

Local wild plants from the Thar Desert for improved health and food security

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The Thar Desert of western India has provided several 'miracle' plants of immense food and medicinal value. Native communities have adopted a unique indigenous knowledge system for environmental conservation and sustainable management of these natural resources for food security. A good example is Panchkutta, a preparation of mixed fruits from four very common native trees namely Ker (Capparis decidua), Kumat (Acacia senegal), Khejri (Prosopis cineraria), Gonda (Cardia Myxa) and an annual creeper Kachri (Cucumis callosus); the combination is known as Panchkutta. The fruits are sun-dried and then different proportions are mixed for Panchkutta preparation. This paper presents a summary of the properties of Panchkutta, its ingredients and traditional processing methods and use. Panchkutta is a readily available dish and source of nutrients in every village of southern Rajasthan.

Keywords: Thar Desert, indigenous knowledge, *Panchkutta*, medicinal value, processing methods

Introduction

The Thar Desert of western India is the most densely populated hot desert in the world. It lies between 24°40' to 30°12' north latitudes and 69°3' to 76°0' east longitudes, covering an area of 210 016 square kilometres or about 64.1 percent of Rajasthan State. Traditional knowledge, coupled with local culture and religion has played a major role in the development and preservation of the Thar Desert's ecosystem (Bhandari 1978). Communities have evolved strategies to live in this most hostile environment. The rural livelihood knowledge system has been a key feature of Thar Desert communities since antiquity. It reflects time-tested knowledge with a proven track record of sustainability especially during natural events like drought and famines. These communities can sustainably manage local biodiversity without harming the desert ecosystem. Moreover, indigenous knowledge can also be used to fulfill socio-economic needs and conserve biodiversity. Local communities have long had a significant interdependence with the environments in which they live.

A number of fruiting trees, shrubs and annual creepers can grow naturally in the desert. Most of the fruits and vegetables of the arid zone are available for a short duration only, hence a very little of the total produce is utilized efficiently and the rest is wasted due to limited processing capacity. Native communities have a unique indigenous knowledge system for environmental conservation and sustainable management of these natural resources for food security. The system relies on preparation of processed produce by mixing dried fruits of four very common trees namely Ker (*Capparis decidua*), Kumat (*Acacia senegal*), Khejri (*Prosopis cineraria*), Gonda (*Cardia Myxa*) and an annual creeper Kachri (*Cucumis callosus*); the combination is called *Panchkutta*. Owing to

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intense sunshine during most of the year, sun-drying of these commodities is very common. This paper presents a summary of the properties of *Panchkutta*, its ingredients, traditional processing methods and use.

Study areas

The study was carried out in Roopawas, Dhamli, Jadan, Kharia, Ketawas and Sodawas villages of Pali District where natural resources were abundant and many people were involved in *Panchkutta* preparation. Approximately 240 households were surveyed using questionnaires, in-depth semi-structured interviews and participatory rural appraisal techniques including focus group discussion; available literature was also reviewed. Information gathered from the survey was triangulated.

Results

Ker {*Capparis decidua* (Forsk), Edgew}

Ker grows well on sand dunes and produces flowers and fruits. Ker fruits at four to five years of age. The fruits are harvested after seven to ten days of fruit setting (5-8 millimetre diameter during March to April). The immature fruits are used for preparation of pickles and so forth after processing. The ripe fruits are sweet but acrid in taste and thus not used as table fruit but are enjoyed by children and rural tribes. The flower buds are cooked as pot-herbs. The fruits are a rich source of protein and minerals. The unripe fruits are also a rich source of proteins (8.6 percent) and vitamin C (8 milligrams/100 grams pulp).

Processing for value-added products: Because of their acrid taste, the fruits are not utilized directly but only after processing. The tender fruits are harvested and the stalks are removed. The fruits are then stored in an earthen pot by mixing curd (250 grams) and salt (50 grams) per kilogram of fruit; water is added till the fruits are properly embedded and then the pot is kept in a sunny place after closing the lid. Water is drained after four days and the process is repeated three to four times till the fruits have a flat and salty taste. The processed fruits can be utilized directly for preparation of pickles etc or can be dried for off-season utilization. The recovery rate is about one-fourth, i.e. 1 kilogram of fresh immature fruit yields about 200-240 grams of processed dried fruit. Based on size, three relative grades of processed Ker are available in the market – big, medium and small. The smaller fruits are more tender and of better quality than the bigger fruits. The processed fruits are stored either in pots or in plastic containers while processed dried fruits are stored in polyethylene bags.

