

Tribulus terrestris

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Tribulus terrestris is a flowering plant in the family Zygophyllaceae, native to warm temperate and tropical regions of the Old World in southern Europe, southern Asia, throughout Africa, and Australia.^[2] It can thrive even in desert climates and poor soil. Like many weedy species, this plant has many common names, including **puncturevine**, **caltrop**, **cathead**, **yellow vine**, **goathead**, **burra gokharu** and **bindii**.^{[1][3]}

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Growth

Tribulus terrestris



Leaves and flower

Scientific classification

Kingdom: Plantae
 Division: Magnoliophyta
 Class: Magnoliopsida
 Order: Zygophyllales
 Family: Zygophyllaceae
 Genus: *Tribulus*
 Species: ***T. terrestris***

Binomial name

Tribulus terrestris
 L.^[1]

Varieties

- *Tribulus terrestris* var. *bicornutus*
- *Tribulus terrestris* var. *inermis*
- *Tribulus terrestris* var. *robustus*
- *Tribulus terrestris* var. *terrestris*

It is a taprooted herbaceous perennial plant that grows as a summer annual in colder climates. The stems radiate from the crown to a diameter of about 10 cm to over 1 m, often branching. They are usually prostrate, forming flat patches, though they may grow more upwards in shade or among taller plants. The leaves are pinnately compound with leaflets less than a quarter-inch long. The flowers are 4–10 mm wide, with five lemon-yellow petals. A week after each flower blooms, it is followed by a fruit that easily falls apart into four or five single-seeded nutlets. The nutlets or "seeds" are hard and bear two to three sharp spines, 10 mm long and 4–6 mm broad point-to-point. These nutlets strikingly resemble goats' or bulls' heads; the "horns" are sharp enough to puncture bicycle tires and to cause painful injury to bare feet.



"Goathead" fruit

Etymology

The Latin name *tribulus* originally meant the caltrop (a spiky weapon), but in Classical times already meant this plant as well.^[4]

Cultivation and uses

The plant is widely naturalised in the Americas and also in Australia south of its native range. In some states in the United States, it is considered a noxious weed and an invasive species.^[5]

It has been reported that the seeds or nutlets have been used in homicidal weapons in southern Africa; murderers smear them with the poisonous juice of *Acokanthera venenata* and put them where victims are likely to step.^[6]

Dietary supplement

T. terrestris is now being promoted as a booster for the purpose of increasing sex drive. Its use for this purpose originated in Eastern Europe in the 1970s. It was popularized in America by 1970s strongman Jeffrey Petermann. Independent studies^[7] have suggested that *Tribulus terrestris* extract slightly increases hormone levels, though leaving them in the normal range.

The extract is claimed to increase the body's natural testosterone levels and thereby improve male sexual performance and help build muscle. *T. terrestris* has consistently failed to increase testosterone levels in controlled studies.^{[8][9][10]} It has also failed to demonstrate strength-enhancing properties.^[11] However, many supplement brands have sold products that combine various herbs with *T. terrestris*, with debatable effects.

Tribulus has been shown to enhance sexual behaviour in an animal model.^[12] It appears to do so by stimulating androgen receptors in the brain.

Some body builders use *T. terrestris* as post cycle therapy or "PCT". After they have completed an anabolic-steroid cycle, they use it under the assumption that it will restore the body's natural testosterone levels.

Medicinal uses

In traditional Chinese medicine *Tribulus terrestris* is known under the name bai ji li (白蒺藜).

Tribulus terrestris has long been a constituent in tonics in Indian ayurveda practice, where it is known by its



Thumbtack-like *Tribulus terrestris* nutlets are a hazard to bicycle tires.

Sanskrit name, "*gokshura*."^[13] It is also used as an aphrodisiac, diuretic and nervine in Ayurveda, and in Unani, another medical system of India.

Animal studies in rats, rabbits and primates have demonstrated that administration of *Tribulus terrestris* extract can produce statistically significant increases in levels of testosterone, dihydrotestosterone and dehydroepiandrosterone,^[14] and produces effects suggestive of aphrodisiac activity.^[15] On the other hand, one recent study found that *T. terrestris* caused no increase in testosterone or LH in young men,^[16] and another found that a commercial supplement containing androstenedione and herbal extracts, including *T. terrestris*, was no more effective at raising testosterone levels than androstenedione alone.^[17]

The active chemical in *T. terrestris* is likely to be protodioscin (PTN),^[18] a cousin to DHEA. In a study with mice, *Tribulus* was shown to enhance mounting activity and erection better than testosterone cypionate.^[citation needed] This however, is not as convincing as one might think. Although an OTC supplement outpacing a pharmaceutical is big news, testosterone cypionate is a synthetic ester of testosterone engineered for its longer activity. To be effective, its level must build up in the system of the animal using it. This process usually takes 2–3 weeks. *National Institutes of Health* (<http://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?id=2268>) , <http://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?id=2268>, retrieved November 15, 2007 The proerectile aphrodisiac properties were concluded to likely be due to the release of nitric oxide from the nerve endings innervating the corpus cavernosum penis.

