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*PROSOPIS CINERARIA (*L) DRUCE: A DESERT TREE TO BRACE LIVELIHOOD IN RAJASTHAN

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ABSTRACT

The *Prosopis cineraria (*L) Druce is an important tree (Khejri- a local name in Rajasthan)for the Thar Desert with hard climatic adaptation and one of the lifeline in desert habitat as mentioned in ancient literature. This is a species representing all five F viz., Forest, Fiber, Fuel, Fodder and Food. This tree is also mythological important in local communities. High value of this species recognized as a State symbol (state tree of Rajasthan). *Prosopis cineraria* (L.) Druce is a tree endemic to hot deserts of India, belonging to the family Leguminosae. Pods locally called "Sangri" are considered as dry fruit of desert and are one of the main ingredients of quintessential Rajasthani dish - The Panchkuta. In the present article, we have attempted to review different characteristics of the pods, to understand its health benefits. Various phytoconstituents like tannins (gallic acid), steroids (stigmasterol, campesterol, sitosterol, etc.), Flavone derivatives (prosogerin A, B, C, D, and E), alkaloids (spicigerine, prosophylline), etc. have been isolated from the sangri pods .As this plant is found in water stress (or deficient area) so antioxidant potential of pods has also been discussed. *Prosopis cineraria* (L) Druce is one of the highly valued plant in the Indigenous System of Medicine. *P. cineraria* pods provide protein, iron, vitamins A and C and other micro minerals Unripe pods are also nutritious and are used to prepare curries and pickles. Its bark is said to be a potent drug for several ailments such as leprosy, dysentery, bronchitis, asthma, leucoderma, piles, muscular tremors, asthma, rheumatism and inflammations. Pharmacological activities like analgesic, antipyretic, antihyperglycemic, antioxidant, antihypercholesterolemic, antitumor, nootropic anthelmintic, antibacterial, antifungal, antiviral and anticancer activities have been reported from different plant extracts. In view of its medicinal importance, the present review is focused to delineate its chemical constitution and therapeutic potentiality, precisely.

Keywords: Vernacular names; Cytotoxic principle; Dry pods; Ailments; Minerals; Carbohydrates; Amino acids; N-free extract; Saponification value

INTRODUCTION

The "Queen of the Desert", khejri (*Prosopis cineraria* (L) Druce) belongs to the subfamily Mimosoidae of Leguminosae family, and has an important place in the economy of the Indian desert. Khejri or Prosopis cineraria is a small to medium size tree, found mainly in the Thar Desert of Rajasthan in India. It grows in dry and arid regions of Arabia and in regions of India mainly Rajasthan, Haryana, Punjab, Gujarat, Western Uttar Pradesh and drier parts of Deccan. Khejri is a small moderate sized evergreen thorny tree, with slender branches armed with conical thorns and with light bluish-green foliage. The leaflets are dark green with thin casting of light shade. Although they belong to the same family as beans and lentils, they are usually distinguished as a separate group because of the ways in which they are prepared. The different types of sangria are all spherical, a feature that also sets them apart from beans and lentils. Dried sangria are produced by harvesting the pods when they are fully mature and then drying them[1]. Once they are dried and the skins removed, they may split naturally. The trees not only boost the growth and productivity of companion plants, but also provide fuel, fodder, food, small timber, medicines, gum and tannin. Its foliage is a nutritive fodder for animals and the wood is of good quality for domestic fuel purposes. Unlopped trees produce green, immature pods (sangri) used as a vegetable (fresh and also dried), and ripe pods (khokha) are used for fresh consumption and for the preparation of flour. Khejri trees occupy a special place in the life of desert dwellers, especially those of rural communities. People often protect khejri trees, as religiously it is considered sacred. About 250 years ago, 663 people of the ´Vishnoi' caste laid their lives in protecting khejri trees against the order of the then ruler of Marwar state, who wanted to fell the trees for making bricks for his castle[9]. It is a true multipurpose species and often referred to in ancient Indian literature as the 'Kalpvriksha' of the desert[2].

