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Puncturevine *(Tribulus terrestris)* Identification and Management for Gardens, Lawn, and Pasture

Other common names: bullhead, burnut, caltrop, goathead, mexican sandbur, puncture weed, tackweed, and texas sandbur.

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Quick Facts

- The genus name *Tribulus*, translates to *caltrop*, a weapon made of spikes.
- On average seeds remain viable in the soil for 7 years.
- A single plant may produce 200-5,000 seeds.

Introduction

Puncturevine is a prostrate-growing annual plant that is particularly undesirable because it produces a spiny fruit that can injure animals and flatten tires. It can also be toxic to livestock and is difficult to control due to continual germination throughout the summer.

Figure 1. Underside of puncturevine hairy leaflets, stems, and fruit.

Identification

Plants grow as prostrate spreading mats that are usually 1 to 3 feet in diameter, but can grow much larger. Stems are branched, but originate from a single crown. Plant crowns are rooted to the ground by a single taproot. Leaves are arranged opposite of each other on the stems. Leaves are comprised of four to eight pairs of hairy leaflets.

Flowers are small (⅓ to ½ inch diameter), originate at leaf nodes (axials), and have five yellow petals.

Figure 2. Yellow puncturevine flowers grow on the node in between leaf pairs.

Fruits (goatheads) are common by July but can be present as early as late May. Once dry, each fruit divides into five woody burrs. Each burr has 2 to 4 prominent spikes arranged so that one spike points upward regardless of orientation. Puncturevine is commonly found in bare, well-drained to dry soils (Nikolova & Vassilev, 2011).

Life Cycle and Biology

Puncturevine is an annual plant; i.e., during one year the seeds germinate, develop, flower, set fruit, and die. It originates from warm, dry regions of Eurasia, specifically the Mediterranean. The plant is well adapted to compact, dry soil and has exceptional drought tolerance. While adapted to heat and drought, puncturevine does not do well in shaded areas or compete with taller plants (Nikolova & Vassilev, 2011).

Plants can flower 3 weeks after emergence and produce seeds by week 6.

Burrs are well adapted to dispersal by piercing skin and hooves of animals and entanglement in fur (Wilen, 2006). Additionally, the burrs are also well suited to dispersal via unsuspecting humans. Burrs often embed into tires, shoes, and equipment, facilitating the infestation of new areas.

Since its introduction to North America, puncturevine has colonized most of the continental United States.

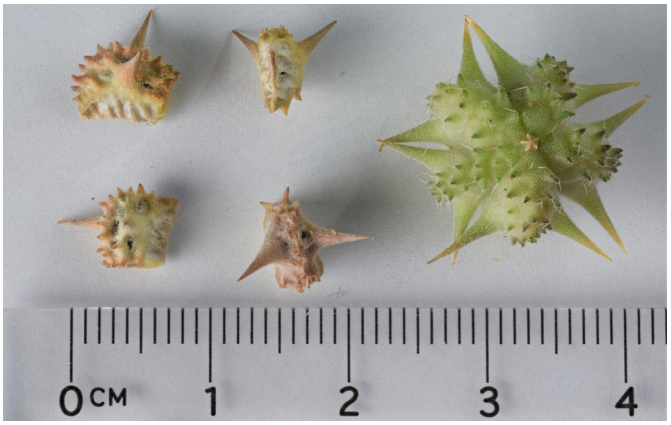

Figure 3. Puncturevine fruits (burrs) viewed from various angles.

Impacts

Puncturevine can cause minor to severe economic losses. Burrs cause injury to pets, livestock, and humans. It also degrades wool quality, deflates tires, and reduces crop yields. Grazing puncturevine is not recommended as it can be toxic to livestock (Wilen, 2006).

In Utah, puncturevine is a Class lll noxious weed (Lowry et al., 2017). Class lll noxious weeds are well established and widespread throughout the state. Control efforts for Class lll weeds are designed to contain populations as well as prevent their spread. Puncturevine should not be cultivated, bought, or sold in Utah.

Preventive and Cultural Control Methods

Prevention is always the preferred method to control noxious weeds. Puncturevine infestations can be prevented with the following practices.

Stop introduction. When choosing fill material, topsoil, and compost, ensure that the source of the material is clean and free of weeds. Upon leaving areas infested with puncturevine, carefully clean equipment, tools, and footwear.

Cover bare soil. Use mulch or weed fabric to block germination and seedling development. Planting competitive crops will prevent puncturevine establishment and can act as a living mulch.

Maintain healthy plant cover. Healthy lawns and pastures outcompete puncturevine. In contrast, short, sparse lawns and pastures may allow for puncturevine establishment. Maintain a dense, well-fertilized lawn at 2½ to 3 inches. Pastures should not be grazed below 4 inches.

