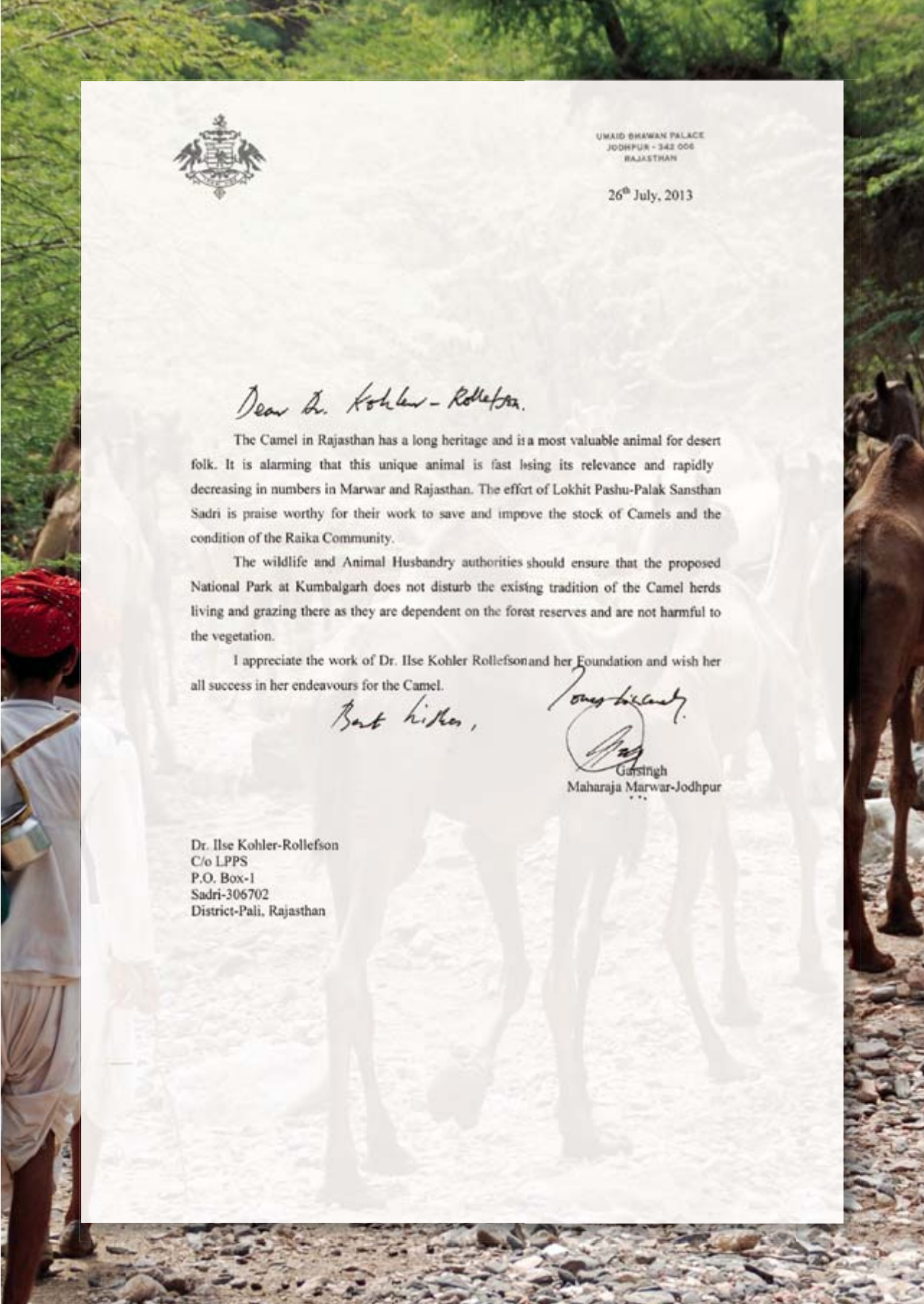
The camels of Kumbhalgarh

A biodiversity treasure

LPPS
Lokhit Pashu-Palak Sansthan



UMAID BHAWAN PALACE
JODHPUR - 342 006
RAJASTHAN

26th July, 2013

Dear Dr. Kohler-Rollefson,

The Camel in Rajasthan has a long heritage and is a most valuable animal for desert folk. It is alarming that this unique animal is fast losing its relevance and rapidly decreasing in numbers in Marwar and Rajasthan. The effort of Lokhit Pashu-Palak Sansthan Sadri is praise worthy for their work to save and improve the stock of Camels and the condition of the Raika Community.

The wildlife and Animal Husbandry authorities should ensure that the proposed National Park at Kumbalgarh does not disturb the existing tradition of the Camel herds living and grazing there as they are dependent on the forest reserves and are not harmful to the vegetation.

I appreciate the work of Dr. Ilse Kohler Rollefson and her Foundation and wish her all success in her endeavours for the Camel.

Best wishes,

Gajsingh
Maharaja Marwar-Jodhpur

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C/o LPPS
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PHOTO © ILSE KÖHLER-ROLLEFSON

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Editing and design Kate Hardy

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LPPS
Lokhit Pashu-Palak Sansthan

'The wildlife and animal husbandry authorities should ensure that the proposed National Park at Kumbhalgarh does not disturb the existing tradition of the camel herds living and grazing there as they are dependent on the forest reserves and are not harmful to the vegetation.'

His Highness Gaj Singhji
Maharaja Marwar-Jodhpur

'The camels and camel herders of Kumbhalgarh form a vital and vibrant partnership in the local agricultural landscape. It is of utmost importance to preserve and further strengthen this unique heritage.'

Dr Ganesan Balachander
Director, ATREE – Ashoka Trust for Research in Edology and the Environment

'Biodiversity conservation can succeed in the long run only when it builds on the knowledge, rights, and participation of local communities.'

