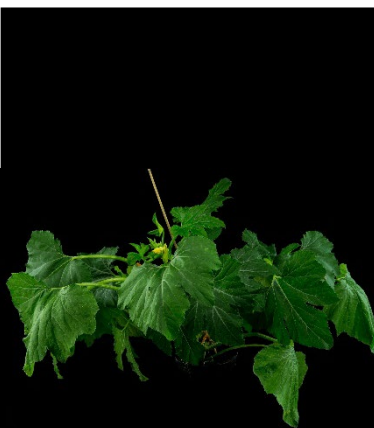
Triclopyr



Fluroxypyr



Aminopyralid



Clopyralid



Picloram



Glyphosate



Glufosinate



Isoxaflutole



Fomesafen



Acetochlor



Results – Squash 1% Field Rate



2,4-D choline

2,4-D choline +
glyphosate

Dicamba

Quinclorac

Triclopyr

Fluroxypyr

Aminopyralid



Clopyralid

Picloram

Glyphosate

Glufosinate

Isoxaflutole

Fomesafen

Acetochlor

Results – Watermelon 10% Field Rate



2,4-D choline

2,4-D choline +
glyphosate

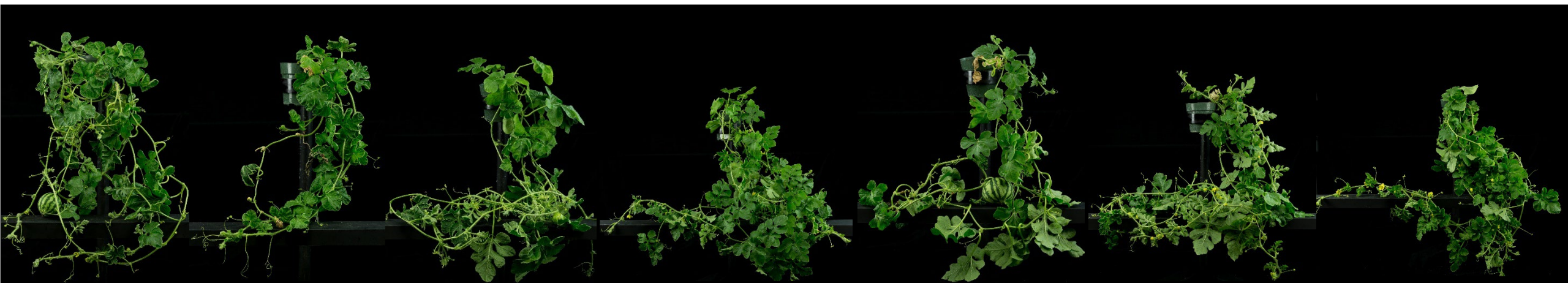
Dicamba

Quinclorac

Triclopyr

Fluroxypyr

Aminopyralid



Clopyralid

Picloram

Glyphosate

Glufosinate

Isoxaflutole

Fomesafen

Acetochlor

Results – Watermelon 1% Field Rate



2,4-D choline

2,4-D choline +
glyphosate

Dicamba

Quinclorac

Triclopyr

Fluroxypyr

Aminopyralid



Clopyralid

Picloram

Glyphosate

Glufosinate

Isoxaflutole

Fomesafen

Acetochlor

Results – Green Bean 10% Field Rate



2,4-D choline

2,4-D choline +
glyphosate

Dicamba

Quinclorac

Triclopyr

Fluroxypyr

Aminopyralid



Clopyralid

Picloram

Glyphosate

Glufosinate

Isoxaflutole

Fomesafen

Acetochlor

Results – Green Bean 1% Field Rate



2,4-D choline

2,4-D choline +
glyphosate

Dicamba

Quinclorac

Triclopyr

Fluroxypyr

Aminopyralid



Clopyralid

Picloram

Glyphosate

Glufosinate

Isoxaflutole

Fomesafen

Acetochlor

Results – Peanut 10% Field Rate



2,4-D choline



2,4-D choline +
glyphosate



Dicamba



Quinclorac



Triclopyr



Fluroxypyr



Aminopyralid



Clopyralid



Picloram



Glyphosate



Glufosinate



Isoxaflutole



Fomesafen



Acetochlor

Results – Peanut 1% Field Rate



2,4-D choline



2,4-D choline +
glyphosate



Dicamba



Quinclorac



Triclopyr



Fluroxypyr



Aminopyralid



Clopyralid



Picloram



Glyphosate



Glufosinate



Isoxaflutole



Fomesafen



Acetochlor



Results – Pepper 10% Field Rate



2,4-D choline

2,4-D choline +
glyphosate

Dicamba

Quinclorac

Triclopyr

Fluroxypyr

Aminopyralid



Clopyralid

Picloram

Glyphosate

Glufosinate