It is known by several vernacular names such as; Janti and Chonksa (Delhi), Jhind, Jhand and Jand (Punjab and Haryana), Banni (Karnataka), Sumri (Gujarat), Kandi (Sindh) and Khejri (Sanskrit). Khejri is the only leguminous tree which grows well against all the climatic odds of the desert. Growth of new foliage, flowering and fruiting occurs during the driest months (March-June) when other plants generally become leafless and dormant. This may be due to its extensive, penetrating root system, thus behaving as a phreatophyte. Its roots have been found at a depth of 36 m in an alkali soil with 9.8 pH. Arid land forms having an annual rainfall of 150 to 500 mm, except hills and saline depressions, have good Khejri population, however optimum density is confined to areas receiving 350 to 400 mm rainfall. Owing to the deep root system, a monolayered canopy and the ability to fix atmospheric nitrogen, *P. cineraria* is compatible with agri-horticultural crops. The tree yields a pale yellow to amber coloured gum with properties similar to that of gum acacias[3]. Bark is used as a tonic, blood purifier and for the treatment of skin diseases. Trees are also planted for sand dune stabilization and reclamation. To utilize the natural biodiversity of the species in relation to its horticultural attributes in terms of both immature and ripe pods, a study was conducted to locate suitable types of *P. cineraria* having the following pod characters:

- good taste with low tannin content;

- tender pods with less fibre at the immature stage and high pulp content at ripening;

- a higher number of smaller tender seeds at vegetable stage.

Yellow green flowers are borne on 5 to 23 cm long spike like racemes. On maturity they become attractively bright yellow and usually 0.6 cm broad. After pollination flowers produce specialized fruits in clusters.

Fruits of Khejri are pods containing up to 25 dull brown seeds, 0.3 to 0.8 cm long. Pods are light green-yellow in colour. They grow up to 8 to 19 cm. These are locally called as Sangar or Sangri in Rajasthan. The dried pods are

locally called as Kho –Kha. These are eaten by the poor people. Dried pods form rich animal feed and are liked by all animals. Humans eat Khejri fruits in boiled form when these are young and soft.

KHEJARI TREES IN RAJASTHAN

These are also used as famine food and are reported to be known by even the pre-historic men. **Khejri (Image 1, 2, 3)** as reported elsewhere in this site is variously named in different regions of the world. In the United Arab Emirates it is called as Ghaf; in Indian states for example in Punjab is known as Jand; in Sindh it is known as Kandi, in Karnataka it is known as Banni, in Tamilnadu it is known asVanni; and in Gujarat it is known as Sami and Sumri. In Sanskrit it is known as shami Sankhphala, Keshahantri, Sivaphala, Mangalya, and Papanasini. It is taxonomically known as *Prosopis cineraria* L. syn. *P. spicigera*. It is one out of 44 species in the genus *Prosopis.* Khejri has a very deep tap root system and hence it does not generally complete with the associated crops. The improved physical soil conditions compared with higher availability of nutrients under the Khejri canopy explain the better growth of the crops associated with it. Due to its extensive root system it stabilizes shifting sand dunes and is also useful as windbreak shelterbelt and in afforestation of dry areas. It fixes atmospheric nitrogen through microbial activities. It adds organic matter through leaf litter decomposition thus rejuvenating poor soils. Since in arid regions, this is the only tree species, it provides much needed shade and shelter to the farmers working in the fields as well as to the cattle and wildlife during the summer months. Pods of Khejari are eaten by cattle, sheep, horses, mules, donkeys, goats, camel and other wildlife in desert especially black buck and chinkara in western Rajasthan have survived by eating pods and leaves of this tree[5,6] The importance of the medicinal value of this tree has been highlighted in our ancient literature. The bark of the tree has abortifacient and laxative properties and is also used as a remedy for rheumatism in the central provinces. The leaves are of high nutritive value and locally called "Loong". Leaf paste of *P. cineraria* is applied on boils and blisters, including mouth ulcers in livestock. . The smoke of the leaves is considered good for eye troubles. Leaf extracts *P. cineraria* have been reported to show antibacterial, antihyperglycemic, antihyperlipidemic and antioxidative activities. Pods are brown to chocolate in colour on ripening, each containing several seeds embedded in sweet dry yellow pulp. *P. cineraria* pods are locally called "sangar" or "sangri". The pod is considered astringent in Punjab. Sangri pods are known to prevent protein and mineral deficiency.