Food: The flower buds and immature green fruits of Ker are pickled, cooked and consumed as vegetable substitutes. They are also cooked as ‘vegetables’ with the fruits of *Prosopis cineraria* (Sangri) and seeds of *Acacia senegal* (Kumat).

Oil: The seeds of *C. decidua* contain 20.3 percent oil of high quality. The oil consists of 68.6 percent unsaturated fatty acids and 31.4 percent saturated fatty acids. The oil is edible after processing.

Medicinal uses: Local communities believe that *C. decidua* has the following medicinal properties:

- Stomach ache: Soak fruits in saline water for ten days, dry and make a powder. Take a spoonful orally twice a day.
- Diabetes: Take two spoonful of the powder of the de-seeded fruit orally.

- Constipation: Soak fruits overnight. Dry them and grind into a fine powder. Take a spoonful of the powder orally every morning.
- Toothache: Tender shoots and leaves when chewed relieve toothache.
- Rheumatism: Cook the chopped fruit (3 kilograms) along with jaggery (500 grams) in ghee (500 grams). Take the preparation (30 grams) twice a day for a month.
- Eczema: Make a paste from the bark of Ker and leaves of Mamejava (*Enicostema littorale* Bl.). Mix in equal quantity. Apply the paste to the infected area.

Paste made from fresh young leaves and tender shoots is applied to burns and inflammations, whereas dried and powdered leaves are used as antidotes against poison and as a cure for joint problems.

Khejri (*Prosopis cineraria*)

Khejri also known as Kalp Taru is another plant species found in the Thar Desert. The tender pods, eaten green or dried after boiling, are called Sangri locally and used in the preparation of curries and pickles. When ripe the pods are sweet and contain 9-14 percent crude protein, 6-16 percent sugar, 1.0- 3.4 percent reducing sugars and 45-55 percent carbohydrate (Jindal *et al.* 2000). The pods are also used as feed for animals. The tree provides excellent fuelwood and charcoal. The wood is hard and reasonably durable; it has a variety of uses for house building and making utensils. The multiple uses of Khejri are shown in Table 1.

Table 1. Multiple uses of khejri

Plant part	Uses
Main trunk	Quality timber for furniture and implements
Lopped branches	Dried branches as fuelwood and fencing material
Leaves	Stall feed for livestock
Dried green pods	Green and dehydrated pods as 'vegetable' constituents of <i>Panchkutta</i>
Mature pods	Cattle feed
Dried ripe pods	Fresh consumption on a limited scale, can be mixed with wheat flour for making chapattis, preparation of cookies, cattle feed
Inflorescence	Blood purifier, for skin diseases, to safeguard against miscarriage
Stem bark	Tanning; treatment for boils, leprosy, dysentery, bronchitis, asthma, leucoderma, piles, tumours and scorpion sting/snake bite
Root	Root bark for tanning, thick roots for agricultural implements, thin roots as fuelwood
Gum	Postnatal use, glue

The leaves are considered as excellent fodder. The green leaves contain 14-18 percent crude protein, 13-22 percent crude fibre, about 6 percent ash, 44-59 percent nitrogen-free extract, 0.28-0.9 percent phosphorus and 1.5-2.7 percent calcium.

Harvesting and yield: Usually, the Khejri plant flowers during spring, February to March, and the tender pods are ready for harvesting in April to May. Although flowering and fruiting are influenced by agro-ecological conditions and management practices, in general pods are ready for harvesting within 20 days of fruit setting. The green tender pods at the papery soft stage can be harvested for Sangri purposes while the ripe pods can be harvested for preparation of cookies. The dried ripe pods are called Khokha. A

fully grown (30 to 50 years) and unlopped tree produces about 5 kilograms of air-dried pods and about 2 kilograms of seeds (Nath *et al.* 1993). The pods are graded into different stages according to size and maturity for further processing. The tender pods fetch better prices in the market than mid-mature pods but both can be utilized as fresh 'vegetables'.