Ashish Kothari
Coordinator, India's National Biodiversity Strategy and Action Plan process

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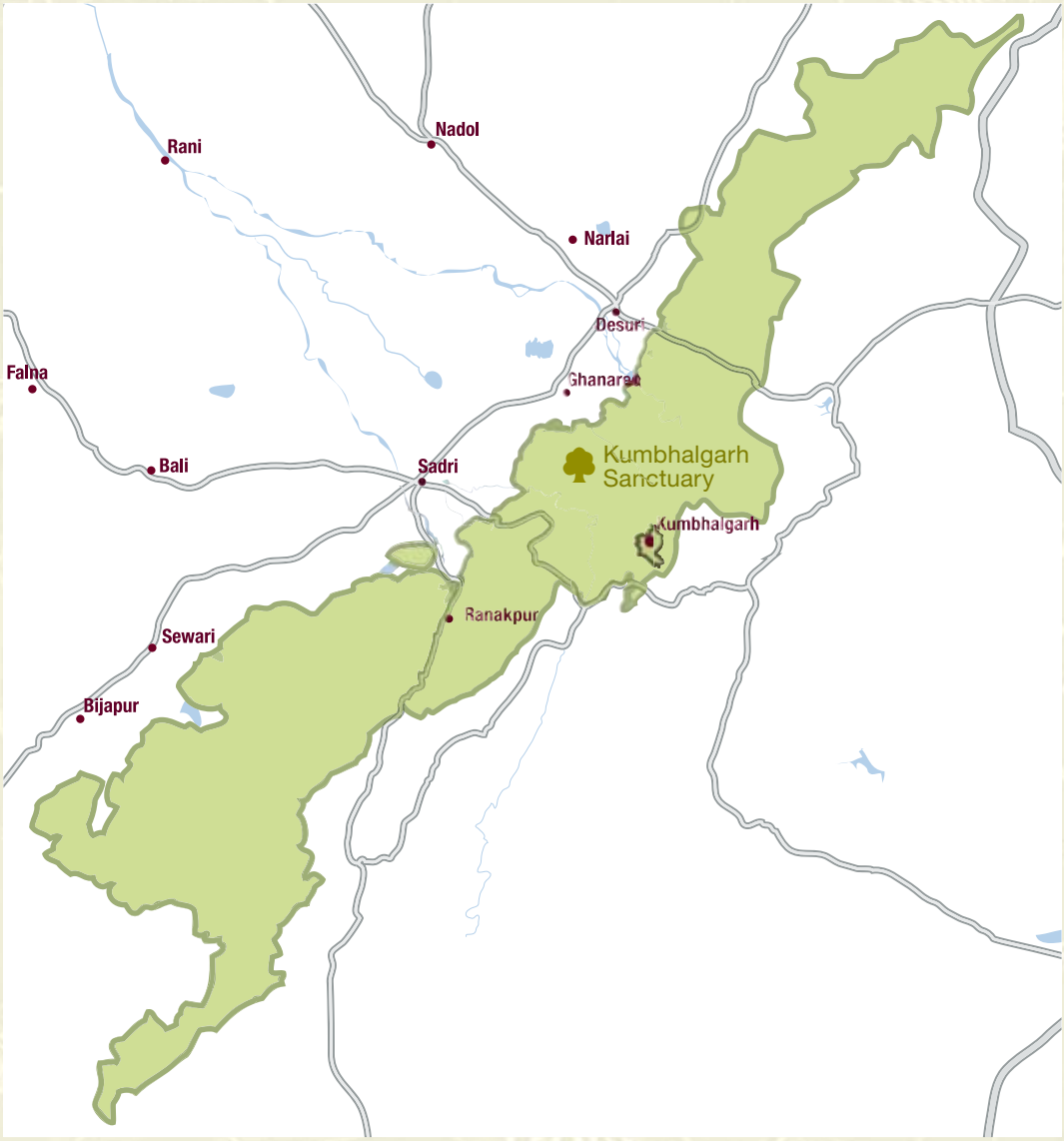


Introduction

Safeguarding the biocultural heritage of Kumbhalgarh

The Kumbhalgarh camel herding system is globally unique, part of the biocultural heritage of the landscape as well as an inimitable example of a sustainable human-animal relationship.

The Kumbhalgarh Wildlife Sanctuary extends over 562 square kilometre of reserved forest along the northern escarpment of the Aravalli Hills. Overlooked by the famous Kumbhalgarh Fort, the area has a rich history and is inhabited by tribal people belonging to the Rawat, Grassia and Bhil communities. It also forms an important resource base for the people in the peripheral villages, most notably as a grazing ground for their livestock (cattle, buffalo, sheep, goats, and camels). Despite its history of sustained use, the sanctuary is famous as the home of leopards and wolves, sloth bear and grey jungle fowl, besides a host of other wildlife.

In February 2012, it was announced by the Rajasthan government that the Kumbhalgarh Wildlife Sanctuary is to be converted into a National Park. Conversion could bring with it eviction of the people who live in the park, as well as restriction of access to customary users. This would have mixed consequences for the ecology and wildlife in the protected area, as the ecologies of the forest and the surrounding plains are deeply intertwined, and the wildlife is also dependent on the livestock.

Globally unique, locally sustainable

One of the distinctive and very special features of the Kumbhalgarh landscape is the existence of a traditional camel herding system which is globally unique and represents an inimitable example of a sustainable human-animal relationship as well as a historic agro-ecological system. The purpose of this booklet is to describe this system, so as to ensure that it is retained as an integral part of the management system for the planned National Park.

PHOTO ©iStockphoto.com MARIO SAVOIA

The camels of Kumbhalgarh
A unique herding system

The camels of Kumbhalgarh are a surviving example of an ecologically balanced and sustainable herding system, part of the identity of the Raika community and the cultural heritage of the region.

The Raika origin myth

"Shiva was meditating. Waiting for him to be finished, his consort Parvati started shaping animals out of clay to pass the time. She created one particularly strange creature that had five legs. Then she asked Shiva to blow some life into it. He refused, saying that such a misshaped animal would be beset by a host of problems. But Parvati persisted in begging him. Finally, Shiva gave in. He folded the fifth leg over the animal's back and then said 'uth' – get up! The camel got up and walked away. After some time it started making a lot of trouble and creating a big nuisance. Parvati once again came to Shiva and asked for his help. She requested him to make a man that could look after the camel. Shiva then rolled of a little bit of skin and dust from his arm and out of this he made the first Raika."
Census of Rajmarwar (1896)

