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Editor: Linda Chalker-Scott

Short, S.[1], Noland, R.[2], and Easterling, B.[3]

[1]County Extension Agent- Ag and Natural Resources, Texas A&M AgriLife Extension Service, Brady, Texas, 76825
[2]Extension Agronomy Specialist, Texas A&M AgriLife Extension Service, San Angelo, Texas, 76901
[3]Extension Agent- Integrated Pest Management, Texas A&M AgriLife Extension Service, Garden City, Texas, 79739

Herbicide Options for Weedy Perennial Mallow Species in Western Texas

Abstract

Various herbicide applications were evaluated for control of *Abuliton fruticosum* (Texas Indian mallow) and *Sphaeralcea angustifolia* (narrow-leaf globemallow) under field conditions at two different locations in Western Texas in 2023. Both trials were arranged as randomized complete block designs with three replications, and treatments included glyphosate, dicamba, 2,4-D, various combinations of these, and an untreated check (UTC), as well as picloram, triclopyr, fluroxypyr, and picloram + 2,4-D at the Indian mallow (non-cropland) site. Findings across both sites highlight a complete lack of control with glyphosate and glyphosate + dicamba which did not vary from the UTC, as well as reduced dicamba efficacy with the addition of glyphosate. 2,4-D + glyphosate achieved complete control of Indian mallow and was among the most effective treatments for globemallow along with dicamba and 2,4-D alone and in combination. This work helps explain the recently increasing weediness of these species, as

dicamba-glyphosate tank mixes have become a common component of herbicide weed management programs in cotton across the region. It also demonstrates potential for greater control with common cropland herbicides. Producers needing herbicide control of these species will need to determine which and when more effective products can be accommodated within their cropping systems.

Introduction

Certain mallow (Malvaceae) species native to West Central Texas have arisen as problematic perennial weeds in no-till and reduced tillage crop fields. These primarily include Texas Indian mallow (*Abutilon fruticosum* Guill. & Perr.) and narrow-leaf globemallow (*Sphaeralcea angustifolia* (Cav.) G. Don). These species are not typically considered weeds in native and managed rangeland ecosystems, as they are suitable forage for small ruminants including sheep, goats, and deer, provide pollinator habitat, and the seeds can be a valuable food source for birds (Linex, 2014). However, producers and crop industry professionals have reported difficulty managing these weeds once established in reduced tillage annual crop systems, generally cotton and wheat. Infested acreage and percent weed coverage vary widely among affected farms, but in severe cases, these weeds are persisting in high densities (Figure 1) across >40% of some fields.

In the absence of mechanical weed control, no-till and strip-till producers in this region rely heavily on herbicides for weed management. Pre-emergence residual herbicides may prevent new weeds from establishing but have no efficacy on perennial weeds once established. The most common post-emergence herbicides used for broadleaf weed control in these systems are glyphosate (in glyphosate-tolerant crops, or as a burndown during fallow periods) and dicamba (in XtendFlex cotton). Per grower reports, glyphosate alone and combinations of glyphosate and dicamba have provided little to no control of the target weed species. Other auxin herbicides including MCPE and 2,4-D are used in winter wheat, but typically when these mallow species are dormant and not actively growing. Metsulfuron-methyl (MSM) is also commonly used for in-season

broadleaf weed control in winter wheat, and post-harvest to keep fallow fields clean. Depending on the crop system in question, producers might also be able to use fluroxypyr, picloram, or triclopyr, although these products are more restrictive to specific crop or range and pasture systems. The only published work specific to globe mallow herbicide response pertains to imazapic use in rangelands (Owen et al., 2002), which is not a compatible herbicide in annual crop systems. Research is needed to determine whether common herbicides or combinations might provide sufficient control, as alternative management options would inevitably be more labor and/or tillage intensive.

Figure 1. Narrow-leaf globemallow in a no-till cotton field at the research site in Glasscock County.

The objective of this work was to 1) evaluate the efficacy of different herbicides and combinations relevant to regional cropping systems for Texas Indian mallow and narrow-leaf globemallow control.