CHEMICAL COMPOSITION OF FRESH, RIPE PODS

Fresh, ripe pods contain 7-10% preformed water, and on a dry matter basis contain 9-17% crude protein, 1.2-4.3% ether extractives, 16-34% crude fibre, 47-61% nitrogen free extracts, 28% acid detergent fibre, 8% acid detergent lignin, 4-5% ash, 0.14-0.29% silica, 0.3-0.5% calcium and 0.40-0.44% phosphorus[11]. The pods are composed of 16.5% protein, 4.2% fat, 16.8% crude fibre, 57% carbohydrates, 5.4% ash, 0.33% calcium and 0.44% phosphorus. It's reported that the amino acid composition of *P. juliflora* pods to be (on a dry matter basis): 0.99%. aspartic acid, 0.28% threonine, 0.14% cystine, 0.43% valine, 0.10% methionine, 0.27% isoleucine, 0.52% leucine, 0.29% tyrosine, 0.33% phenylalanine, 0.37% alanine, 0.19% histidine, 0.32% lysine, 0.56% arginine, 0.41% serine, 1.4% glutamic acid and 0.51% glycine[12]. The dry pods contained reasonable amounts of iron (208-639 ppm), copper (13-16 ppm) and manganese (22 ppm), but the zinc content (13-16 ppm) was below the level desired (40 ppm) for animal feeds. The seed alone contained 31-37% crude protein and 3.4-8.5% crude fibre. Excluding the seed coat, the true seed on a dry matter basis contained 60-69% crude protein. The seed yielded 17.3% fatty oils of 8.55 acid value, 69.75 iodine value and 179.1 saponification value[13]. The raw seeds had 10.9% moisture content and on a dry matter basis contained 39.3% protein, 4.5% fat, 18.6% carbohydrates and 3.8% ash. Seed protein is constituted of 3.19% alanine, 3.80% arginine, 11.23% aspartic acid, 9.44% glutamic acid, 7.31% glycine-serine, 2.13% isoleucine-leucine, 1.77% histidine, 2.01% lysine, 0.53% methionine, 0.90% phenylalanine, 3.87% proline, 0.41% threonine, 0.43% tyrosine, 0.84% valine and traces of tryptophan[7,14].

Composition of *P. cineraria* leaves and pods

	Leaves	Pods
Crude Protein	11.9	18.0
Fat	-	2.0
Ether extract	2.9	-
Carbohydrate	-	56.0
Crude fibre	17.5	26.0
Nitrogen free extract	43.5	-
Phosphorus	0.4	0.4
Calcium	2.1	0.4
Iron	-	0.2
Ash	8.1	-

Sangri pods'flour is mixed with wheat flour to make bread (chapati) and bakery products. One of the great dishes of Rajasthani cuisine. This simple piquant and tangy vegetable preparation does not really reflect the richness of its colorful school of cooking. Because ker and sangri are not exotic vegetables, but are wild berries (or beans) that grow independently and abundantly in the desert. Cooked pods of Khejri are used as a functional food in Rajasthan, for the amelioration of numerous illnesses (Images 4,5,6,7).

THERAPEUTIC PROPERTIES

Khejri flower is pounded, mixed with sugar and used during pregnancy as safeguard against miscarriage. Water-soluble extract of the residue from methanol extract of the stem bark exhibits anti-inflammatory properties[15-17]. Khejri plant produces gum, which is obtained during May and June. The bark of the tree is dry, acrid, bitter with a sharp taste; cooling anathematic; tonic, cures leprosy, dysentery, bronchitis, asthma, leucoderma, piles and tremors of the muscles. The smoke of the leaves is good for eye troubles. The pod is considered astringent in Punjab. The bark is used as a remedy for rheumatism, in cough colds, Asthma. The plant is recommended for the treatment of snakebite. The bark is prescribed for scorpion sting (Image 8).