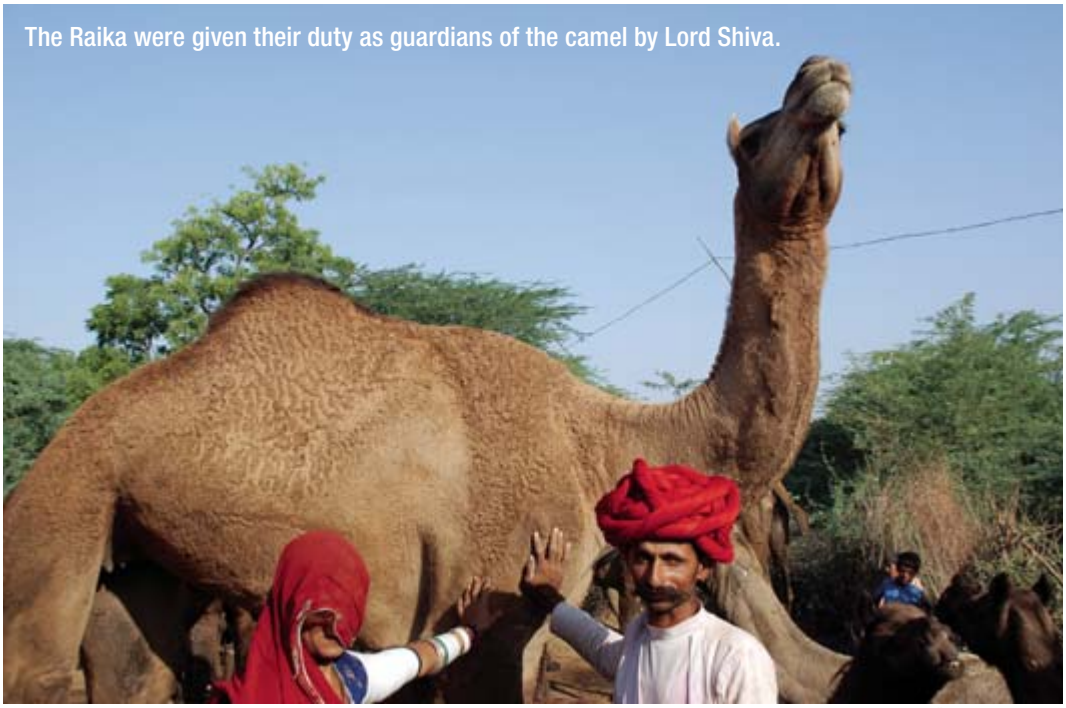
The people

The camel herders of the Kumbhalgarh area belong to the Raika community, with only one or two exceptions. The Raika are a Hindu caste and are regarded as the proverbial camel herders of Rajasthan. According to their myth of origin, they were tasked with the responsibility of looking after the welfare of the camel by Lord Shiva, after his wife Parvati had shaped the first camel out of clay.

Based on this myth of origin, the older generation of Raika to this day feel a sense of responsibility for the welfare – and the survival – of the camel. If asked about his identity, a Raika will reply that he is a camel herder.[1]

The Raika are the only camel herders in the world that have a taboo on camel slaughter and eating camel meat. Traditionally, they also banned the sale of female camels, the sale of milk and wool, and the processing of camel milk. The only marketable products were young male camels and camel manure, although there is now growing interest in developing camel products for sale.

There are two different groups of Raika: the Maru and the Godwar Raika. They have quite similar customs, but do not marry amongst each other. The Maru Raika are concentrated around Jodhpur



The Raika were given their duty as guardians of the camel by Lord Shiva.

PHOTOS © ILSE KÖHLER-ROLLEFSON

Local Raika herders have traditionally grazed their camels in the Kumbhalgarh landscape during the monsoon months as part of their migratory herding system.

60% drop in camel numbers in Rajasthan since 1995

decline in camel herds

and in Pali district while the Godwar Raika, who were termed Pitalia or Chalkia in the British Gazetteers, inhabit the southern part of Pali district, Jalore and Sirohi districts.

The keepers of the Kumbhalgarh camels are mostly Godwar Raika, although some are Maru Raika. Godwar and Maru Raika are easily distinguished by the differences in turbans. While the Godwar Raika wear either red or white (in the case of the older men) turbans, the Maru Raika wear a range of colours. There is also a difference in the size and the way of tying the turban. Raika women wear striking clothes and jewelry which differ between the Godwar and Maru groups.

The camels

The camels of Kumbhalgarh are one-humped or dromedary camels *(Camelus dromedarius)*. The Kumbhalgarh camels may not represent a distinct breed, but they could be classified as a sub-set of the 'Marwari' breed, extant in the districts that once constituted the kingdom of Marwar, which was ruled by the Maharajah of Jodhpur. They are extraordinarily tall, sometimes having a withers height of more than two meters, and may actually represent the tallest camels in the world. Their colours range from reddish brown to almost black and the Raika distinguish about six different

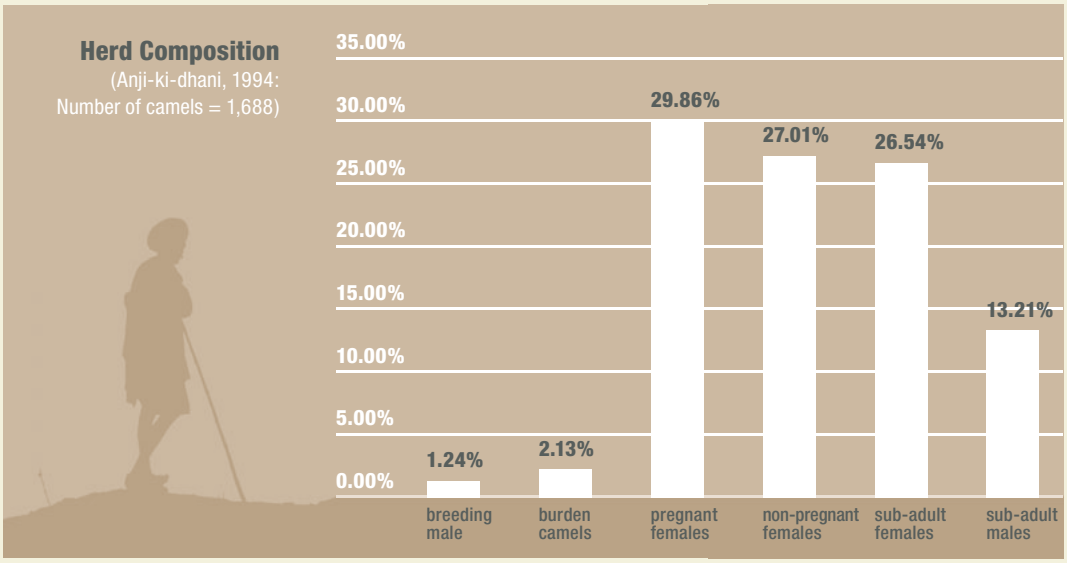
The Kumbhalgarh camels are among the tallest in the world, and may even be the tallest.

PHOTO © TIM CUSHAN

colour shades *(kala, buri, rathi, teli, heli, pila, dhola)*. Very dark/blackish is the most popular colour.

Declining herds

The numbers of camels grazing in the Kumbhalgarh area has declined significantly over the last couple of decades. This is in line with the general trend of the camel population in Rajasthan and India. Lokhit Pashu-Palak Sansthan has monitored the camel population in Bali and Desuri tehsils



since 1995 by means of household surveys. There are now only a few herds left and most of these have become smaller. According to our survey data, the numbers have decreased by more than 60% in Desuri and Bali tehsils.

Currently around 300-550 camels are estimated to seasonally use the forest that comes under the purvey of the National Park. The number fluctuates throughout the year, as offspring are sold and new camels are born.

Herd structure

Raika camel herds are predominantly composed of female animals, as the male calves are sold annually at the Pushkar Fair in October or November. Only one male camel is required for breeding up to 100 females. As camels give birth only every second year, this means that a male camel typically serves about 50 female camels per year. Male breeding camels do not compose more than 1% of the herds.