Materials and Methods

Field trials were conducted in native populations of narrow-leaf globemallow and Texas Indian mallow in Glasscock and McCulloch Counties, respectively. The Glasscock County site was in an annual crop field, whereas the McCulloch County site was in a non-crop area. As such, the specific herbicides and rates tested varied between sites. In both trials, treatments were applied in a randomized complete block design with three replications.

The Glasscock County site was sprayed on July 22, 2023 with six treatments of the most commonly used products in cotton, compared to a UTC for a total of seven treatments (Table 1). Dicamba, 2,4-D, and glyphosate were applied both alone and tank mixed. Plots were 8-rows by 125 feet long with only the middle 4 rows being treated to prevent drift between plots. Applications were made using a self-propelled sprayer (LEE Spider, LeeAgra Inc., Lubbock, TX) at 12.0 GPA with 40 psi using TTJ60-02 nozzles.

The McCulloch County site was sprayed June 7, 2023 with 11 herbicide treatments plus an untreated check (UTC) for a total of 12 treatments (Table 2). Treatments were applied with a CO_2 pressurized backpack sprayer and a 3-nozzle hand boom on 20-inch spacing. TTI 8002 flat fan nozzles were used at 40 psi to deliver a 12 gallon per acre (GPA) spray volume. Texas Indian mallow plants were not uniformly distributed throughout the trial area, so individual plants were staked and treated as the experimental units.

At each site, control was rated as percent damage at 14 and 28 days after application (DAA). Control assessments were analyzed separately for each trial using mixed models in SAS 9.4 with treatment as a fixed effect and block as random. Treatment differences were identified at $\alpha = 0.05$ and model estimates were separated using Fisher's LSD.

Table 1. Herbicide treatments applied to narrow-leaf globemallow in Glasscock County, TX 2023.

Treatment	Product†	Rate	Unit
Glyphosate	glyphosate	32.0	oz/ac
	AMS	2.0	% v/v
Dicamba	dicamba	32.0	oz/ac
	NIS	2.0	% v/v
	AMS	2.0	% v/v
2,4-D	2,4-D	32.0	oz/ac
	NIS	2.0	% v/v
	AMS	2.0	% v/v
Dicamba + Glyphosate	dicamba	32.0	oz/ac
	glyphosate	32.0	oz/ac e
	NIS	2.0	% v/v
	AMS	2.0	% v/v
2,4-D + Glyphosate	2,4-D	32.0	oz/ac
	glyphosate	32.0	oz/ac
	NIS	2.0	% v/v
	AMS	2.0	% v/v
Dicamba + 2,4-D	dicamba	16.0	oz/ac
	2,4-D	16.0	oz/ac
	NIS	2.0	% v/v
	AMS	2.0‡	% v/v
UTC	Untreated	-	-

† dicamba, Xtendimax; 2,4-D, 2,4-D Amine; glyphosate, Roundup Powermax; NIS, LI700; AMS, ammonium sulfate.

‡ 2 % v/v AMS = 17 lb AMS / 100 gal.

Table 2. Herbicide treatments applied to Texas Indian mallow in McCulloch County, TX 2023.

Treatment Name	Ingredient†	Rate	Unit
Glyphosate 32	glyphosate	32	oz/ac
	AMS	2	% v/v
Glyphosate 64	glyphosate	64	oz/ac
	AMS	2	% v/v
Glyphosate + Dicamba	glyphosate	32	oz/ac
	AMS	2	% v/v
	dicamba	22	oz/ac
	surfactant blend	0.25	% v/v
Dicamba	dicamba	22	oz/ac
	surfactant blend	0.25	% v/v
Glyphosate + 2,4-D	glyphosate	32	oz/ac
	2,4-D	32	oz/ac
	AMS	2	% v/v
	NIS	0.25	% v/v
Glypohsate + 2,4-D + MSM	glyphosate	32	oz/ac
	2,4-D	32	oz/ac
	metsulfuron-methyl	0.2	oz/ac
	AMS	2	% v/v
	NIS	0.25	% v/v
2,4-D	2,4-D	32	oz/ac
	NIS	0.25	% v/v
Picloram	picloram	16	oz/ac
	NIS	0.5	% v/v
Triclopyr	triclopyr	16	oz/ac
	NIS	0.5	% v/v
Fluroxypyr	fluroxypyr	11	oz/ac
	NIS	0.5	% v/v
Picloram + 2,4-D	picloram	16	oz/ac
	2,4-D	32	oz/ac
	NIS	0.5	% v/v
UTC	Untreated	-	-