Processing for value-added products: Pod drying is commonly practised by communities in western Rajasthan. The pods are washed in water thoroughly in order to remove dust and other inert material adhering to the surface. Pods are blanched in a 2 percent salt solution then sun-dried. Dehydrated pods are packed in gunny bags, and in polyethylene bags can be stored for more than 12 months without deterioration.

Societal aspects: The *Khejri* plant provides food and fodder for millions of poor people in the desert. Besides its multiple utility, it has economic, cultural and socio-religious value. In Rajasthan, cutting of *Khejri* is strictly prohibited and damaging the tree is considered sacriligious.

Kumat (Acacia senegal)

Acacia Senegal, locally known as Kumat, is a multipurpose tree grown primarily for gum but plays a secondary role in agricultural systems, restoring soil fertility, stabilizing sand dunes and providing fuel and fodder. Dried and preserved seeds are palatable and commonly used by people as a 'vegetable' as it is a good source of protein.

The foliage and pods are browsed by sheep, goats and camels. Leaves contain 10-13 percent digestible protein and 0.12-0.15 percent phosphorus, while the pods contain 15 percent digestible protein and 0.12-0.14 percent phosphorus. Seeds contain fat, which is used both for medicine and for soap-making. Leaves and gum are used to treat gastritis disorders, haemorrhage, ophthalmia, colds, diarrhoea, as an emollient and an astringent; the gum is considered an aphrodisiac. The socio-economic importance of Kumat for the production and trade of Gum Arabic as well as use of its leaves pods as forage and its ecological requirements are well recognized (Chandra *et al.* 1994).

Harvesting and yield: Fruits (pods) ripen at the end of September to November. At the time of maturity, some of the pods start to split and the colour turns from green to yellowish or brown; after harvesting of pods from trees, seeds can be separated. On average 17 Q seeds can be obtained from one hectare of plantation. Another important product of this tree is Gum Arabic. The best period for gum tapping is when the trees start shedding their leaves after turning a yellowish colour, i.e. usually when the winter season sets in, which coincides after mid-October or early November. Gum Arabic exudes from the duct of the inner bark; it is also tapped in the hot season (May to June) when the trees are stressed.

Processing for value-added products: Its seeds are used for preparing *Panchkutta* and curry or can be fried and salted to improve taste. Seeds are dried in Rajasthan especially by tribal people for subsequent use as 'vegetables' in the off season. They are dried after blanching with saltwater for a few minutes. For processing, fully ripe pods are selected followed by extraction of seeds and blanching in a 3.0 percent salt solution with dipping of seeds in the same salt concentration for eight hours. Water is drained and seeds are dried in the shade and packed in polyethylene bags. These seeds can be stored safely for up to six months at room temperature. Polyethylene bags of dried seeds are sold in the market as a mixture for *Panchkutta* and otherwise.

Lasoda (Cordia myxa)

Lasoda (*Cordia* spp.), also known as ‘the cherry of the desert’, owing to its higher productivity, suitability to adverse soil and climate conditions and high processing value, is now becoming popular as a monoculture as well as in agroforestry systems in arid and semi-arid regions (Chandra *et al.* 1992). Flowering takes place from March to May with new leaves. In Rajasthan, flowering occurs in March to April. Young plants produce 5-10 kilograms of green fruit while a developed plant yields nearly 50 kilograms of fruit. *Lasoda* trees are also known for their shade during the hot summer; it is planted around fields or orchards as windbreaks to protect orchards from hot and cold winds and also to provide additional income. Lac insects can also be reared on *Lasoda* plants. Twigs are used as fuelwood. Fibre obtained from bark is used for caulking boats. The *Lasoda* kernels are used for curing ringworm.

Fruit: The tender fruits are mostly used as a ‘vegetable’. They are also dried for consumption in the off season. Half-ripe fruits make a tasty broth. Mucilage obtained from half-ripe fruit can even be used as an alternative to paper glue. Fruits can make an excellent pickle that is effective against indigestion. Ripe fruits are eaten fresh and used for preparing liquor. Ripe fruits are full of vitamins and regular use supplements hair growth and prevents baldness. Fruits have profound medicinal value and are considered to have antihelmentic, diuretic, demulcent and expectorant properties.

Leaves: Leaves are used as fodder for goats and cattle during famine and contain about 12-16 percent crude protein and 16-27 percent crude fibre. Leaves are also used for preparation of eating vessels and for wrapping cigarettes. Leaf preparations of several species of *Cordia* are used in traditional medicine as remedies for osteoarthricular disease.

