



# GUAYULE

## *Parthenium argentatum* A. Gray

Plant Symbol = PAAR5

*Common Names:* guayule

### Description

*General:* Guayule is a perennial shrub with thick lignified stems, a low, spreading form, and an average height of approximately 20 inches (USDA, 1945). The leaves are greenish-grey and are covered with small hairs that aid in reducing evapotranspiration. Guayule has a deep, coarse taproot to collect water and nutrients from deep in the soil profile as well as a shallow fibrous system to collect moisture from brief desert rainfall (USDA, 1945; Muller, 1946). It flowers in the spring and through most of the summer months. The small, yellow composite flowers formed at the end of a stem are approximately 6 inches long. Reproduction is by facultative apomixis or sexual reproduction and results in small seeds, 0.12 inches long and 0.06 inches wide, of relatively low viability (Lloyd, 1911).



*Guayule.* Photo by Blase Evancho. University of Arizona Cooperative Extension.

*Distribution:* Native guayule stands are distributed throughout the northeastern parts of the Chihuahuan Desert from Mexico to the Big Bend region of Texas. For current distribution, please consult the Plant Profile page for this species on the PLANTS Website.

*Habitat:* Guayule is frequently found in the foothills and hillslopes of the transitional zone between desert and desert grassland regions. It prefers shallow, sandy soils formed from limestone where it has the highest competitive advantage over other flora (Lloyd, 1911).

### Adaptation

Guayule is a long lived, desert adapted shrub but requires more water than associated desert vegetation for active growth (Muller, 1946). During temperature or drought stress, it enters a semi-dormant state characterized by darker, grayer leaves and a lack of vegetative growth (Lloyd, 1911). Reduced metabolic periods are also seen in cultivated stands during the hottest and coldest parts of the year (Lloyd, 1911).

### Uses

Guayule accumulates large amounts of natural rubber in its stems. Rubber production is the economic driver for its cultivation (Muller, 1946; Rasutis et al., 2015). Globally, the main contributor to commercial natural rubber production is the Pará rubber tree (*Hevea brasiliensis*) (The Editors of Encyclopaedia Britannica, 2020). Pará tree plantations, made-up of genetically identical clones, cannot be harvested mechanically and are genetically fragile due to their lack of genetic diversity (Sethuraj and Mathew, 1992). Guayule fields are established with genetically diverse seed and can be harvested mechanically. Harvested materials are ground into bagasse, a fine wood pulp, and the solid rubber is chemically extracted from its cells (Rasutis et al., 2015).

### Ethnobotany

Guayule use has been documented in Indigenous communities. Fangmeier et al. (1984) and Lloyd (1911) report that guayule stems were chewed to extract rubber particles which were then bound together to form a ball approximately twice the size of a baseball.

## **Status**

*Threatened or Endangered:* No

*Wetland Indicator:* Guayule is an upland (UPL) species.

*Weedy or Invasive:* Guayule does not display invasive or weedy characteristics. Please consult with your local NRCS Field Office, Cooperative Extension Service office, state natural resource, or state agriculture department regarding its status and use.

Please consult the PLANTS Web site (<http://plants.usda.gov/>) and your state's Department of Natural Resources for this plant's current status (e.g., threatened or endangered species, state noxious status, and wetland indicator values).

## **Planting Guidelines**

Plant guayule at a rate resulting in stand densities between 12,000 and 40,000 plants per acre (D. A. Dierig, personal communication, 5 June 2020). Foster and Coffelt (2005) recommend planting at a rate between 0.24 and 0.36 PLS (Pure Live Seed) pounds per acre. Seeding rate is highly variable and based on seed quality, planting equipment, soil type and local conditions.

## **Management**

Guayule has two growth phases in a calendar year. In the warm season, guayule increases in biomass. In the cool season, rubber production is initiated and accumulates until spring. Harvest occurs after two to three years. During harvest, plants are cut nearly to the ground and the biomass is baled for rubber processing. After harvest, guayule sprouts back from the root stalk and supports another harvest cycle. Healthy guayule fields will be productive for at least two harvest cycles (Foster and Coffelt, 2005).

## **Pests and Potential Problems**

Common pests of guayule during establishment are pale striped flea beetle and grasshoppers. Scout stands early and often for pests. Please contact your local agricultural extension specialist or county weed specialist to learn what works best in your area and how to use it safely. Always read label and safety instructions for each control method.

## **Environmental Concerns**

None known.

## **Seeds and Plant Production**

Guayule seed is planted in the spring or fall with a precision planter on well cultivated beds spaced 36-40 inches wide at a depth of 1/8 to 1/4 inch. After planting, irrigate the furrows for 3-5 days for optimal germination and establishment. Sprinkler irrigation may be required on coarse textured soils or poorly prepared fields. Early season weed control is paramount. Use pre-emergent and post-emergent herbicide programs to control weeds. Please contact your local agricultural extension specialist or county weed specialist to learn what works best in your area and how to use it safely. Always read label and safety instructions for each control method. Once established, weeds will not outcompete guayule and will generally not require management. Reduce irrigation to approximately once a month during periods of active growth. Apply nutrients according to soil test results.

Commercial scale seed harvest is accomplished from spring through fall with a highly modified cotton picker. Seed can also be harvested by hand. Seed is cleaned with commercially available equipment used for small seeded plants. Seeds produced in the spring and fall generally have higher quality and germination rates than those produced in the heat of summer (Lloyd, 1911).

## **Cultivars, Improved, and Selected Materials (and area of origin)**

Guayule breeding programs have existed since the late 1800's to develop varieties with increased rubber production but only incremental advances have been obtained. The variety grown commercially is AZ-2. It was selected for its increased biomass and rubber production compared to other lines (Ray et al. 1999).

## **Literature Cited**

- Fangmeier, D. D., D. D. Rubis, B. B. Taylor and K. E. Foster. 1984. Guayule for Rubber Production in Arizona. University of Arizona Technical Bulletin 25. Tucson, AZ.
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Muller, C.H. 1946. Root Development and Ecological Relations of Guayule. USDA Technical Bulletin 923. U.S. Gov. Print Office, Washington, D.C.

Rasutis D., K. Soratana, C. McMahan, A. E. Landis. 2015. A Sustainability Review of Domestic Rubber from the Guayule Plant. *Industrial Crops and Products* 70 (1) 383-394.

Ray D. T, D. A. Dierig, A. E. Thompson and T. A. Coffelt. 1999. Registration of Six Guayule Germplasms with High Yielding Ability. *Crop Science* 39 (1) 300.

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