†Products used: glyphosate, Roundup Powermax; AMS, ammonium sulfate; dicamba, Xtendimax; surfactant blend, Smoke; 2,4-D, 2,4-D Amine; NIS, Induce; metsulfron-methyl, Patriot; picloram, Tordon 22K; triclopyr, Remedy; fluroxypyr, Staredown.

Results

Herbicide treatments affected weed damage and mortality in both trials ($P < 0.05$). At Glasscock County, dicamba, 2,4-D, and 2,4-D + glyphosate resulted in the greatest weed damage at 14 DAA (mean = 38.8% control) (Figure 2), with 2,4-D and 2,4-D + glyphosate resulting in greater control than all other treatments containing glyphosate as well as dicamba + 2,4-D. At 28 DAA, dicamba, 2,4-D, and 2,4-D + glyphosate resulted in greater control than glyphosate, dicamba + glyphosate, and the untreated check. At both assessment timings, the effects of glyphosate and dicamba + glyphosate were not different than the untreated check.

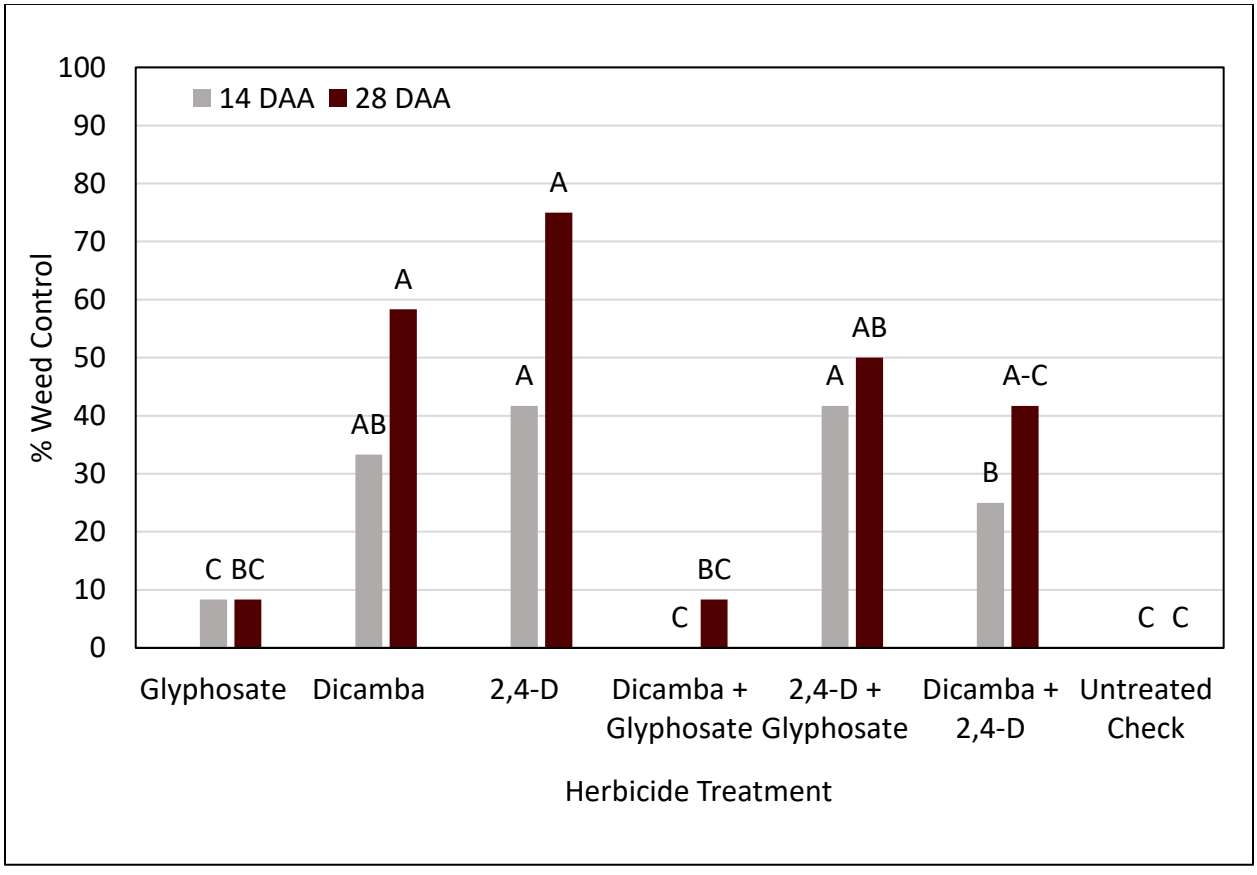

Figure 2. Herbicide treatment effects on narrow-leaf globemallow (*Sphaeralcea angustifolia* (Cav.) G. Don) control 14 and 28 days after application in Glasscock County, TX. Treatments applied 22 July 2023. *Within assessment timings, bars with the same letter are not statistically different ($\alpha = 0.05$).

In McCulloch County, treatments including both 2,4-D and glyphosate consistently resulted in greater control of Texas Indian mallow than all other treatments (Figure 3). Similar to the findings in Glasscock County, the effects of glyphosate and glyphosate + dicamba were not different than the untreated check, nor was picloram. Dicamba, 2,4-D, triclopyr, fluroxypyr and picloram + 2,4-D all resulted in intermediate control, greater than glyphosate and glyphosate + dicamba, but less than the glyphosate + 2,4-D treatments.

