



# TEPARY BEAN

## *Phaseolus acutifolius* A. Gray

*Plant Symbol* = PHAC

**Common Names:** tepary bean, tepari, bawī, bafv, pavi, yori muni, xmayum, escomite, escumite, dinawa, Texas bean, frijol trigo, frijol pinuelero, garbancillo bolando, rice haricot bean, haricot riz, haricot Sudan.

**Scientific Names:** There are three variants: *P. acutifolius* var. *acutifolius*, *P. acutifolius* var. *tenuifolius*, and *P. acutifolius* var. *latifolius*.

### Description

**General:** Tepary bean is a native, annual legume. Domesticates of the variant *P. acutifolius* var. *acutifolius* have been cultivated for thousands of years; ancestral populations still live in the wild. Wild forms of tepary bean are twining or weakly trailing indeterminate vines that can climb shrubs and trees. The domesticated plants are bushier, up to 12 inches in height and 20 inches in diameter. Leaves are trifoliate with narrow, pointed leaflets. Flowers are white or light colored. Fruit are small pods, 1.25 to 3 inches long, containing 2 to 7 seeds. The wild pods are strongly dehiscent (scattering their seed when mature), while the domesticated forms are less so. Domesticated tepary bean seeds are about 1/3 inch long and can be brown, beige, black, mottled, or white, while wild seeds are smaller, dark and mottled. Plant roots form associations with nitrogen fixing bacteria (Kearney and Peebles, 1964; Nabhan and Felger, 1978; Felger and Rutman, 2015; FAO, 2010).

**Distribution:** Wild tepary bean grows in Arizona, New Mexico, and Texas, as well as throughout Mexico. Cultivated tepary bean is grown in dry regions around the world, including North and Central America, Africa, Europe, and South Asia (ILDIS, 2018).

For current distribution in the United States, please consult the Plant Profile page for this species on the PLANTS Web site.

**Habitat:** Wild tepary bean grows in washes and on alluvial soils, at elevations from sea level to 6200 feet above sea level.

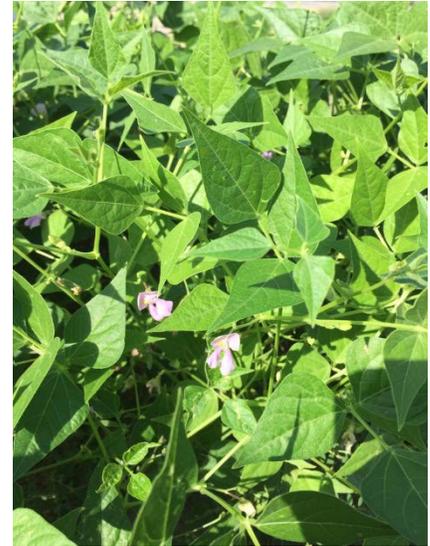
**Adaptation:** Tepary bean is adapted to very hot and dry environments. It responds to summer monsoon precipitation in the southwest deserts. Tepary bean plants use water freely, which allows them to maintain a high photosynthetic rate. The plants complete their reproductive cycle rapidly, a strategy that avoids subsequent drought (Nabhan, 1990). The flowers can produce viable pollen and set seed at temperatures greater than 105° F. Leaflets can track the sun and tilt parallel to the sun's rays to reduce heat load. Tepary bean roots extend deep into the soil and can extract soil moisture that is unavailable to common bean (*P. vulgaris*) (Nabhan, 1990). Tepary bean is more salt tolerant than common bean (Hendry, 1918; Goertz and Coons, 1991).

In the wild, associated plants include mesquite (*Prosopis* spp.), desert willow (*Chilopsis linearis*), ocotillo (*Fouquieria splendens*), paloverde (*Parkinsonia* spp.), ironwood (*Olneya tesota*), common sotol (*Dasyllirion wheeleri*), sweet four o'clock (*Mirabilis longiflora*), oak (*Quercus* spp.), pointleaf manzanita (*Arctostaphylos pungens*), and Arizona sycamore (*Platanus wrightii*).

### Uses

Domesticated tepary bean is a traditional Native American food crop and a drought-tolerant crop in minor use in dry regions worldwide. The seeds are primarily used as dry shell beans but are sometimes processed into meal. The plants provide forage or hay for livestock and have been used as a drought-tolerant summer cover crop that can be grown on residual soil moisture.

Roughly a hundred years ago, tepary beans had found widespread use as a crop and cover crop by Euro-American farmers in the greater Southwest and Midwest. In 1918, California alone had 17,000 acres planted to tepary bean (Hendry, 1919). This



Tepary bean (*Phaseolus acutifolius*).  
Photo by M. Wolf, USDA-NRCS Tucson Plant Materials Center.

tepany bean boom was short-lived, as market forces and public preferences caused the tepary bean to fall from favor with Euro-Americans by the 1920's (Nabhan and Felger, 1978).

Interspecific crosses between common bean and domesticated tepary bean have been used to develop common bean breeding lines with improved tolerance to disease and abiotic stress (drought, heat and salinity) (Mhlaba et al., 2018).

Proteins (protease inhibitors) contained in tepary beans have been shown to inhibit the growth of some types of cancer cells. (García-Gasca et al., 2002).