Processing for value-added products: Tender fruits cannot be stored for long periods at room temperature as they turn yellow and become unsuitable for consumption. They require cleaning, grading and blanching for consumption purposes. The fruits are blanched in solution containing NaCl (1 percent) + sugar (1 percent) at 100°C for eight to ten minutes followed by sudden cooling in tap water and dipping in 0.2 percent KMS for 30 minutes. In homes, fruits are generally blanched with 1 percent NaCl solution. The destoning of fruits is also required. The destoned pulpy halves of the fruits are either sun-dried or put in mechanical driers. The dried pieces are packed in polyethylene bags and can be used for cooking after rehydration.

Kachri (Cucumis callosus)

Kachri belongs to the Cucurbitaceous family and grows throughout Western Rajasthan. It is extremely drought-resistant and its roots go deep in search of water (Chaudhary 2004). Thus it survives naturally in water-deficient areas. It grows naturally on common lands and pastures during the rainy season in Rajasthan and its fruits are very sour and acidic. Hence it is used as one of the choicest ‘vegetables’ in combination with others. As it is produced in bulk during monsoons, it is traditionally preserved by drying. It is dried by cutting the fruits into thin slices and boiling in water for three to four minutes before drying. Other drying methods include peeling the whole fruit, boiling in water for three to five minutes and then drying in open sun for two days.

Kachri powder is used as souring agent along with other spices to make a multispace and is also used as a mouth freshener. Powder is used for treating stomach pain, gas, nausea, vomiting, constipation and diarrhoea. Indigenous people use *Kachri* pieces soaked in whey to cure a variety of gastric and digestion problems.

Panchkutta

In desert regions only limited vegetation is available, often for a short duration only, hence people of the region have developed different survival strategies and identified food crops which can survive harsh conditions and improve health. *Panchkutta* is a unique example of utilizing all available food resources with the aim of ensuring year-round nutritional security and making use of some of the ingredients which otherwise are non-palatable. The proportion in which each ingredient is mixed and hammer-milled to a coarse mixture has evolved over the ages. Table 2 lists the common proportions of different ingredients. Lasoda and Ker have an acrid taste, whereas seeds of Kumat have distinct flavour but an unacceptable taste; however when they are mixed with Khejri and Kachri the mixture is relished by local people. It is important to note that Kumat is rich in protein and fat, Kachri is rich in fat and minerals, Khejri and Lasoda are good sources of fibre, and Kachri and Ker are good sources of carbohydrate; their unique combination makes *Panchkutta* a balanced dish. Moreover each ingredient has its own medicinal value, thus when taken in a mixture this also provides health benefits.

Table 2. Approximate composition of Kachri, Ker, Khejri, Lasoda, Kumat and Panchkutta (grams/100 grams)

Nutrient	Kachri	Ker	Khejri	Lasoda	Kumat	Panchkutta
Moisture	8.3	10.9	6.7	9.9	10.5	8.7
Protein	2.2	12.4	17.1	9.3	33.3	16.0
Fat	10.0	5.8	1.7	5.1	9.1	5.6
Ash	11.4	5.3	4.5	4.1	4.5	5.6
Fibre	9.5	12.4	22.5	24.7	10.3	17.6
Carbohydrate	58.5	53.2	47.5	46.9	32.3	46.5
Sources	Goyal and Sharma (2008)			Ali (2011); Chaudhary (2004)	Banerjee et al. (1988); Chaudhary (2004)	

Conclusion

The vegetation in deserts is a unique blend of perennial grasses, hardy shrubs and scattered small trees. These perennial systems are the lifeline of the desert and sustain humans and livestock, even during drought or near famine situations. Such vegetation is dominant in hot arid ecosystems and adapted to the harsh climates of arid and hyper-arid regions. It is a primary source of food and fodder for the rural masses in areas with low tree cover and has the potential to provide products useful to local people as well as industry. The local rural population in various extreme environments has identified many plants since time immemorial and *Panchkutta* is a unique product of identified desert plants that is rich in proteins, carbohydrates and all essential nutrients. It can be stored for a long time and consumed at any time of year. Apart from its role as food it has many medicinal properties.

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