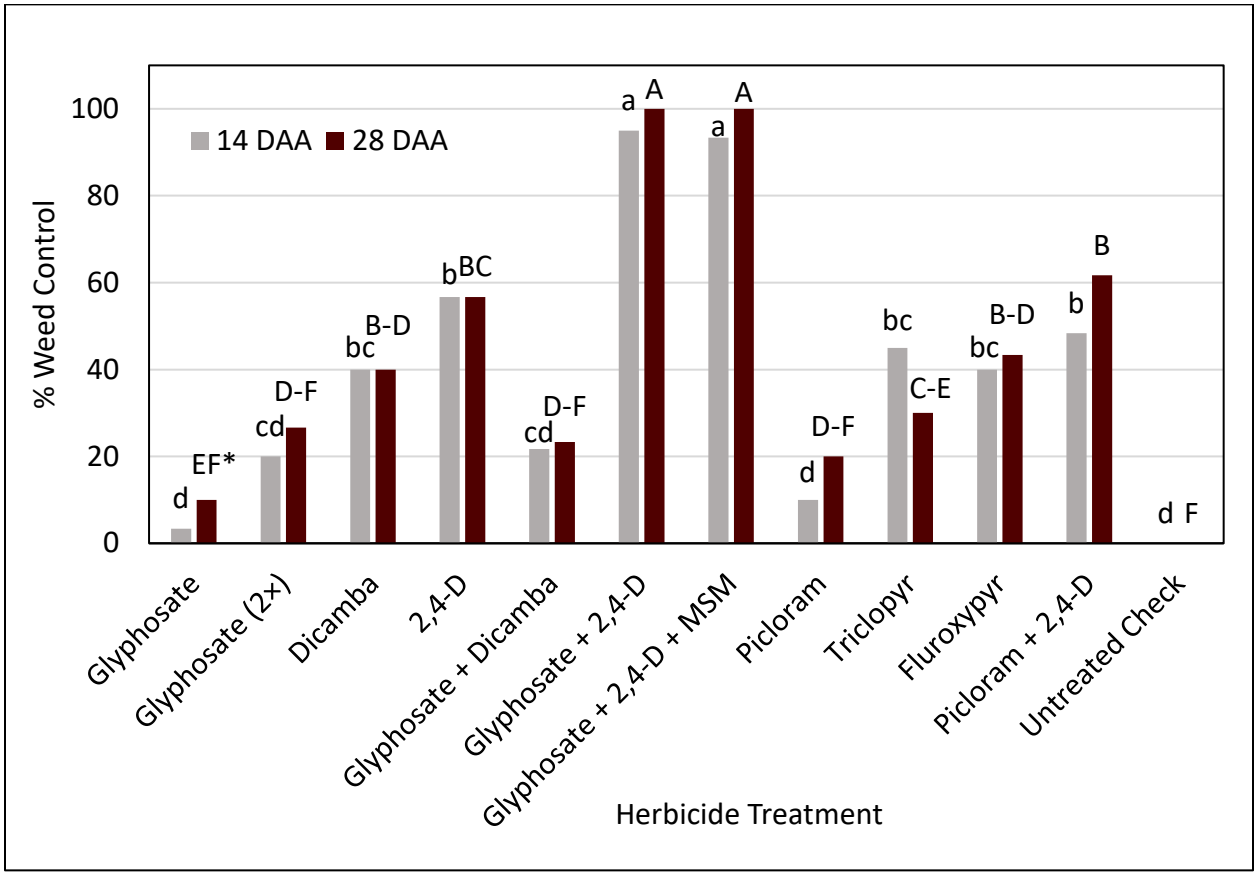

Figure 3. Herbicide treatment effects on Texas Indian Mallow (*Abutilon fruticosum* Guill. & Perr) control 14 and 28 days after application in McCulloch County, TX. Treatments applied 2023. *Within assessment timings, bars with the same letter are not statistically different (α = 0.05).

Discussion

Overall, the findings of this work validate local reports of poor efficacy from glyphosate and glyphosate + dicamba to control this group of weeds. Findings also highlight the lack of complete control with any product on narrow-leaf globe mallow, as the most effective treatment (2,4-D) ultimately achieved only 75% control. The success of 2,4-D + glyphosate tank mixes on Texas Indian mallow suggests synergistic or complimentary action between these herbicides for this species, as neither product performed as well alone. While the published literature lacks information regarding these species, Chorbadjian and Kogan (2022) also highlight a synergy between glyphosate and fluroxypyr (another auxin herbicide) in controlling an annual mallow weed species, cheeseweed (*M. parviflora* L.). Conversely, our findings at both sites suggest potential antagonism between glyphosate and dicamba, as dicamba alone consistently performed better than when mixed with glyphosate. This aligns with other reports of reduced efficacy of dicamba-glyphosate tank mixes in related species: velveltleaf (*Abutilon theophrasti*) (de Sanctis and Jhala, 2021) as well as other common weed species (Polli et al., 2022). This further aligns with the recent increase in these weed issues, as a large percentage of cotton acres in West Texas are routinely treated with dicamba-glyphosate tank mixes as the center of their herbicide program.

None of the range and pasture herbicides tested exhibited any notable benefit over the more common products with current cropland labels (Figure 3). Likewise, Indian mallow control was excellent with the 2,4-D + glyphosate combination whether metsulfuron-methyl was included or not. This simplicity is valuable regarding staying on label and reserves greater flexibility in crop rotation options, as metsulfuron-methyl and picloram have particularly long residual activity and lengthy crop rotation restrictions (Corteva Agriscience, 2020; FMC Corporation, 2001).

Conclusion

Herbicide control of perennial Malvaceae species is complicated by the inefficacy of glyphosate alone, as well as apparent tank-mix antagonism between glyphosate and dicamba. This necessitates accommodation of other herbicide options within cropping systems to achieve no-till control of these weeds. This work indicates that potentially useful herbicide options for narrow-leaf globemallow are 2,4-D and dicamba alone and in combination, as well as 2,4-D + glyphosate, whereas 2,4-D + glyphosate was the most effective option to control Texas Indian mallow. As metabolism and primary areas of growth in perennial plants vary seasonally, a logical next step to refine management recommendations may be to investigate timing of herbicide application as a factor. Crop species, growth stage, and rotation also influence opportunities and timing for herbicide application.

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