A 1994 survey of 69 herd owners in Anji-ki-dhani about the composition of their herds revealed that the total camel population of 1,688 head consisted of 13.21% sub-adult males, 26.54% sub-adult females, 29.86% pregnant females, 27.01% lactating females, 1.24% breeding males and 2.13% beasts of burden.

Pregnancy rates vary considerably between the years. The average birth interval is two years, which suggests that around 50% of the female camels in a breeding herd will be pregnant, but this can be skewed. It may happen that in some years only 25% of the adult females are in calf, but this is usually followed by a year in which up to 75% will conceive. More rarely it can happen that a female becomes pregnant in two consecutive years, but this only occurs in around 5% of animals.

The Raika usually arrange for she-camels to be covered at the age of four years, so they are five years old at their first calving. However, there are exceptions, and

vanishing genes

The camel is globally recognised as one of the most important species for future food security in arid zones. In Rajasthan, bloodlines developed over centuries and superbly adapted to local conditions will be lost without conservation support.

camels can conceive earlier than that. In a lifetime, camels usually give birth four times, sometimes five times, but never more than six times.

Although the Raika have traditionally had a caste ban on selling female camels, they do sell those that are sterile or fail to conceive for several years. It is rare to find a camel that is more than 18 years old.

The agro-ecology

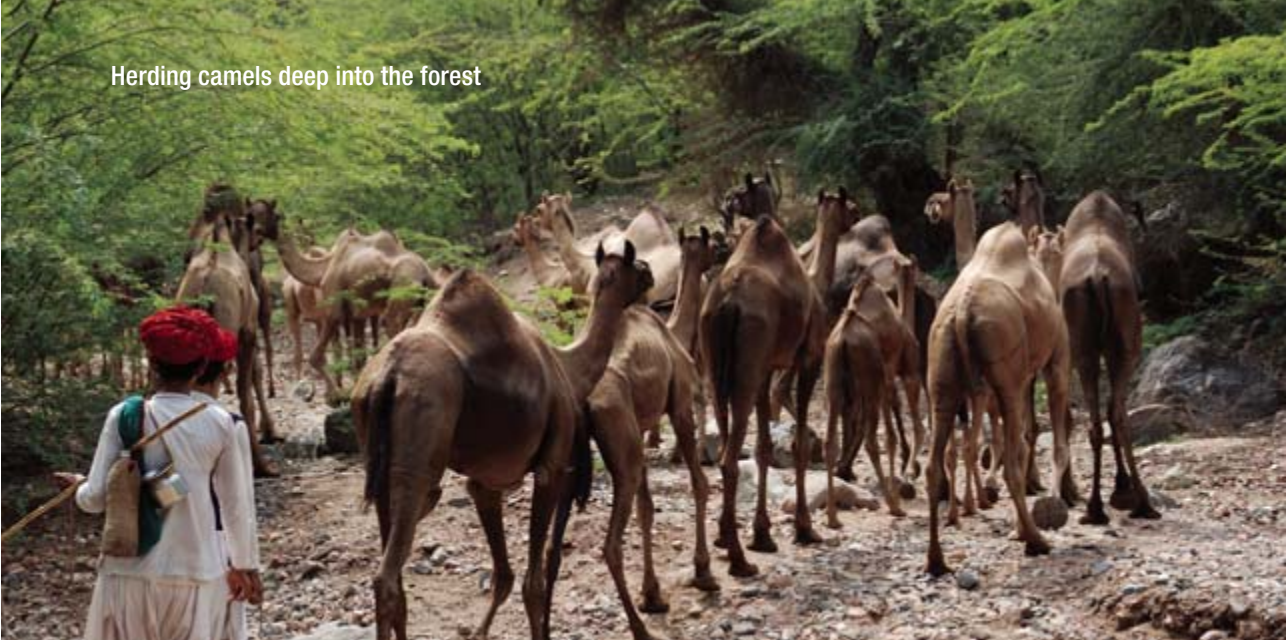
The purpose of the Kumbhalgarh camel breeding system is to produce male camels as work animals. Additional products are camel milk, wool, and dung. For this reason, herds are composed mostly of female camels. In each herd there are usually one male camel for breeding and one or two young males that have been trained as beasts of burden.

The camels basically live off resources that other livestock does not consume and that would not get utilized in their absence. They convert the vegetation into a variety of products which benefit farmers and other people throughout the region and even as far away as Delhi.

These herds are managed in migratory systems. For up to nine months of the year (in winter and summer) they browse and graze on trees and shrubs

A new born baby camel, still wet.

PHOTO © ILSE KÖHLER-ROLLEFSON



Herding camels deep into the forest

PHOTO © ILSE KÖHLER-ROLLEFSON

in agricultural fields. During the three months of the rainy season (July, August, September) they depend entirely on the forest for feeding.

Since their numbers are relatively small, and due to their special feeding behaviour, they are in balance with the agro-eco-system – in fact, they intensify it by recycling nutrients from the forest to the fields.

The management system

The camels are kept in herds of between 12 to more than 100 camels. They are herded both in the Aravalli forest and in the adjoining agricultural fields. They mainly feed on trees and shrubs, but seasonally also on grasses and creepers. During the winter, they browse on the trees in fallow fields, but also on *gauchars*[2] and *orans*[3], as well as in hilly areas and along river beds.

During the rainy season from June to September, the camels depend entirely on access to the forests of the Aravalli Hills for sustenance. At this time of year, the fields are cultivated, so there is no space for them there.

Foraging trees, shrubs and grasses

From the beginning of January until the end of April, unt-kantalo is a favourite and important food. Other plants which are less frequent and eaten in smaller quantities are hingota *(Balanites roxburghii)*, kolvan *(Dicrostachys cinerea)*,

Most important camel fodder plants

Mid-June – mid-October *Chaumasa* (monsoon) Rainy season	Mid-October to March *Siyala* (winter) cold season	March to mid-June *Unyala* (summer) dry season
kumtia *Acacia senegal*	babool *Acacia nilotica*	khejri *Prosopis cineraria*
dhav *Anogeissus pendula*	neem *Azadirachta indica*	orabjia *Acacia leucophloea*
kolvan *Dicrostachys cinerea*	unt-kantalo *Echinops echinatus*	
kankeda	ker *Capparis decidua*	

jal *(Salvadora persica)* and gundi *(Cordia gharaf)*. At the end of February and the beginning of March, some of the main fodder trees (khejri, babool, neem) drop their leaves and there may be a shortage of food. But at this time of year the irrigated fields are harvested and become available for grazing. During the hot season *(unyala)*, orabjia, khejri, ker, endro and bar are the most important fodder plants.

