

Guayule Weed Management During Establishment in Arizona – September 2021

William B. McCloskey^{1,2}, Blase Evancho², Naomi Pier²

¹School of Plant Sciences, ²Cooperative Extension - University of Arizona

Guayule is a desert-adapted crop that is grown using agronomic practices like those used to grow cotton. Guayule seed is planted shallow in dry soil on beds and then irrigated to germinate the seed. Guayule seedlings are small and grow slowly making them poor competitors with weeds. Weeds must be actively managed for several months after planting until the crop canopy closes and guayule becomes very competitive against weeds.

There are currently four herbicides registered (24c SLN labels) for use on guayule in Arizona: the preemergence herbicide Prowl H2O®, and the postemergence herbicides Aim®, Fusilade® DX, and Gramoxone® (Table 1; website: cdms.net checked 9/28/21). The use of these few herbicides must be supplemented with cultural practices to successfully control weeds in guayule. Guayule should be planted in fields that are as free of weeds as possible and rotated with other crops to manage difficult-to-control weeds. Fields can be preirrigated to germinate weed seeds which can then be destroyed prior to planting guayule. Tillage and chemical burn-down treatments (e.g., glyphosate and some herbicides in Table 1) can be used to produce weed free beds or rows for planting.

Prowl H2O and Preemergence Weed Control

Using Prowl H2O (pendimethalin) preplant-incorporated before bed formation is crucial for successful weed control in furrow irrigated guayule fields. In sprinkler irrigated fields, Prowl H2O can be applied after planting and incorporated with water. The amount of Prowl H2O applied prior to planting needs to be adjusted depending on soil type; 2 pints/acre in sandy loam soils or 3 pints/acre in soils with more clay content. Preplant-incorporated rates above 2 pints/acre in sandy loam soils may result in plant loss and poor stand establishment. Guayule requires several irrigations at short intervals (e.g., every other day in a sandy loam soil) to germinate seeds and keep the seedlings hydrated. This frequent irrigation during establishment increases the degradation or inactivation of Prowl in the soil. Additional Prowl H2O will need to be applied 6 to 8 weeks after planting to help maintain weed control. After guayule is established, greater rates of Prowl H2O can be applied over-the-top of guayule, as a directed spray to the soil between rows, or applied in irrigation water (see labels and Table 1). If guayule is transplanted, greater rates of Prowl H2O can be applied before or after transplanting, but do not spray exposed roots. Prowl must be incorporated mechanically or with water (rainfall or irrigation) soon after application. Prowl can be applied multiple times per year as long as no more than 6.3 quarts is applied per year (Table 1).

Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the University of Arizona or the U.S. Department of Agriculture.

Aim 2 EC for Postemergence Broadleaf Weed Control

Guayule is not resistant to Aim (carfentrazone-ethyl), but it is tolerant to it after about the 4th true-leaf stage. **At this stage guayule will show damage from an Aim application (e.g., leaf necrosis), but will grow out of the damage while surrounding small weeds are completely killed.** Larger, more mature leaves of guayule are a gray-green color due the development of dense, silvery leaf hairs and a thick cuticle. This appears to be the basis of guayule tolerance to Aim at use rates of 1 to 2 fl. oz./acre (Table 1). Since Aim is a contact or “burn-down” herbicide, good scouting for weeds is essential so that weeds are sprayed when they are small. Aim herbicide requires the use of a surfactant to reduce the surface tension of water and improve spray droplet retention on leaf surfaces. Carrier volumes for Aim should be 20 gallons of water per acre or more depending on weed density. Appropriate nozzles (e.g., flat-fan nozzles) should be used to produce medium droplets to get good coverage of sprayed leaf surfaces. Sequential applications of Aim may be needed soon after planting to obtain adequate broadleaf weed control in newly planted guayule fields.

Leaf necrosis on 3.5 leaf guayule from Aim applied at a rate of 2fl.oz per acre.



Photo credit: William B. McCloskey, University of Arizona

Fusilade DX for Postemergence Grass Weed Control

Fusilade DX (fluazifop-P-butyl) is a systemic herbicide that can be applied to control weedy grasses in guayule fields and does not damage guayule seedlings at any growth stage. Fusilade DX should be applied to small weeds to ensure maximum efficacy like all postemergence herbicides. As with Aim, flat-fan nozzles and surfactants or methylated crop-oil-concentrates should be used to produce fine to medium spray droplets that will adhere to the more vertical leaf canopies of grass weeds. Repeat applications of Fusilade DX will be required to control perennial grass species (Table 1).

HERBICIDE APPLICATION STEWARDSHIP **Read and strictly adhere to all herbicide labels.**

Material based upon work supported in part by the Sustainable Bioeconomy for Arid Regions Center of Excellence Grant # 2017-68005-26867 and the U.S. Department of Agriculture National Institute of Food and Agriculture (USDA-NIFA) under the Crop Protection and Pest Management, Extension Implementation Program, grant # 2017-70006-27145.



