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Editor: Linda Chalker-Scott

Cummings, C.¹, Perkins, C.², Maxwell, C.³, Phillips, T.⁴, Morrow, A.⁵, Gowin, S.⁶, Sutton, P.⁷, Spencer, C.⁸

¹County Extension Agent - Ag and Natural Resources, Texas A&M AgriLife Extension, Sherman, Texas, 75090

²County Extension Agent - Ag and Natural Resources, Texas A&M AgriLife Extension, Tyler, Texas, 75702

³County Extension Agent - Ag and Natural Resources, Texas A&M AgriLife Extension, Bonham, Texas, 75418

⁴County Extension Agent - Ag and Natural Resources, Texas A&M AgriLife Extension, Kaufman, Texas, 75142

⁵County Extension Agent - Ag and Natural Resources, Texas A&M AgriLife Extension, Canton, Texas, 75103

⁶County Extension Agent - Ag and Natural Resources, Texas A&M AgriLife Extension, Emory, Texas, 75440

⁷Range and Pasture Specialist, Corteva Agriscience, Ruston, Louisiana, 71270

⁸Range and Pasture Specialist, Corteva Agriscience, Sherman, Texas, 75090

Demonstration Review: Control of *Croton capitatus* and *Parthenium hysterophorus* in Texas

Abstract

Pasture management is an annual process. Annual weeds like goatweed (*Croton capitatus*) and false ragweed (*Parthenium hysterophorus*) are problematic for control across east Texas and throughout the southern US. Many herbicide options fail to control the species due to lack of activity on the spurge family or incorrect timing of herbicide applications. To better understand efficacy of various herbicide treatments and application timing, herbicide application demonstrations were initiated in Fannin and Van Zandt Counties on established bermudagrass pasture dominated by goatweed (Fannin) and false ragweed (Van Zandt) with minor populations of various other warm season weeds. Weed control ratings for herbicide treatments and a mowing treatment were collected monthly to determine the initial efficacy and season long control of weeds in the grazed pasture for various treatments and timings. Herbicide efficacy on target weeds with all treatments, locations, timings, and application techniques was excellent (90% visual control or more), except for the mowing treatment at Fannin County, which resulted in initial weed knockdown on the day of application, but not long-

term control (30% control 2 months after treatment). Mowing early in July did not provide acceptable control of annual weed populations – some weeds survived the mowing operation, and additional weeds emerged due to lack of vegetative cover or residual herbicide. Treatments in June and July provided similar efficacy on target weeds, even with larger, more mature weed sizes. Aerial drone applications at 2 GPA total spray volumes (Van Zandt County) performed similarly to the conventional ground applications on target weeds.

Introduction

Pasture weed control is an annual concern for our local producers in hay and grazed pasture markets. Goatweed (*Croton capitatus*; Euphorbiaceae) and false ragweed (*Parthenium hysterophorus*; Asteraceae) are some of the most common annual weed problems in central and eastern Texas. Many herbicide options fail to control the species due to lack of activity on the spurge family or incorrect timing of the herbicide application. Goatweed, and croton species in general are constant species of interest across central and eastern Texas due to its ability to grow under a wide range of environmental conditions (Diggs et al., 1999; Figures 1-2). In recent years, false ragweed has expanded in density, dominance and distribution across north and east Texas, likely due to drought conditions and over-grazing.

Corteva Agriscience produces some of the most widely used herbicide products in the range and pasture market (Corriher-Olson, Nolte and Howard, 2023). Many of the treatments for weed control in the southern US are aminopyralid or picloram based treatments.



Figure 1. Goatweed sizes in Fannin County at the July application period (Photo by Colton Spencer).



Figure 2. Goatweed dominates this pasture in Fannin County at the June application period. This would be the proper size and stage for control according to most herbicide product labels (Photo by D. Chad Cummings).

To better understand the efficacy of various herbicide treatments and application timing, herbicide application demonstrations were initiated in north Fannin County and Van Zandt County on established bermudagrass pasture dominated by goatweed (Fannin) and false ragweed (Van Zandt) with minor populations of various other warm season weeds. Weed control ratings for herbicide treatments and a mowing treatment were collected monthly to determine the initial efficacy and season long control of weeds in the grazed pasture for the various treatments and timings.

Methods

The Fannin County study site was established on June 22, 2023, in Bonham, TX, on an established bermudagrass pasture (Figure 3). The location is 6 miles south of the Red River, 5 miles north of highway 82. Soils are a Crockett Silt loam, with gentle slope to no grade. The bermudagrass stand is greater than 10 years in age. The West Pasture (June treatment) had been grazed continuously through 2022 and 2023. The East Pasture (July treatment) had been rested periodically through 2022 and 2023.