During the monsoon (*chaumasa*), the camels feed on dhav (*Anogeissus pendula*), kanter *(Capparis separia)*, kumtia (Acacia senegal), bordi *(Ziziphus nummularia)*, khairna *(Wrightia tinctoria)*, but occasionally also farangani *(Grewia flavescens)*, golra *(Lannea coromandelica)*, khair *(Acacia catechu)*, sarguro *(Moringa concanensis)*, neem (*Azadirachta indica)*, endro *(Bauhinia racemosa)*, kolvan *(Dichrostachys cinerea)* and jinja *(Mimosa hamata)*. The forest trees provide excellent nutrition for the camels.

Migration routes

The routes that the camel herders take during the year are variable. The Godwar Raika tend to return to their villages every night, although they may also stay absent for 3 or 4 nights to make use of grazing that is beyond their daily radius.

By contrast, the Maru Raika of Anji-ki-dhani near Jojawar cover fairly large distances and are on permanent migration. They only return to their home twice a year during Holi and Diwali. They are very mobile and, while grazing outside the forest on fields and *gauchars* they change their camping site on average every second night; never staying anywhere longer than 5-6 days. They do not have problems finding a place for their night halt as their dung is much in demand by the farmers (although this may be changing).

They move most frequently in April and May. When the rains come, at around the end of June, they have to leave the fields as the farmers start cultivating. They then move to the edge of the forest and remain almost entirely stationary for

Annual cycle of an Anji-ki-dhani herd in 1994/1995

Month	Frequency of moves	Owner of agricultural field, by caste	Main forage plants	Type of grazing land	Notes
December	19	Rajput, Raika, Jat, Mali, Meghwal	bar, babool, khejri	field, gauchar,	Nadol, Dhani, (Desuri tehsil. Barkana)
January	16	Jat, Kumhar, Rajput, Mali, Raika	bar, babool, kantalo	field, gauchar, oran	Reaching the most southern point of migration (Bisalpur)
February	12	Rajput, Jat, Mali, Ghanchi, Jat	kantalo, bar, keir	gauchar, oran, field, hill	Turn towards the north; reach most eastern point (Khiwandi)
March	12	Jat, Mali, Ghosi, Rajpurohit, Raika	bar, kantalo, khejri	field, oran, gauchar	Near Rani
April	20	Raika, Jat, , Rajput, Charan	bar, khejri, keir	field, gauchar, oran	13.4-15.4 at home for shearing; reaching most northern point of migration
May	21	Rajput, Jat, Raika	bar, khejri, keir	gauchar, field, oran	Near Nadol
June	20	Raika, Jat, Rajput, Rajpurohit	bar, babool, khejri	gauchar, field,	Kenpura, Muthana
July	11	Jat, Mali, Suthar, Raika	bar, khejri, dhav kater, bordi, kheino, kumthia	gauchar, field, forest	On 17 July, herd is stationed at entrance to forest
August	–	Jat	dhav, kater, bordi	forest	
September	–	Jat	dhav, kater, bordi	forest	
October	1	Jat	dhav, kater, bordi	forest	Change of camp site on 1st October
November	1	Jat, Ghosi	dhav, kater, bordi	forest	At the end of November return to the fields

about four months. The owners of the fields on which they are staying fence of a night resting place for the camels which they change every couple of days to achieve systematic distribution of dung and fertilization. During the day, the herds wander into the forest where they have their customary grazing places – often quite deep in the forest, so it can take them several hours to reach them.

After Diwali (around the end of October), when the crops have been harvested, the agricultural fields are once again open and the cycle starts again.

Several families – often related to each other – form herding groups and keep their camels together throughout the year. Only men are involved in herding, but they take regular turns to spend some time at home in their villages. Some families hire herders to do the work for them. For 100 camels, about 4-5 men are required.

PHOTO © GEMMA JULIA

Tea is drunk from the folded leaves of the Aak tree, *Calotropis procera*, which the camel herders carry in their turbans.

During the breeding season when the babies are born and breeding takes place, this number may rise.

The herders only carry minimal equipment on migration: a herding stick, a blanket for sleeping, a milking vessel *(chada)* and half a dozen ropes for tying down the camels in the night. They also carry some cooking utensils. They subsist on camel milk and on food provided by the owners of the land on which they are camping.

Daily routine

In the morning, the herders that have spent the night in the field milk one or more of their lactating camels and make tea. Any visitor will be offered tea and made to join them. Traditionally, the tea is drunk from folded leaves of the Aak plant *(Calotropis procera)*. The Raika always carry a small supply of Aak leaves in their mighty turbans. The Raika usually just milk a small number of their camels and only for immediate consumption. Most camels need their young in order to let down their milk, but some of them have a close relationship to their herder and can readily be milked. These camels are

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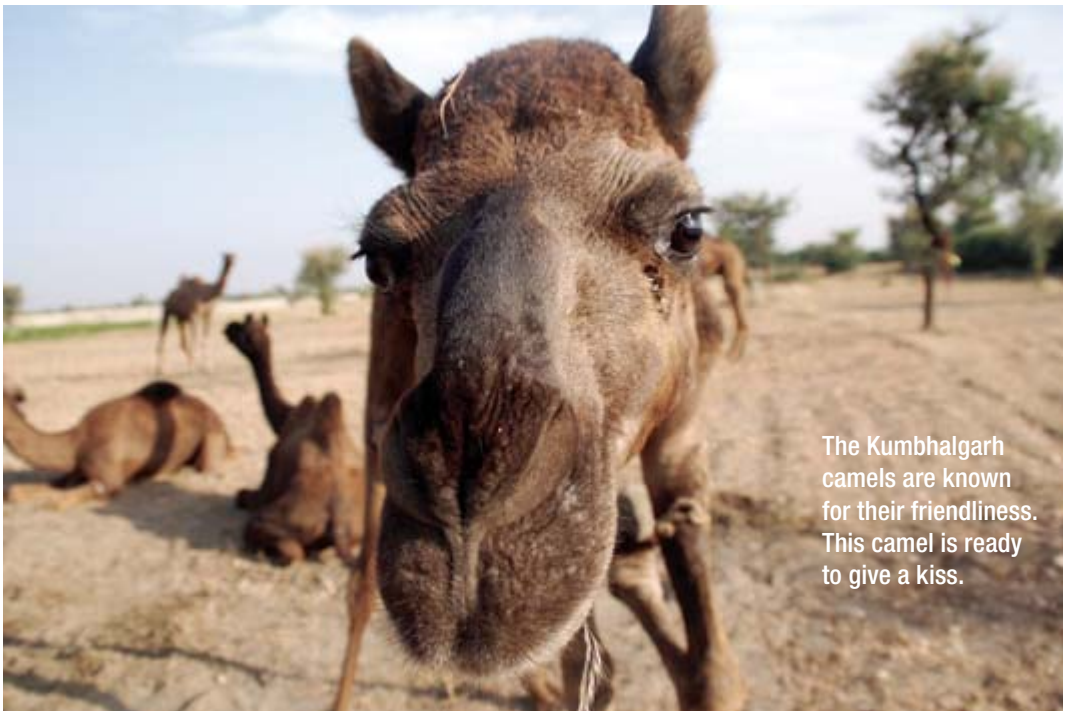


The Kumbhalgarh camels are known for their friendliness. This camel is ready to give a kiss.

