

PROSOPIS CINERARIA: A BENEVOLENT TREE OF THE DESERTS

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Prosopis cineraria is an evergreen tree that inhabits the dry and hot regions of the Middle East and South Asia. In the United Arab Emirates (UAE) and other Arab countries *P. cineraria* is commonly called ghaf. A very useful tree that generously supplies food to human, livestock and wild animals, the green canopy of the *Prosopis* also provides cool shade from the blistering desert heat to a wide range of wildlife. Given its importance to the people, domestic animals and wildlife of the country, it is considered to be the national tree of the UAE.

Belonging to the family Fabaceae (Leguminosae) and subfamily Mimosoideae, the genus *Prosopis* includes about 45 species of shrubs and trees that are found in tropical and subtropical areas of Africa, the Americas and Asia. The natural growth ranges of *P. cineraria* are the arid regions of Oman, Saudi Arabia, UAE, Iran, Afghanistan, Pakistan and India. By growing in areas with 75 mm annual rainfall, eight months dry period and temperature of 50°C, *P. cineraria* demonstrates its high drought and heat tolerance. It grows quite successfully in sandy soil. Under relatively mild conditions *P. cineraria* usually form open dry woodlands that play an important role in desert ecosystems.

P. cineraria leaves are alternate, bipinnately compound with 1-3 pairs of pinnae. Its spines are straight having a conical base and are spread along the stem length. Yellow to green 0.6 cm flowers are borne on 5-23 cm racemes during March to May and October to January. Its light-yellow to reddish-brown pods that appear after about two months of flowering are 5-20 cm long that enclose up to 25 light to dark brown seeds.

The tree has a long and well developed root system with a tap root that may grow up to 60 m in length vertically, thus anchoring it in the ground and enabling it

to absorb water from the deep aquifers. Its root nodules, as with other legumes, have symbiotic bacteria that help in fixing atmospheric nitrogen in the soil.

P. cineraria is a very salt-tolerant tree that thrives quite well in 50% seawater. A number of its ecotypes have been observed growing in the highly saline coastline areas. In the UAE, some of the ghaf trees have been found flourishing close to hyper-saline drainage water. The tree also grows in high alkaline soil of pH 9.8.

GHAF IN THE UAE

Prosopis cineraria is one of the three species of the genus that are found in the UAE. It is the tallest tree of this region and may reach to the height of 15 m. Single trees are common in the northern UAE, although forests are found in the Digdaga area of Ras Al Khaimah Emirate, smaller groves exist in the Hajar Mountains.

Before the oil boom in this region, people would eat the young tender ghaf leaves and pods as salad or add them to their rice as a supplement. For its medicinal values, the ghaf has been used to cure different ailments including cataracts, dysentery, dyspepsia and toothache. The ghaf tree plays a vital role for the existence of nearly all of the desert animals by providing food and shelter, for example, wild animals including gazelles, oryx, and hares. Many rare bird species of the UAE like the eagle owl and brown-necked raven nest in it.

For centuries the ghaf has been an essential source of feed for domestic animals. Its leaves which remain green even during the hottest months of the year provide fodder to domestic animals and the pods which are rich in protein are collected in summer and fed to livestock during winter.

Local people love and revere the generous ghaf so much that they name their children after the tree, for



P. cineraria is a multi-use tree of the deserts



P. cineraria bark can be used in tannery processes



Camels love to nibble at tender nutritious pods of *P. cineraria*

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example, Ghafa, Ghafan and Ghaufa. The founding father of the modern UAE, Sheikh Zayed bin Sultan Al Nahyan, emphasized the importance of preserving the ghaf tree and encouraged its plantation along the highways as well as in the open desert.

The ghaf tree in the UAE is under threat for many reasons including global warming which is making the deserts too hot for its survival. The increase in camel number is to blame for the overgrazing of the tree while the population boom is responsible for the overuse of groundwater that has led to declining levels making it beyond the reach of the ghaf roots. Pollution of both air and water is also contributing to a fall in the number of ghaf trees in the UAE. The UAE conservationists are running a campaign to secure the future of the tree in the country.

UTILIZATION AND BENEFITS

Prosopis cineraria produces new foliage during the hot and dry months of July and August when most other trees are leafless. Its leaves have 14% crude protein, 20% crude fiber and 18% calcium that make the tree highly nutritious fodder which is liked by different animals such as goats, sheep, camels and donkeys. As both its leaves and pods are rich in protein (and low in fat) they can be exploited as food for health-conscious people. Its flowers can be used as a source of nectar in honey production.

The tree is an excellent source of firewood and charcoal (5,000kcal/kg). It is also used in house-building, boat frames, tool handles and posts. Its bark produces edible gum and the bark itself has the potential to be used in industries such as tannery.

P. cineraria plays a role in containing desertification by stabilizing the sand dunes with its deep root system. This system also means that the tree does not compete with nearby crops for water and nutrients and soil fertility of soil is improved by the addition of nitrogen.

RESEARCH NEED

Within its natural range, *Prosopis* is considered to be one of the most important trees with key economic and environmental roles to play in some of the most hostile arid environment. In the vast desert areas found in the Arabian Peninsula large *P. cineraria* woodlands are found, which are vital to local inhabitants, who have used the tree historically in a sustainable way.

Increased pressure on the woodland has halted regeneration and threatened the trees' survival in large parts of the Arabian Peninsula. Its high degree of tolerance to adverse soil and climatic condition and wide and unexploited genetic diversity within the species shows its potential role in agro-forestry and silviculture programs.

In some of its natural range areas it is an important agro-forestry species. Exploitation of its genetic variation in other regions may bear fruit. With this in mind a study was undertaken by the Plant Genetic Resources Program of the International Center for Biosaline Agriculture to find the diversity of *P. cineraria* trees in the UAE. For this purpose different morphological characteristics of the tree including angle/shape of tree crown, leaf color, number of leaves per 30 cm of branch, leaf area and dry weight, date of flowering, maturity date of pod, inflorescence color, length and weight, pod length and weight, number of seeds per pod, number of seeds infected with insects and other seed details (width, thickness, color and weight) have been studied in detail.

Initial results indicate the presence of considerable genetic variability within the local ghaf trees. The sizeable genetic diversity of *P. cineraria* can be exploited for different breeding purposes including introduction to other non-natural range areas.



Many bird species including the Collard dove shelter in *P. cineraria* tree



P. cineraria flowers provide nectar for honey production



At Al Hayer in the UAE, a road has been bifurcated for a short distance to save a *P. cineraria* tree