The bermudagrass was actively growing (5-15 inches tall) and continuously grazed by cattle and horses at a heavy stocking rate (0.33 animal unit/acre). The pasture had not been fertilized for 2 years prior to the study. No herbicide treatments were applied in 2022, due to the drought conditions (Figure 4).

Plant and pasture conditions at the time of application in June and July were good to excellent in terms of soil moisture and plant health (Figure 5). Additional weed species in the treatment area included prostrate spurge (*Euphorbia maculata*), bitter sneezeweed (*Helenium amarum*), late boneset (*Eupatorium serotinum*), western ragweed (*Ambrosia psilostachya*), dallisgrass (*Paspalum dilitatum*), and broomsedge bluestem (*Andropogon virginicus*).



Figure 3. Aerial photo of the Fannin County study site. (Inset: Soils map of the demonstration pasture, indicating consistent silt loam across the area.)

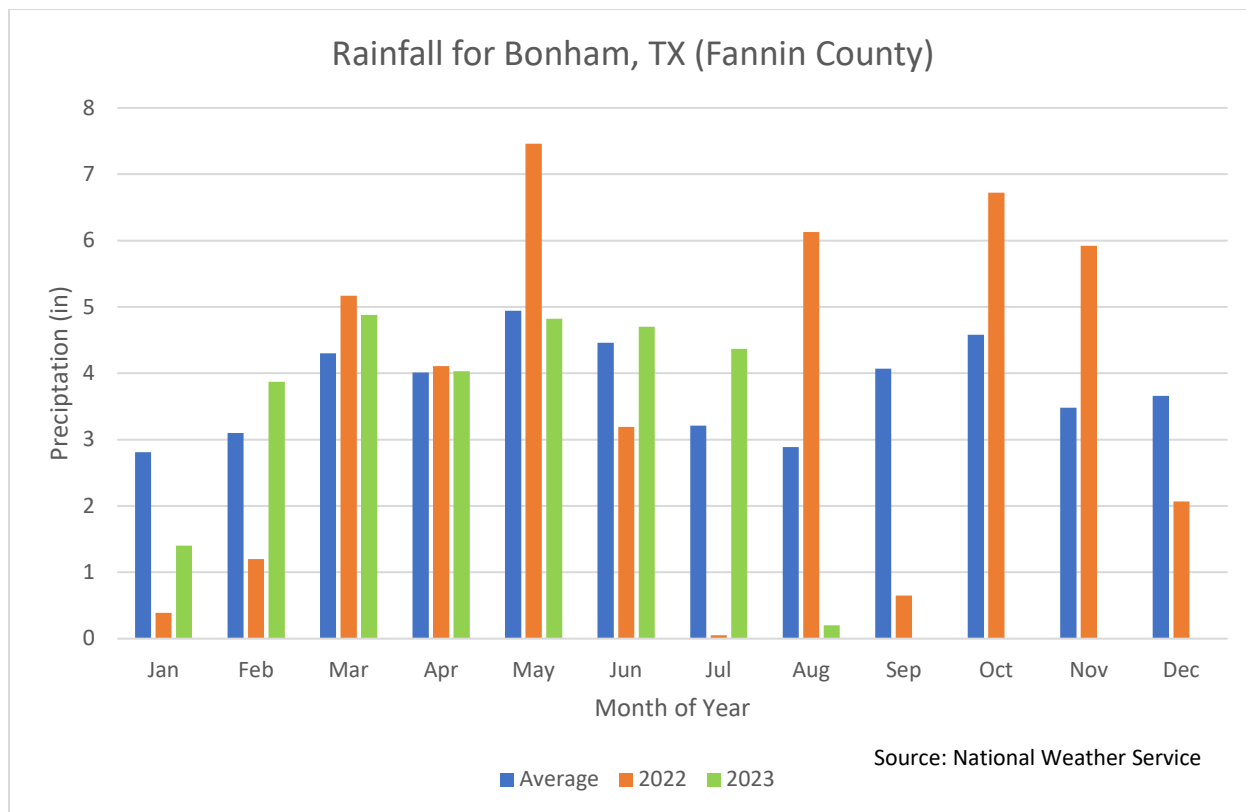


Figure 4. Rainfall data for Fannin County, TX for 2022 and 2023: 30-year averages and actual observed rainfall from the National Weather Service. Lack of summer rainfall likely contributed to extremely high control ratings across most treatments.