PHOTO © ILSE KÖHLER-ROLLEFSON

called *hathvar*. It is astonishing to see how camels are milked without any restraint.

After having tea, the herders go around and inspect and treat any animal which may have an injury from a thorn, a skin disease or a swollen foot. They carefully disinfect wounds and have a whole range of traditional treatments for them.

Grazing takes up most of the day, usually around twelve hours from 8 or 9 o'clock in the morning to about 9 o'clock in the evening. Some of the members of the herding group may take care of different chores, such as watching over the new-born babies or making arrangements for the next night's stay.

Access to water is not normally a problem. Camels are watered at least daily, but sometimes also twice daily from wells, rivers and irrigation channels.

Once a month, usually during new moon, the herds are given salt. For 100 camels about 20 kg (or half a maund) are necessary. This amount of salt is distributed on four charpoys whose legs are tied and on which camel hair rugs *(baql)* have been spread out. The camels fight and jostle to lick up the salt within a couple of minutes.

Friendliness of the camels

The Kumbhalgarh camels are amazingly friendly. Even if a stranger visits a herd and stands amongst it, the female camels will walk up to him or her and give a friendly nuzzle, as if to say hello. There is no other place in the world where one can have such an experience. The friendly behaviour of the Kumbalgarh camels has been reported in the national press *(The Hindu)* and in international media including the BBC.

The annual cycle of the camel breeders

The important events in the camel herders' year are correlated with Hindu holidays. They divide the year into three seasons. The rainy season, *chaumasa*, lasts from mid-June to mid-October. Diwali marks the transition to the cold season, *siyala*, which lasts until the Holi festival in March. This is followed by the hot season, *unyala*.

The breeding season corresponds to the *siyala*. At the end of October, the male breeding camels start to go into rut. As the pregnancy length for one-humped camels is a bit less than 13 months, the birthing season lasts from December to March, although sometimes babies are born outside this time period. This is the most labour-intensive part of the year. It finishes at Holi when communal shearing takes place.

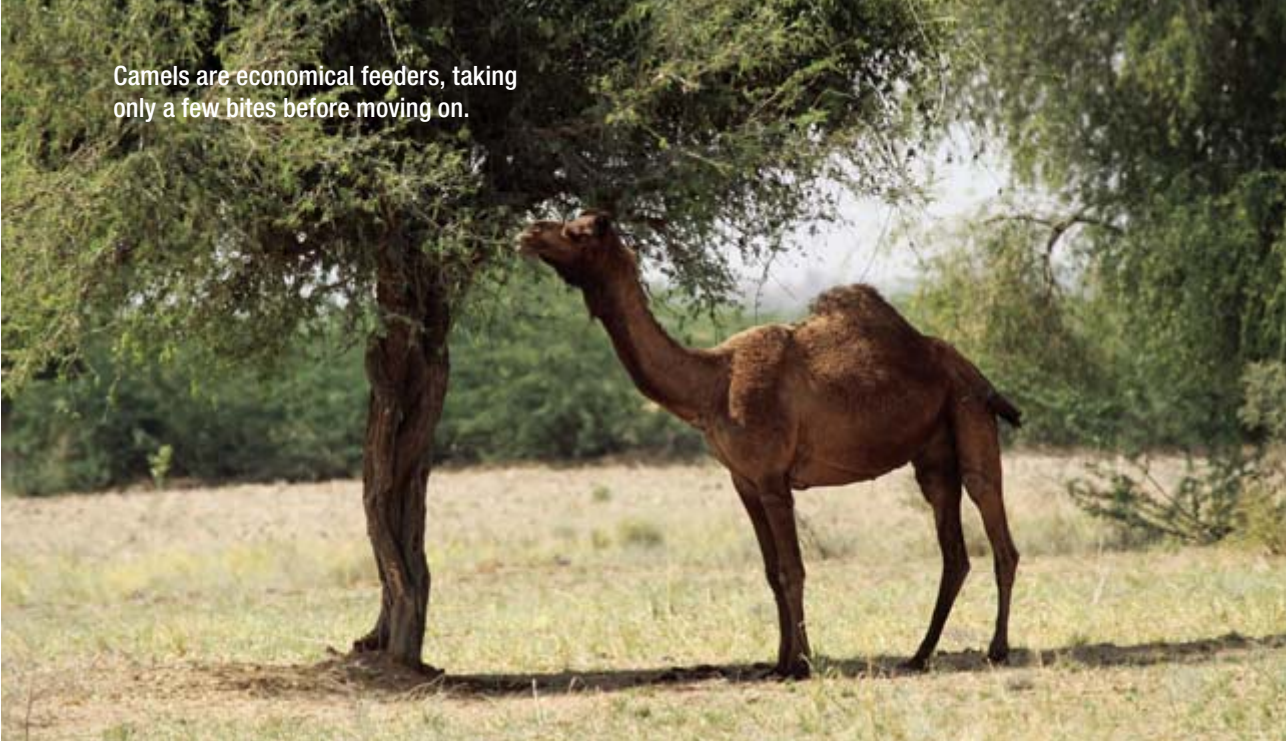
During the *unyala*, the work load is less. The herds do not need much supervision, but this is also the bottleneck in the feed supply. Then, when the first rains come at the end of June and beginning of July, the camels have to leave the fields. The Raika station their herds just at the edge of the forest and take them inside during the day, but return at night. They camp on the fields that are to be cultivated and receive remuneration in kind from the farmers. Every three or four days, the camping site is shifted slightly to achieve an even distribution of dung.

During the *chaumasa*, the risk of camels becoming infected with trypanosomiasis is high. This is a disease brought on by a blood parasite that is transmitted by biting flies and is similar to malaria in humans. It leads to emaciation, death and often causes miscarriages in the female camels.

In the beginning of October, the preparations start for the annual sale of the young male camels at the Pushkar Fair which takes place after Diwali. The animals selected for sale are assembled at Anji-ki-dhani and then driven from there to Pushkar – a trek that takes eight days and covers about 20-30 kilometres per day. The camels reach Pushkar a few days before the official start of the Fair.

Recycling of nutrients into the soil

The farmers believe strongly in the fertilizing effects of camel dung and many prefer it over chemical fertilizers. Crop yields can rise by 50% from the application of camel dung. They also note that camel dung has a slow release effect and is beneficial for up to three years.