Isoxaflutole

Fomesafen

Acetochlor



Results – Pepper 1% Field Rate



2,4-D choline

2,4-D choline +
glyphosate

Dicamba

Quinclorac

Triclopyr

Fluroxypyr

Aminopyralid



Clopyralid

Picloram

Glyphosate

Glufosinate

Isoxaflutole

Fomesafen

Acetochlor



Results – Sugar Beet 10% Field Rate



2,4-D choline

2,4-D choline +
glyphosate

Dicamba

Quinclorac

Triclopyr

Fluroxypyr

Aminopyralid



Clopyralid

Picloram

Glyphosate

Glufosinate

Isoxaflutole

Fomesafen

Acetochlor

Results – Sugar Beet 1% Field Rate



2,4-D choline

2,4-D choline +
glyphosate

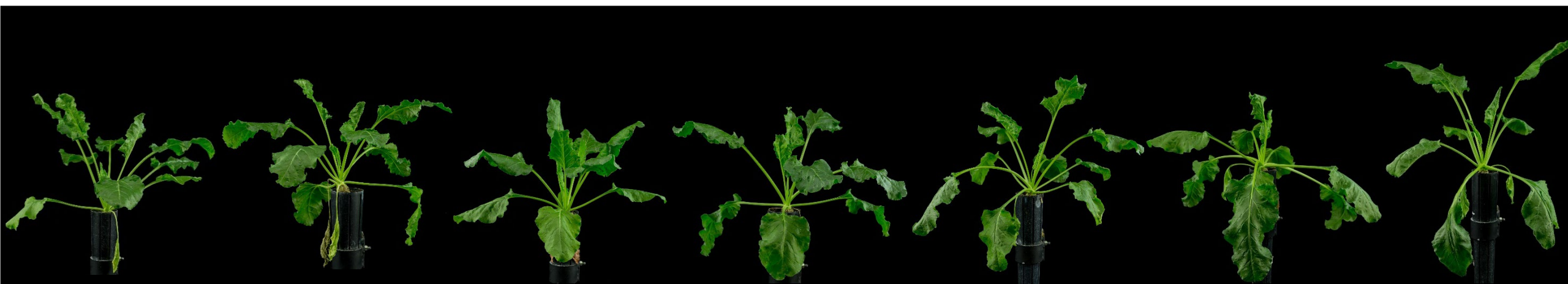
Dicamba

Quinclorac

Triclopyr

Fluroxypyr

Aminopyralid



Clopyralid

Picloram

Glyphosate

Glufosinate

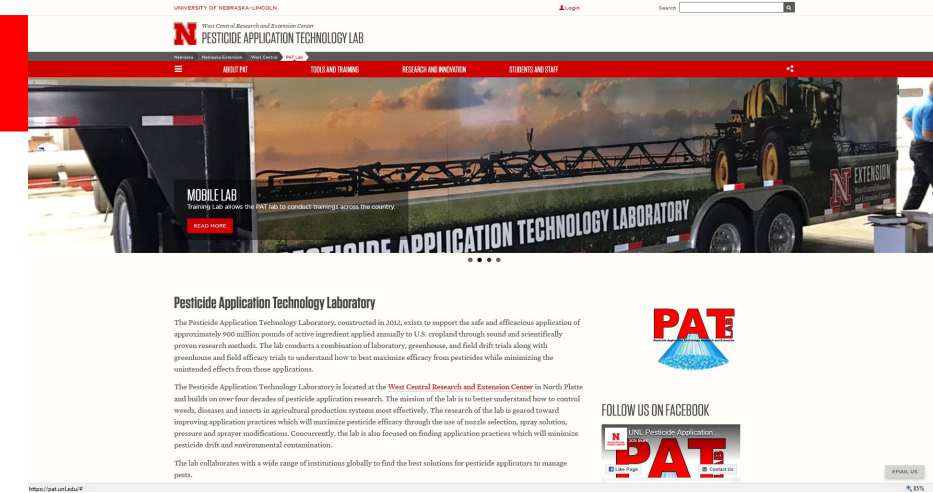
Isoxaflutole

Fomesafen

Acetochlor

Results

- Picloram and 2,4-D + glyphosate caused most severe symptomology
 - 75% or greater damage to 9 species
- Acetochlor and triclopyr caused least symptomology at 10% Field Rate
 - Acetochlor: 25% or less damage to nine species
 - Triclopyr: 25% or less damage to eight species
- Acetochlor, triclopyr, and glyphosate caused least symptomology at 1% Field Rate
 - Acetochlor: 25% or less damage to eight species
 - Triclopyr: 25% or less damage to ten species
 - Glyphosate: 25% or less damage to nine species
- Tomato, tobacco, and green bean had most severe symptomology
 - Tomato: 50% or greater damage on eight species with 10% field rate
 - Tobacco: 50% or greater damage on nine species with 10% field rate
 - Green bean: 50% or greater damage on ten species with 10% field rate
- Rose, squash, peanut, and sugar beet showed least severe symptomology
 - Rose: 25% or less damage on 12 species with 1% field rate
 - Squash: 25% or less damage on 11 species with 1% field rate
 - Peanut: 25% or less damage on 12 species with 1% field rate
 - Sugar beet: 25% or less damage on 12 species with 1% field rate
- Squash recovered from injury quicker than any species



Questions?



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