Adverse effects from supplementation with *Tribulus terrestris* are rare and tend to be insignificant. However, some users report an upset stomach, which can usually be counteracted by taking it with food.^[7] Another rare side effect which has been reported is gynaecomastia,^[19] which while potentially problematic does tend to support the purported androgenic-anabolic effects of this plant.

Eradication

Where this is a non-indigenous species eradication methods are often sought after. There are both biological and herbicidal solutions to the problem but neither of them provide a quick long lasting solution because *T. terrestris* seeds remain viable for up to 3–7 years on average.

Physical

In smaller areas puncture vine is best controlled with manual removal using a hoe to cut the plant off at its taproot. This requires monitoring the area and removing the weed throughout the preseedling time (late spring and early summer in many temperate areas). This will greatly reduce the prevalence of the weed the following year. Mowing is not an effective method of eradication because the plant grows flat against the ground.

Another avenue of physical eradication is to crowd out the opportunistic weed by providing good competition from favorable plants. Aerating compacted sites and planting competitive desirable plants including broad-leaved grasses such as St Augustine can reduce the impact of puncture vine by reducing resources available to the weed.

Chemical

Chemical control is generally recommended for home control of puncture vine. There are few preemergent herbicides that are effective. Products containing oryzalin, benefin, or trifluralin will provide partial control of germinating seeds. These must be applied prior to germination (late winter to midspring).



Typical habit of *Tribulus terrestris*

After plants have emerged from the soil (postemergent), products containing 2,4-Dichlorophenoxyacetic acid ("2,4-D"), glyphosate, and dicamba are effective on puncture vine. Like most postemergents they are more effectively maintained when caught small and young. Dicamba and 2,4-D will cause harm to most broad-leaved plants so the user should take care to avoid over-application. They can be applied to lawns without injuring the desired grass. Glyphosate will kill or injure most plants so it should only be used as spot treatments or on solid stands of the weed.

Biological

Two weevils, *Microlarinus lareynii* and *M. lypriformis*, native to India, France, and Italy, were introduced into the United States as biocontrol agents in 1961. Both species of weevils are available for purchase from biological suppliers but purchase and release is not often recommended because weevils collected from other areas may not survive at the purchaser's location.

Microlarinus lareynii is a seed weevil that deposits its eggs in the young burr or flower bud and the larvae feed on and destroy the seeds before they pupate, emerge, disperse, and start the cycle over again. Its life cycle time is 19 to 24 days. *Microlarinus lypriformis* is a stem weevil that has a similar life cycle, excepting the location of the eggs, which includes the undersides of stems, branches, and the root crown. The larvae tunnel in the pith where they feed and pupate. Adults of both species overwinter in plant debris. Although the stem weevil is slightly more effective than the seed weevil when each is used alone, the weevils are most effective if used together and the puncture vine is moisture-stressed.

Phytochemistry

Two alkaloids that seem to cause limb paresis (stagers) in sheep that eat *Tribulus terrestris* are the beta-carbolines harman (harmane) and norharman (norharmane).^[20] The alkaloid content of dried foliage is about 44 mg/kg.^[20]

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External links

- Germplasm Resources Information Network: *Tribulus terrestris* (<http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?100965>)
- Flora Europaea: native distribution in Europe (http://rbg-web2.rbge.org.uk/cgi-bin/nph-readbtree.pl/feout?FAMILY_XREF=&GENUS_XREF=Tribulus&SPECIES_XREF=&TAXON_NAME_XREF=&RANK=)
- Page on *T. terrestris* at the Global Compendium of Weeds (<http://www.hear.org/gcw/html/autogend/species/19396.HTM>)
- Page from the U.S. Department of Agriculture's PLANTS database (<http://plants.usda.gov/java/profile?symbol=TRTE>)
- *Tribulus terrestris* List of Chemicals (Dr. Duke's Databases) (<http://sun.ars-grin.gov:8080/npgspub/xsql/duke/plantdisp.xsql?taxon=1438>)

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