Paraquat for Total Postemergence Weed Control

Gramoxone (paraquat dichloride) is a contact herbicide that is active on both grass and broadleaf weeds as well as guayule. If sprayed on guayule seedlings it will kill the seedlings. Paraquat can be used to control weeds between rows once guayule has grown to substantial size. Paraquat must be post-directed to the soil at the base of guayule plants and is best applied using a hooded sprayer to minimize spray contact with guayule foliage. A non-ionic surfactant should be added to paraquat to maximize foliar activity and weed control (Table 1).

Weed Control Tactics for Establishment

Guayule seeds and seedlings are very small, with low vigor and can easily be overwhelmed during seedling establishment. Planting in fields with few weed seeds in the soil will improve the survival of guayule seedlings. Other weed control tactics should include: Prowl H₂O applied preplant incorporated, Aim applied at the 4 true-leaf growth stage for broadleaf weed control, and Fusilade DX applications to control emerged grassy weeds. All foliar herbicides should be sprayed on actively growing weeds that are not stressed due to lack of water, temperature extremes, or mechanical or chemical injury. Depending on the size of the guayule, it may be possible and desirable to cultivate for weed control and then apply additional Prowl H₂O (followed by an irrigation for incorporation). Second applications of Aim or Fusilade may be needed to control to emerged weeds and it may be necessary to hand weed a field to remove large weeds not controlled by the previous tactics. After guayule canopies close in the seed-line, chemical sprays should be post-directed to the base of the guayule plants.

A hooded or shielded sprayer with gauge wheels for control of nozzle height and position will allow more accurate herbicide applications. In larger guayule, a single drop-tube between rows with a single nozzle or double swivel with two nozzles can be used to post-direct herbicides onto small weeds.

Where is the guayule!?! Hint, it is circled in red. Direct seeding presents with many weed control challenges.



Photo credit: William B. McCloskey, University of Arizona

Table 1. Herbicides registered for use in guayule. The user is responsible for understanding information on the section 3 and 24c SLN labels of these products. Treated guayule cannot be used for food or feed for human or animal consumption. Do not feed, forage or graze livestock in treated areas.

Trade name (common name)	Herbicide Group #	Foliar activity /movement	Rate Product (lb ai/acre)	Maximum amount per year	Spray vol. (GPA)	Spray Adjuvants	Pre-harvest Interval (PHI)	Plant back restrictions	Weeds Controlled	Application notes
Prowl H₂O (pendimethalin)	3	No	Preplant: 2 to 3 pt. (0.95 to 1.4) Established: 2 to 4 qt. (1.9 to 2.8)	6.3 quarts (6 lb a.i.)	≥20	None	None listed	24 mo.	Preemergence herbicide. Grasses, certain small seeded broadleaves. Will not control emerged weeds.	-Apply preplant-incorporated in furrow or drip irrigated systems; if sprinkler irrigating, Prowl H ₂ O can be applied after seeding but before irrigation. -Direct spray to the ground beneath shrubs; contact with shoots may cause malformed plant tissues. -If transplanting, apply higher rates prior to or after transplanting; do not spray exposed roots; incorporate with rainfall or irrigation soon after application.
Aim EC (carfentrazone-ethyl)	14	Yes, contact	1 - 2 fl. oz (0.016 - 0.031 lb)	7.9 fl. oz. (0.124 lb a.i.)	≥20	NIS 0.25% v/v	3 days	None for registered crops; see label	Annual broadleaf weed < 4" in height or rosettes < 3" in diameter. Will not control grasses	-Scouting for weeds is critical – only small weeds will be controlled. -Thorough spray coverage is required for weed control. -Leaf speckling (necrosis) will occur, but no crop loss is expected in healthy stands. -Sequential applications must be at least 14 days apart.
Gramoxone 2.0 SL (paraquat dichloride)	22	Yes, contact	2 - 4 pts (0.5 - 1 lb)	Not specified on label, no more than 5 appl.	≥20	NIS 0.25% v/v	4 days	None	Annual broadleaf and grass weed, spray when weeds are 1" to 3" in size, do not spray weeds > 6" in size	-Can be used preemergence to guayule and postemergence as a directed spray in established plantings; do not allow spray to contact green stems or foliage as injury will result. -Thorough spray coverage is required for weed control. -Can also be used to desiccate guayule to facilitate harvest. Do not exceed 5 applications per year.
Fusilade DX (fluzifop-P-butyl)	1	Yes, systemic	16 - 24 fl oz (0.25 – 0.375 lb)	72 fl. oz. (1 lb)	10 – 40	COC 1% v/v; NIS 0.5% v/v	None listed	60 days for grass crops	Annual grasses (2"-8" tall) and perennial grass weeds (see label); perennials require repeat treatment	-Apply within 7 days of irrigating for best results. -Antagonism by some other herbicides can occur if they are applied 5 days before or after Fusilade application. -Apply to actively growing grasses not stressed by lack of water, temperature extremes or mechanical or chemical stress.