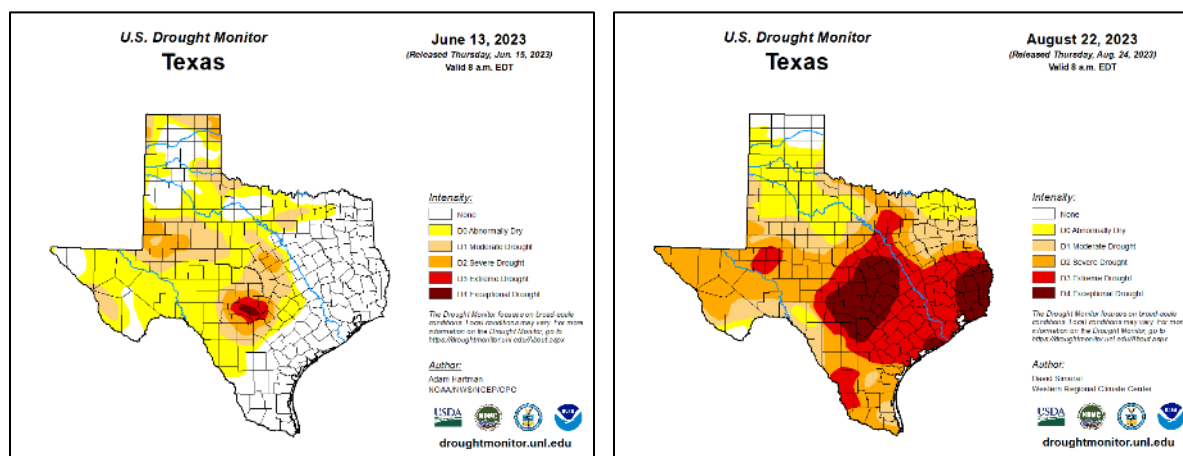


Figure 5. In June 2023, both Fannin and Van Zandt Counties were experiencing excellent growing conditions. By late August 2023, both counties were in D0 (Abnormally Dry) or D1 (Moderate Drought) and under associated county wide outdoor burning bans. Conditions became very drought stressed in mid and late summer 2023. Graphs from the US Drought Monitor.

The Van Zandt County study site (Figure 6) was established on June 12, 2023, at County Road 4414 (Tank Farm Road) in Colfax, Texas, 0.25 miles south of Interstate 20. The site was established common bermudagrass mixed with bahiagrass. The soils were a Bernaldo fine sandy loam, and a Woodtell loam, 1 to 3% slope.



Figure 6. Aerial photo of the Van Zandt County study site northeast of Colfax, TX.

Plant and pasture conditions at the time of application in June were good to excellent in terms of soil moisture and plant health (Figure 5). Weed species in the Van Zandt County treatment area included false ragweed (*Parthenium hysterophorus*), goatweed (*Croton capitatus*), milkweed (*Asclepias viridis*), blackberry (*Rubus* spp.), ironweed (*Vernonia baldwinii*), and dogfennel (*Eupatorium capillifolium*) (Figure 7).



Figure 7. Weed populations in Van Zandt County at the time of application.
(Photos by Clint Perkins)

Application details for study sites (Tables 1-2)

Table 1. Application information for Fannin County (Bonham, TX)

Timing	June	July
Date	June 22, 2023	July 6, 2023
Time	09:00	14:30
Air Temp	81 F	87 F
Relative Humidity	62 %	63 %
Wind	5-8 mph E	5-7 mph SE
Soil Temp at 6 inches	80 F	82 F
Goatweed	3-15 inches; vegetative and reproductive	4-24 inches; vegetative and reproductive

Table 2. Application information for Van Zandt County

Date	June 12, 2023
Time	10:45 am to 12:15 pm
Air Temp	82 F
RH	68 %
Wind	8 mph E
Soil Temp at 6 inches	79 F
GPA	18 GPA for ground, and 2 GPA for aerial drone
Weed size	4-12 inches tall

Application techniques for demonstration sites

Application system data (drone – Van Zandt County only)

- Aircraft manufacture and model DJI-T-40
- Rotor width: 9 ft
- Nozzle type: Rotary sprinkler nozzle (DJI, Figure 8)
- Swath width: 30 ft
- Pressure: 30 PSI
- Application speed: 22 MPH
- Plot size: 50 ft x 200 ft (0.23 acres)

Conventional application system (ground – both sites)

- Brand and model equipment used: Rozell 14' Boom Sprayer
- Nozzle type: AI11002 (Figure 9)
- Pressure: 40 PSI
- Plot size: 0.5 to 0.75 acres (Fannin); 0.14 acres (Van Zandt)

Applicators for the application techniques

- Aerial Drone Operator- Justin Easley
- Conventional Ground Spray Rig- Stephen Gowin



Figures 8-9. Droplet patterns for the aerial and ground applicators in Van Zandt County.