Camels are economical feeders, taking only a few bites before moving on.

PHOTO © KATE HARDY

Camels and the vegetation

The camel breeders firmly believe that camel browsing is good for the vegetation. They observe that browsing actually stimulates tree growth and leads to the development of new green shoots. While no scientific studies are available from India about the impact of grazing by camels on plants, detailed studies are available from the Sahara in Africa. Scientists here came to the conclusion that 'Unlike slow-moving cattle and intensively grazing goats, which crop plants down to the roots and even climb into trees to forage, camels are economical feeders that never overgraze the vegetation. They keep on moving while feeding... No matter how rich or how poor the quality of the vegetation, camels take only a few bites from any one plant before moving to another.'[4]

Camel feeding behaviour

Camel feeding behaviour is unique. As also observed by the scientists above, they disperse widely which is also an advantage for the vegetation. Because of their great height, camels can feed on trees up to about 2.5 m. The food intake of camels is low in relationship to their bodyweight. About 5-10 kg of dry matter is sufficient for them to perform a day's work, and camels are much more efficient than cows in converting vegetation into milk. While cattle require 9.1 kg of dry matter to produce one liter of milk, camels need only 1.9 kg to produce the same amount, and are thus almost five times more efficient. This is because camel herds disperse over huge areas and never eat up plants completely, but take only one or two bites before wandering to the next one. Their flat padded feet do not carve up the surface so they do not cause erosion.

‘Unlike slow-moving cattle and intensively grazing goats, which crop plants down to the roots and even climb into trees to forage, camels are economical feeders that never overgraze the vegetation.’[4]

According to the Raika, they do not go back to the same grazing patch on which they have fed before, but always select fresh areas.

‘Camels do not degrade the vegetation; in fact they may actually conserve it. It has been shown that in an area where camels have grazed on grass, the vegetation has fared far better than in a similar area that has been protected from camels.’[5]

Camel forage plants

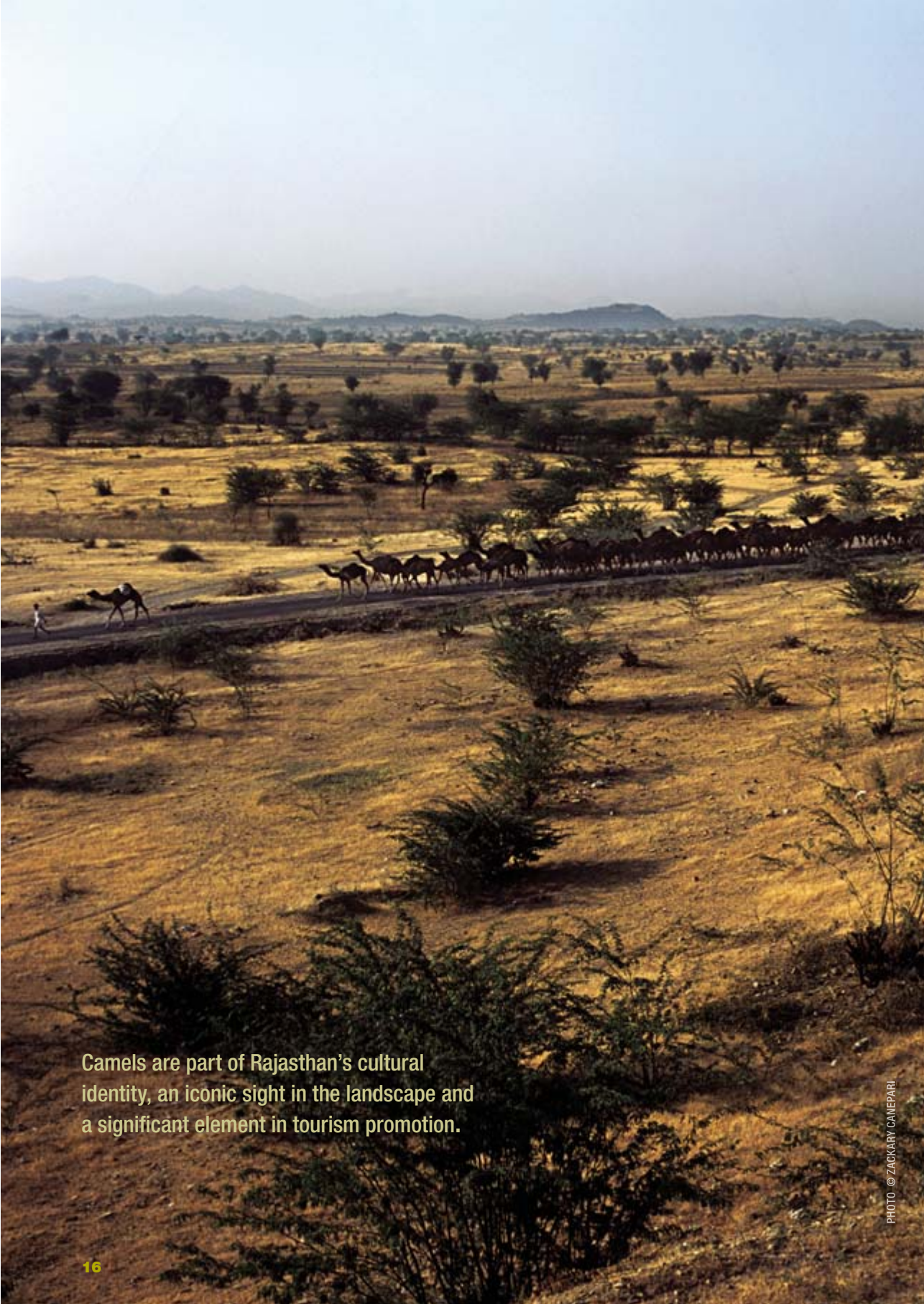
Camels eat 36 different types of trees, shrubs, and grasses – that’s what the camel breeders in Rajasthan and Gujarat say! This information is to be taken with a grain of salt, as ‘36’ is something of a magic number.[6] But camels certainly live off a very diverse range of vegetation. For camels in the Sahara, ecologists documented 114 principal food plants.

Some of the plants are eaten frequently and represent the mainstay of the diet. Others are available or eaten only in certain months or seasons. Camels also have decided preferences, and will consume some of the plants only in dire emergency. A description of important camel forage plants is contained in the Appendix.

Traditional knowledge

The Raika have a tremendous amount of traditional knowledge about managing camels in tune with the eco-system. They know what is going on in the minds of the camels. The camels themselves usually determine in which direction they go for grazing. With the start of the rainy season, they are irresistibly drawn towards the forest area. They march into the forest in single file and then disperse once they have reached an open area.