The bark of the tree provides immediate relief to a person bitten by snake or scorpion. Its leaves and fruits are used in preparing medicines for curing nervous disorders. The medicines prepared from its bark are also used for treating diarrhea, dysentery, piles, worm infestations and other skin problems[8]. The bark is also used to cure leprosy, bronchitis, asthma, tumour of muscles and to improve concentration. The gum of the tree is nutritive and good in taste and is used by pregnant woman at the time of delivery. Reported to be astringent, demulcent, and pectoral, khejri is a folk remedy for various ailments. In India, the flowers are mixed with sugar and administered to prevent miscarriage. In Las Bela, India, the ashes are rubbed over the skin to remove hair (perhaps *Leucaena* ashes should be tried as well). The bark, considered anthelmintic, refrigerant, and tonic, is used for asthma, bronchitis, dysentery, leucoderma, leprosy, muscle tremors, piles, and wandering of the mind. Smoke from the leaves is suggested for eye troubles, but the fruit is said to be indigestible, inducing biliousness, and destroying nails and hair. Punjabis consider the pod astringent. Central Province Indians use bark for rheumatism. Although recommended for scorpion sting and snakebite, the plant has not proved out[10]. The stem bark contains vitamin K, n-octacosyl acetate, the long chain aliphatic acid. Presence of glucose, rhamnose, sucrose and starch is also reported. A cytotoxic principle, patulibin, has been isolated from flowers. Khejri has been reported to contain Piperidin alkaloids, Juliflorinine and N-methyjulifloridine, Julifloricene, and Julifloricene. These compounds show significant anti-fungal activities against dermatophytes. The alkaloids found in the Khejri extract showed broad spectrum anti- bacterial activity against both Gram-positive and Gram – negative bacteria comparable to penicillin, streptomycin, ampicilline, sulphamethoxazole, and tetracyclin[18,19].

The fruits yield a Flavoneglycoside Patulitrin which exhibit cytotoxic activity. Numerous bioactive compounds have been found in Khejri by various researchers from time to time are – Flavonoides, diketones, Phenolic content, free amino acids, Patulitrin, specigerine, prosogerine- A,B,C,D, lipids, sugars and vitamins. Dried pods of the plant if administered in proper doses help in preventing Protein Calorie Malnutrition. It is also reported that flowers of Khejri when mixed with sugar and administered orally prevent miscarriage. A paste of flowers along with twig also act as anti-diabetic agents when administered orally. The ash or Bhasm of Khejri fruit and other parts is used to control the effects of Shani, as per the Hindu mythology and some astrologers. It is reported that if the Saturn is well places in the horoscope of a person, it leads to discipline in life, responsibility, humbleness etc. One, who uses Khejri Bhasm regularly, has a long life. He remains charitable and proficient in every work. In case the Saturn is not placed well in the horoscope of a person, it is reported that the individual suffers from depression, anxiety, fear, loneliness and disorders of nervous system[11]. Recently, LPO, COX and enzyme inhibitory activities of Sangri pods has been explored.

CONCLUSION

Prosopis cineraria (L.) Druce (Leguminosae) locally known as ghaf, jand, jandi, and khejri, is a multipurpose indigenous tree growing wild in dry and arid regions of Pakistan. It is used by native healers to manage multiple ailments including gastrointestinal, respiratory, and cardiovascular disorders. The stem bark has folkloric repute to possess anti-inflammatory, antirheumatic, tonic, and vermifuge properties and is used in the treatment of anxiety, asthma, bronchitis, dyspepsia, fever, dysentery, leprosy, piles, wandering of the mind, and tremors. Furthermore, it is claimed to have abortifacient and laxative properties. The smoke of the burnt leaves is used to treat eye inflammations. Leaf paste is applied on boils and blisters, including mouth ulcers in livestock and leaf infusion on open sores on the skin. Flowers are used as an antidiabetic agent and to prevent abortion. The plant material is one of the herbal remedies for snake bite and scorpion sting. The wood ash may be used as source of potash and the ashes are rubbed over the skin to remove hair. The leaves are good fodder for camels, goats, and donkeys. The pods are used as a vegetable. Sangri acts as a cooling anthelmintic; tonic, cures leprosy, dysentery, bronchitis, asthma, leucoderma, piles and tremors of the muscles. Foliage and pods of khejri are very nutritious, being rich in protein, carbohydrates and mineral matter. Green leaves of *P. cineraria* contain 14-18% crude protein, 13-22% crude fibre and about 6% ash, with a high calorific value of 5000 Kcal.

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