Herbicides applied to demonstration sites (Table 3)

Table 3. Herbicide component information for 2023 demonstration of pasture herbicides in Fannin and Van Zandt Counties.

Herbicide Trade Name	Components in Herbicide
DuraCor	Rinskor + Aminopyralid
Grazon PD3	Picloram + 2,4-D Choline
Chaparral	Aminopyralid + Mestsulfuron Methyl
GrazonNext HL	Aminopyralid + 2,4-D amine
DuraCor + 2,4-D amine	Rinskor + Aminopyralid + 2, 4-D amine
MezaVue	Aminopyralid + Picloram + Fluroxypyr
Remedy Ultra	Triclopyr BEE (Van Zandt County Only)

Herbicide treatment data for demonstration sites (Tables 4-5)

Table 4. Herbicide treatments, rates, and timings for the 2023 Fannin County pasture weed control demonstration.

Timing	Trt #	Herbicide Trade Name	Rate per Acre	Treated Area
June	1	DuraCor	16 fl oz	0.75 acre
June	2	Grazon PD3	20 fl oz	0.75 acre
June	3	Chaparral	2 oz	0.75 acre
June	4	GrazonNext HL	24 fl oz	0.75 acre
June	5	DuraCor + 2,4-D amine	14 fl oz + 12 fl oz	0.5 acre
June	6	MezaVue	18 fl oz	0.5 acre
Mowed	7			0.75 acre
July	1	DuraCor	16 fl oz	0.75 acre
July	2	Grazon PD3	20 fl oz	0.75 acre
July	3	GrazonNext HL	24 fl oz	0.75 acre
July	4	DuraCor + 2,4-D amine	14 + 12 fl oz	0.75 acre

Table 5. Treatments and rates for the herbicide applications with an aerial drone or conventional ground application at the Van Zandt demonstration, 2023.

App Type	Trt #	Herbicide Trade Name	Rate	Rate Unit
Drone	1	DuraCor	16	fl oz/A
Ground	2	DuraCor	16	fl oz/A
Drone	3	Grazon PD3	20	fl oz/A
Ground	4	Grazon PD3	20	fl oz/A
Drone	5	MezaVue	24	fl oz/A
Ground	6	MezaVue	24	fl oz/A
Drone	7	Chaparral	2.25	oz/A
Ground	8	Chaparral	2.25	oz/A
Drone	9	GrazonNext HL	24	fl oz/A
Ground	10	GrazonNext HL	24	fl oz/A
Drone	11	DuraCor + Remedy Ultra	16 + 8	fl oz/A
Ground	12	DuraCor + Remedy Ultra	16 + 8	fl oz/A

Herbicide efficacy evaluation

Simple % visual control of target species and % visual desirable grass phytotoxicity (if present) were recorded at monthly intervals post application. Three randomly selected areas of observation per treatment for broadleaves, or 3 transects of 100 plant live/dead counts for brush were evaluated and combined into a plot mean.

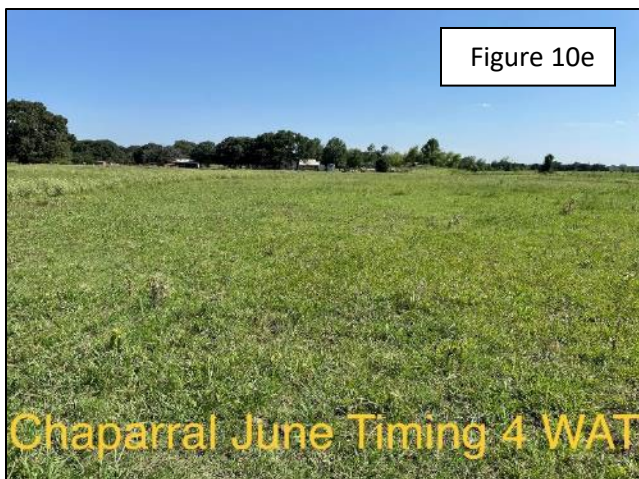
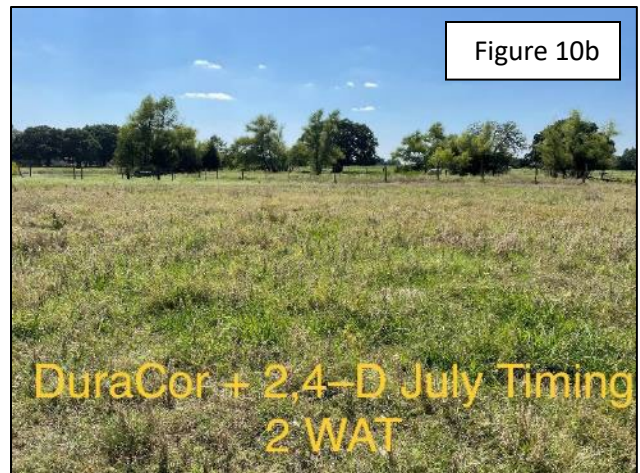
Results and Discussion (Fannin and Van Zandt Counties)

