



Puncturevine

Tribulus terrestris

Other names: Tackweed, Puncture weed, Mexican sandbur, Texas sandbur Burnut, Goathead, Caltrop, Bullhead

INTRODUCTION

A native of the southern Europe and Mediterranean region, puncturevine was first found in the Pacific Northwest in gravel along railroad tracks at Wawawai, Whitman County, Washington in 1924. This plant likes to hitch rides. Human activity has introduced and spread the plant into the United States and Pacific Northwest. Puncturevine fruits resemble the caltrop, a metal device placed on the ground with one spike up to slow advancing armies in medieval warfare. This weed is a member of a small genus composed of about 12 species in the Caltrop family (Zygophyllaceae), native to both warm and temperate regions. The genus name derives from the Latin word *tribo*, "to tear," which refers to the spiny fruits.

This weed injures the feet, hides, mouths, eyes, and digestive tracts of livestock. Puncturevine foliage may contain levels of nitrate toxic enough to poison livestock. Some researchers have also connected a toxin produced in puncturevine to photosensitization in sheep that leads to bighead. Damage occurs to the sheep's liver, which then cannot filter chlorophyll or a derivative of chlorophyll, phylloerythrine. These substances enter the

blood and are carried in the blood to skin cells, sensitizing them to sunlight. Photosensitization symptoms appear on the lips, ears, and around the eyes, followed by swelling of the head.

Puncturevine grows well in dry, loose, sandy soils, and prospers near sand dunes or loose blown soil at the margins of fields. It also grows in heavier soils, especially if they are fertile and moist, or on compacted soils, such as those found on roadsides or in playgrounds. Puncturevine is seldom a serious weed in intensively cropped fields. However, the burs can be difficult to remove from the seed when present in crops such as lima beans or peas. Puncturevine can be a serious

problem in perennial crops, such as asparagus, tree and vine crops. The stiff, sharp spines are a nuisance on bare ground sites, such as road shoulders, railroad rights-of-way, school grounds, barn lots, and areas normally used for parking and storage. The spines can injure people and pets, and can puncture bicycle tires and inflated balls.

IDENTIFICATION

Stems are green to reddish or brownish, pubescent, and may extend to 10 feet and radiate from a central axis. Although normally prostrate, puncturevine may grow almost upright in dense crop stands. Cotyledon leaves are elliptical-shaped and have a main midrib. The com-



Puncturevine foliage and flowers.

pound leaves are opposite and are divided into five to eight pairs of pubescent leaflets, each about $\frac{1}{4}$ to $\frac{1}{2}$ inch long and oval. Yellow flowers are $\frac{1}{3}$ to $\frac{1}{2}$ inch wide with five petals borne in the leaf axils. Fruits consist of five wedge shaped segments or burs, each with two short spines $\frac{1}{5}$ to $\frac{1}{3}$ inch long and numerous smaller prickles.

BIOLOGY

Puncturevine is a summer annual plant. The plant has a deep, somewhat woody taproot, which obtains moisture for growth under conditions unfavorable for most other plants. Puncturevine requires less water than many other plants. In a Texas study, puncturevine used 158 pounds of water to produce 1 pound of dry matter; sorghum and alfalfa used about 300 and 840 pounds of water, respectively, for the same rate of production.

Puncturevine reproduces from seeds formed in woody, spiny

fruits with five segments that split when mature. Each segment, or bur, contains one to four seeds separated by the same woody tissue found in the outer walls of the fruit. The seed nearest the pointed end of the bur is the largest and usually sprouts first. The other seeds germinate in order of their position in the bur when conditions are right. Although not considered a prolific seed producer, a plant growing by itself without competition may produce over a million seeds. In California, one plant produced 576,000 fruits. Assuming these fruits contained an average of two seeds per segment, the plant could have produced 1,152,000 seeds.