### **Ethnobotany**

Tepary bean has a long history of cultivation in North America. The archaeological record does not reveal where or when tepary beans were first domesticated. However, domesticated tepary beans were found in archaeological sites in the Tehuacán Valley of Mexico dating to about 2500 years ago (Kaplan and Lynch, 1999). In Arizona, tepary beans were found in Hohokam sites dating to about 1000 years ago (Kaplan, 1965). Genetic research points to a single domestication event, probably in northern Mexico (Garvin and Weeden, 1994; Blair et al., 2012).

Tepary beans play an important role as a heritage food in the culture of some Tribes in the southwestern U.S. and Mexico. (Nabhan and Felger, 1978). Of the U.S. Tribes, the Tohono O'odham of the Sonoran Desert in Arizona have the strongest cultural ties to tepary bean cultivation (Nabhan and Tiewes, 1983). Tohono O'odham mythology tells that the Milky Way is made up of white tepary beans scattered across the night sky (TOCA, 2010).

The traditional Sonoran Desert method of planting employed the arroyo mouth or *ak chin* system. Farmers would locate a flat area at the mouth of an arroyo, then build diversion structures that would cause monsoon flood waters to spread across the flat area, irrigating it evenly. Planting occurred at the onset of summer monsoon rains. Blocks of tepary beans were planted along with corn, sorghum, and pinto beans. Men prepared the fields, and women and children planted the crops. Prayers were sung asking for a good harvest. By October, the beans were ready to harvest. The bean plants were pulled up, allowed to dry, and were beaten or stomped to release the beans from the pods. The beans were then winnowed from the chaff using woven baskets. The cleaned beans were stored in baskets or clay pots (TOCA, 2010; Nabhan and Tiewes, 1983) Some Sonoran Desert peoples gathered wild tepary beans into the early 20<sup>th</sup> century, but this is no longer widely practiced (Nabhan, 1990; TOCA, 2010).

Tepary bean was a widely grown staple crop on the Tohono O'odham Nation up until World War II. During and after the war, cultivated area declined because many farmers had joined the military or were working for wages on new, large-scale cotton farms made possible by well irrigation. (Nabhan and Felger, 1978). However, some O'odham farmers have recently brought tepary bean back into cultivation, restoring its status as a traditional food.

In addition to being a heritage food, tepary beans are also important to the health of the people who traditionally ate them. The Tohono O'odham have a high incidence of type 2 diabetes and obesity, particularly among young people (CDC, 2014). These health problems were not present in the older people who ate traditional foods but are the result of younger people's eating a highly-processed modern diet (CDC, 2014). Eating a traditional Sonoran Desert diet can reduce the incidence of diabetes and obesity (CDC, 2014). Tepary beans are high in fiber and protein and are low on the glycemic index (TOCA, 2010). The Tohono O'odham community has worked to integrate tepary beans and other traditional foods into school lunches to reduce and prevent type 2 diabetes and childhood obesity (CDC, 2014).

### **Status**

*Threatened or Endangered:* No.

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

*Weedy or Invasive:* Tepary bean is not known to become weedy or invasive. 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**

In the Southwest deserts, tepary beans are traditionally sown at the start of monsoon rains (mid-June to mid-July). Tepary beans can be planted earlier if supplemental irrigation is available. For small areas, plant beans 4 inches apart in rows that are



*Tepary bean seeds, USDA-NRCS PLANTS Database, <https://plants.usda.gov/core/profile?symbol=PHAC>*

12 to 16 inches apart. Plant at a depth of 1-1.5 inches (TOCA, 2010). For large scale production, use mechanical planting equipment to plant beans in rows wide enough to allow field operations (28-30 inches). Planting rate is approximately 25-30 lb/ac. There are approximately 4000 seeds per pound of domesticated tepary beans.

### **Management**

Tepary bean can be grown under irrigation. However, excessive irrigation or rainfall will lead to poor stand establishment and may later cause the plants to produce vegetative growth at the expense of seed yield. Soil test prior to planting to determine if nutrients or amendments are needed. Do not over-apply nitrogen, as this may inhibit root nodulation and nitrogen fixation.

### **Pests and Potential Problems**

Tepary bean seeds and plants can harbor common bean diseases, such as bean common mosaic virus (Kaiser, 1981). These disease organisms can potentially transfer to nearby commercial bean crops.

### **Environmental Concerns**

None known.

### **Seeds and Plant Production**

Sow beans in a firm, weed-free seedbed. Irrigate to start, and then only when plants show significant water stress. First harvest may be between 60-120 days after sowing, depending on environmental conditions. Beans may be harvested and threshed by hand, or mechanically harvested by cutting, windrowing, and then combining. Reported average yields of dry beans under dryland conditions are 350-700 lb/ac and yields with supplemental irrigation are 800-1500 lb/ac. Dry hay yields are between 1.8-4.5 tons/ac (FAO, 2010).

### **Cultivars, Improved, and Selected Materials**

There are many local land races of domesticated tepary bean, each adapted to a specific location and environment. Some of these are available in limited amounts on the commercial market.

Currently, there are few improved or selected varieties of tepary bean.

Cultivars should be selected based on the local climate, resistance to local pests, and intended use. Consult with your local land grant university, local extension or local USDA NRCS office for recommendations on adapted cultivars for use in your area.

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### **Citation**

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