Biocontrol and Mechanical Control Methods

Biocontrol is the process of introducing a natural predator to control a given pest. There are two species available for the biocontrol of puncturevine. The seed weevil (*Microlarinus lareynii*) and the stem weevil (*M. lypriformis*) were introduced to the United States from Eurasia (India, Italy, and France). Together, *M. lareynii* and *M. lypriformis* have been proven as an effective method for reducing puncturevine density (Huffaker, Hamai, & Nowierski, 1983). Weevils used for puncturevine biocontrol have not been documented to survive over winter in colder climates including the Wasatch Front.

Mechanical removal is accomplished by pulling, hoeing, cultivation, or tillage. It is best to do this when plants are young and haven't set seed.

Seedlings will continue to emerge throughout the growing season and should be removed every 2 to 3 weeks or as needed. A small amount of water applied to the seedbed can induce additional germination. For larger plants, cutting the taproot and gathering the branches toward the center into a ball can remove large numbers of seeds still attached to the plant. For burrs on the ground, many of the burrs can be collected by dragging a carpet, or rolling old pumpkins through the area. Vacuuming burrs is highly effective on smaller sites (Whitesides, 2012).

Biocontrol and mechanical control methods are summarized in Table 1.

Figure 4. Puncturevine seedling emerging from the soil.

Chemical Control Methods

Chemical controls are the application of chemicals known as herbicides to infested areas where appropriate. Herbicides are an effective way to kill or prevent puncturevine. The location and the herbicide label will determine which herbicides should or should not be used. Be aware of surroundings (e.g., open water), temperature, and wind when applying chemical control. Since puncturevine germination and growth occur during warm weather, particular attention should be given to temperature restrictions on herbicide labels to avoid potential volatilization (vapor drift) and injury to desirable plants. Always read and follow the directions on the label.

Preemergence herbicides prevent weeds; i.e., prevent seedlings from establishing. These herbicides are usually non-selective and prevent most annual plants from establishing. They are most useful to control puncturevine in perennial desirable plants and in bare ground settings.

Postemergence selective herbicides will kill actively growing plants of a targeted class of plants. Selective herbicides work well when puncturevine is growing in grass lawns and pastures. They also can be used in many non-crop settings.

Postemergence non-selective herbicides kill most or all actively growing plants, regardless of plant classification. Non-selective herbicides are useful in areas where desirable plants are absent, e.g., sidewalks or patios

Chemical control options are summarized in Table 2.

Table 1. Summary of non-herbicide options.

Control Method	Notes
Prevention	• Keep puncturevine seeds from entering your property. • Only buy clean fill, mulch, and compost • Clean equipment, tools, and footwear.
Mulching	• Suppress puncturevine germination by covering bare soil. • Works well for long term control. • Works well in flower beds and other small spaces. • It can be cost-prohibitive and difficult to maintain for larger spaces.
Competition (maintaining plant cover)	• Cultivate desirable plants to compete with puncturevine. • Select desirable plants adapted for the location. • Choose desirable plants that can establish and grow before puncturevine begins to germinate.
Hoeing, Tilling, and Cultivation	• Remove puncturevine plants before fruits form. • Continue to remove plants as new seedlings appear. • Gather and discard plants that produce burrs.
Biocontrol	• Introduce weevils that feed on stems and/or seeds. • Only reduces densities and control is highly variable. • It is difficult to establish sustaining populations in Utah.

Table 2. Summary of herbicide options.			
Location	**Preemergence**	**Postemergence (Selective)**	**Postemergence (Non-selective)**
Lawn/Pasture	Yes[1] (Many)	Yes (Many)	No
Garden/Flowerbeds	Yes[1] (Many)	Yes (Few: crop specific)	Yes (glyphosate or pelargonic acid applied selectively)
Pavement	No	Yes (Many)	Yes[1] (Many)
Parking lots, roadsides, and trails	Yes[1] (Many)	Yes[2] (Many)	Yes[1] (Many)
Notes	[1] Non-selective herbicide. Do NOT apply near desirable plants. [2] Selective herbicide, but can kill desirable plants. Do Not apply on desirable plants.		

References

Huffaker, C. B., Hamai, J., & Nowierski, R. M. (1983). Biological control of puncturevine, *Tribulus terrestris* in California after twenty years of activity of introduced weevils. Entomophaga, 28(4), 387-400. doi:10.1007/bf02372193

Lowry, Brenda Jarvis; Ransom, Corey; Whitesides, Ralph; and Olsen, Heather, "Noxious Weed Field Guide for Utah" (2017). All Current Publications. Paper 1352. https://digitalcommons.usu.edu/extension_curall/1352

Nikolova, A., & Vassilev, A. (2011). A STUDY ON *Tribulus terrestris* L. ANATOMY and ECOLOGICAL adapt. Biotechnology & Biotechnological Equipment, 25(2), 2369-2372. doi:10.5504/BBEQ.2011.0032

Whitesides, R. (2012, May 16). How to Take the Bite Out of Puncturevine. Retrieved March 20, 2019, from https://extension.usu.edu/archive/how-to-take-the-bite-out-of-puncturvine

Wilen, C. A. (2006, March). Puncturevine. Retrieved March 20, 2019, from http://ipm.ucanr.edu/PMG/PESTNOTES/pn74128.html

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