The spiny fruit segments facilitate seed spread. Large and small seed spines are arranged at different angles, so that no matter how the seed falls, at least one spine points upward to meet the unwary foot, hoof, or vehicle tire. The sharp spines easily penetrate leather, rubber

tires, skin, or other surfaces, and may be transported some distance before being knocked or picked off. Usually reported first near agricultural communities or railroad yards, the weed is often found in hay, straw, or manure. Seeds have probably crossed oceans in the wool of European sheep. Puncturevine is one of the few weeds spread by aircraft. The first infestations in some areas occur in airport runway cracks, where seeds were brushed from aircraft tires.

In the field, germination starts during warm spring weather and continues until frost. Seedlings tend to emerge in flushes following rainfall or irrigation. New seed is mostly dormant, and less than 10% will germinate the year after production. Flowers appear as early as three weeks after germination, and fruits with viable seed appear one to two weeks later. Puncturevine does not readily emerge from soil depths greater than 2 inches.



Puncturevine bur, leaves, and stem.



Puncturevine bur.

CONTROL

The best method of controlling puncturevine is to prevent establishment by destroying the first plants found in an area before burs begin to form. If green burs carrying seed are present, dispose of the plants properly, preferably by burning.

Puncturevine grows best along field borders and roadsides where plant competition is often limited. To discourage puncturevine infestation, plant a desirable grass along field borders and leave the grass undisturbed. If puncturevine is present in these areas, a selective herbicide such as 2,4-D can be used until the grass can fill in. Puncturevine can be controlled with mulches in ornamental plantings, orchards, vineyards, vegetable crops, and gardens, if all light is screened out. To be effective, organic mulches should be at least 3 inches thick. However, puncturevine burs that fall onto mulch surfaces may be able to establish on that surface. Synthetic mulches screen out light and provide a physical barrier to seedling development, and can also work well.

Chemical Control

Puncturevine plants are easily controlled by hoeing, by shallow tillage, or by use of contact herbicides, such as paraquat (Gramoxone), bromoxynil (Buctril), oxyfluorfen (Goal), and carfentrazone (Aim) or translocated herbicides, such as 2,4-D, MCPA, dicamba (Banvel or Clarity), MSMA, imazapic (Plateau), imazamox (Raptor or



Puncturevine fruits with extracted seeds.



Puncturevine infesting an asparagus field margin.

Beyond), imazethapyr (Pursuit), and glyphosate (Roundup and other glyphosate products). Seedlings emerge during the growing season as long as water is available via precipitation or irrigation. If the herbicide does not have soil persistence, additional applications will be necessary to control seedlings after each rainfall or irrigation event.

Soil-applied herbicides that may prevent puncturevine establishment are bromacil (Hyvar), oxyfluorfen (Goal), norflurazon (Solicam), atrazine (AAtrex), pendimethalin (Prowl), chlorsulfuron (Telar), imazapyr (Arsenal or Habitat), and dichlobenil (Casoron). Consult the herbicide label for use instructions on specific crops and

sites. Timing the application is important for effective control. Apply soil residual herbicides for bare ground treatment in the late fall or early spring when rainfall can move the chemical into the soil. Too much moisture may leach the herbicide below the germinating seedlings, preventing control. Make spring applications of residual herbicides in February or early March, unless mechanical incorporation or sprinkler irrigation is available to move the herbicides into the soil. A single herbicide application rarely provides season-long control.

Products suitable for use by homeowners include diquat, glufosinate, glyphosate, and oryzalin (for landscaped areas); 2,4-D (for turf areas); and diquat and glyphosate (for bare ground areas). Consult the herbicide label for use instructions for specific sites around the home.

Biological Control

Two species of weevils were introduced into the United States for puncturevine control in 1961. Larvae of *Microlarinus lareynii* attack the seed, and larvae of *M. lypriformis* attack plant stems. Together they

provide effective puncturevine control over large areas of the southwestern United States. The seed weevil was introduced into Oregon in 1963, but did not become established. Both species were reintroduced in Jackson, Wheeler, Malheur, Grant, and Wallowa counties in Oregon in 1983. A thriving population was documented once at one of these sites in Jackson County. Both species are common in the Umatilla-Hermiston area in Umatilla County. Similar weevil release programs in Washington and Idaho have failed to establish the insects.

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Use pesticides with care. Apply them only to plants, animals, or sites listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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