Herbicide efficacy on target weeds with all treatments, locations, timings, and application techniques was excellent (90% visual control or more), except for the mowing treatment at Fannin County, which resulted in initial weed knockdown on the day of application, but not long-term control (30% control 2 MAT; Table 6, Figure 10). Mowing early in July did not provide acceptable control of the annual weed populations – some weeds survived the mowing operation, and additional weeds emerged due to the lack of vegetative cover or residual herbicide.

Table 6. Mean plot efficacy (% visual control) of herbicide treatments for the control of goatweed and other weed species in bermudagrass pasture, Fannin County (MAT = Month after treatment; WAT = Weeks after treatment; GW = Goatweed).

Timing	Trt No	Herbicide Trade Name	GW Control 1 MAT 07/22/23	All Weed Control 1 MAT 07/22/23	GW Control 2 MAT 08/22/23	All Weed Control 2 MAT 08/22/23
June	1	DuraCor	95	90	99	99
June	2	Grazon PD3	98	95	99	98
June	3	Chaparral	95	95	99	98
June	4	GrazonNext HL	98	98	98	98
June	5	DuraCor + 2,4-D	98	95	95	95
June	6	MezaVue	98	95	95	95
Mowed	7		70	75	30	50
July	1	DuraCor	85	85	98	90
July	2	Grazon PD3	90	85	99	95
July	3	GrazonNext HL	90	90	99	98
July	4	DuraCor + 2,4-D	90	90	99	99

*MAT ratings for each timeframe will be at the MAT for June treatments and at -2 weeks for the July treatments (Ex. 1 MAT for June is 2 WAT for July treatments).





Figures 10a-i. Fannin County demonstration plot photos from 2-4 week after treatment (WAT) evaluation. Figures 10a to 10d represent July timing treatments at 2 weeks after treatment. Figures 10e to 10i represent the June timing treatments at 4 weeks after treatment. Figure 10i was mowed in early July 2023. By 3 WAT, weeds were beginning to reinvade the area. Some plants were newly emerged, while some plants were regrowth from mowed weeds.

Treatments with or without a 2,4-D component performed well on the target weed populations resulting in acceptable control at 1 and 2 MAT (Tables 6 and 7). Treatments in June and July provided similar efficacy on target weeds, even with the larger, more mature weed sizes (Table 6). Aerial drone applications at 2 GPA total spray volumes (Van Zandt County) performed similarly to the conventional ground applications on the target weed populations (Table 7). No phytotoxicity occurred with any of the treatments, therefore no data were collected on those parameters.

Table 7. Mean plot efficacy (% visual control) of herbicide treatments for the control of weed species in bermudagrass pasture Van Zandt County, TX (MAT = Month after treatment).

App Type	Trt #	Herbicide Trade Name	All Weed Control 1 MAT 07/12/23	All Weed Control 2 MAT 08/12/2023
Drone	1	DuraCor	95	99
Ground	2	DuraCor	99	99
Drone	3	Grazon PD3	99	99
Ground	4	Grazon PD3	98	99
Drone	5	MezaVue	99	99
Ground	6	MezaVue	99	99
Drone	7	Chaparral	99	99
Ground	8	Chaparral	99	99
Drone	9	GrazonNext HL	99	99
Ground	10	GrazonNext HL	99	99
Drone	11	DuraCor + Remedy Ultra	99	99
Ground	12	DuraCor + Remedy Ultra	99	99

Annual weed control of target weeds like goatweed, false ragweed, and bitter sneezeweed are historically difficult for the entire season. However, lack of summer rainfall in July and August, and extreme high temperatures resulted in no additional emergence of target weeds in any treatment except the Mowing treatment (Fannin) as of September 2023 (Figures 4 and 5). While these control ratings remained high in herbicide treatments, it should be noted that there were new plants that emerged earlier in the mowed treatment where no residual herbicide was present to prevent further germination.

Observations are continuing into fall 2023 and one year after application, to determine if there are additional emergence events of target weeds. Without additional rainfall, high efficacy ratings for all treatments will likely not change. Additional rainfall occurred in late October 2023, but additional emergence may not occur due to cold temperatures and shorter day length.

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