PHOTO © GEMMA JULIA



Camels are part of Rajasthan's cultural identity, an iconic sight in the landscape and a significant element in tourism promotion.

PHOTO © ZACKARY CANEPARI

The Raika are very well aware of the effects of the various trees and shrubs on the health of the camels and on the quality and taste of the milk.

They avoid grazing on the same patch on consecutive days and always try to seek out fresh areas, a behaviour which prevents pressure on and damage to the vegetation. The Raika are very well aware of the effects of the various trees and shrubs on the health of the camels and on the quality and taste of the milk. The milk is sweet when the camels feed on bordi or ber (*Ziziphus sp.)*, but it becomes salty and bitter if the camels consume neem *(Azadirachta indica)* leaves.

The Raika are also very knowledgeable about the use of plants for treating both camels and people. Almost all of the trees in the forest have some kind of medicinal effect. This is reflected in the camel milk which has positive effects for a range of illnesses.

Symbiosis with wildlife

The populations of some of the key wildlife species for whose protection the Kumbhalgarh Protected Area was designed have grown significantly during the last two decades. For instance, the population of leopards increased from 54 to 82 (52%) between 1991 and 2005, while sloth bear numbers grew from 105 to 162 (54%) during the same time period.[7] Scientists have attributed this to the presence of livestock in and around the sanctuary which serves as a critical source of food for these predators. Analysis of leopard scat showed that of 38 samples that were collected, 27 contained the remnants of livestock.[8] Quite frequently, the Raika report that a baby camel, or other young animal, gets stalked by leopards. However, they are not unduly concerned about this as it is seen as the way of nature.

PHOTO © NANCY ABEIDERRAHMANE

The camel milk revolution

The health benefits of camel milk are beginning to be understood by scientists and medical researchers. The FAO estimates that the global camel milk market could be worth as much as $10 billion within a decade.

In California, camel milk is a premium product renowned for its health benefits. In the United Arab Emirates, Camelicious milk is a recognised quality brand. And Swiss chocolatiers have helped a Dubai-based company, Al Nassma, turn camel milk powder into chocolate for the luxury market and make camel milk chocolate a best-selling airport souvenir.

Desert dairy pioneers

Tiviski, Mauritania's pioneering desert dairy, was set up in 1989 and has led the way in small-scale desert dairy production ever since. The first dairy to collect raw milk from camel herders, they set out to operate to international quality control standards from the outset. The first to produce pasteurized camel milk in the desert and the first dairy to put camel milk in a carton, they have gone on to produce many more firsts over the years including camel yoghourt, camel ice cream and Caravane camel cheese. Today, they operate rural collection centres where camel milk is collected from pastoralists alongside cow and goats milk. The milk is checked, weighed and chilled, and then taken to the modern Tiviski processing plant in insulated tanker trucks. Tiviski salesmen deliver directly to shops to ensure that the quality chain is unbroken and products are looked after all the way to the consumer.

Pasteurized camel milk in the Sahara

Traditionally, the Touareg people of Niger did not sell the milk from their camels. Camel milk was a gift for friends and visitors, or for poor people, and it was difficult for camel farmers to join the market system. All that changed after a technical proposal by a CIRAD expert[9] led to the creation of a private camel milk factory in the desert town of Agadez. The camel milk is collected from nomad camps in an area 40–50 km around the town. This small-scale dairy is able to market pasteurized camel milk and cannot satisfy demand. The establishment of the factory helped assure a future for local herds and provided the impetus for the development of milk production, further work on milk quality, and the development of additional camel milk products.

India's market share is less than 0.1%. Government dairies are not currently accepting camel milk. India's new Livestock Development Board has no provision for camels.

Camel products
Supporting local herds

PHOTO © ROLEX AWARDS/XAVIER LECOULTRE

For the camel herds around Kumbhalgarh to survive, herding families need to be able to develop supporting sources of income, so that camel breeding can retain its appeal as a way of life and a viable career option for the younger generation. Creating opportunities in tourism, milk production and camel products can help assure the future. Tourism could provide a critical part of the mix.

One of the problems faced by Raika camel breeders and their families around Kumbhalgarh is that the income for those who depend on camel breeding alone has declined and can become so precarious that young herders have to leave home to work in the cities and help support the family. This drives a trend towards urban migration. Boys of fifteen or younger may be sent to the cities to work in low-skilled jobs. Living conditions are often poor, and outcomes mixed; although some go on to find success, few are equipped to make life choices or deal with the pressures of city life at such a young age. Not all young people want to leave their family and way of life. Developing other sources of income can support family herds so that leaving the land becomes an option rather than a necessity.

Changing attitudes

The Raika historically had a taboo on camel slaughter and eating camel meat. Traditionally, they also banned the sale of female camels, the sale of milk and wool, and the processing of camel milk. The only marketable products were young male camels and camel manure. Attitudes are slowly changing, and the success of pilot projects has led to growing interest in developing milk production and other camel products for sale. Camel milk production requires capital investment to bring the right products to market,

PHOTO © ALICIA SULLY

but small scale processing is already established locally.

Milk

Camels produce milk that is not only nutritious and tastes good, but also has clinically proven therapeutic qualities. Containing ingredients that act as an immune-system booster, it is becoming very popular with urban people. It also contains an insulin-like substance that is not broken down in the stomach and immediately lowers the blood sugar level. is recommended by doctors for diabetes patients and lactose intolerant individuals. A recent study has indicated that it can also be helpful for autistic children and milk is already being sent to Delhi for that purpose. Camel milk ice cream is already much in demand by tourists, and the development of a camel milk health drink for sale to visitors is another possibility.

Wool

Camel wool is also harvested and processed in the villages around Kumbhalgarh Sanctuary into a range of products, especially dhurries and fine wool shawls. Other products, such as such as mobile phone covers, also find a ready market. The camels are shorn in March, around the time of Holi. The yield per camel is about 0.6 to 1.0 kg. The quality of the wool of young animals is very fine.

Camel dung paper

The production of extremely bio-diverse paper from camel dung has been pioneered in Sadri and a small processing plant has been set up. The paper contains the seeds and other remains

$10 billion

FAO estimate of the global market for camel milk

of the 36 foraging species of the camel. The paper is made into notebooks and attractive greetings cards designed by local artists.

Camel milk soap

Small-scale artisanal production of soaps made using camel milk has been established in Sadri and helps provide income for members of the Raika community. The soap is sold to tourists and is also establishing a reputation as a beauty product and a growing clientele amongst women who appreciate its moisturising properties. There is potential to expand and diversify production.

Camel milk soap

PHOTOS © ILSE KÖHLER-ROLLEFSON

Camel dung paper notebooks and greetings cards are produced in Sadri

PHOTO © DIPTI DESAI

Conserving biodiversity

The Godwar Raika community has established a Biocultural Community Protocol which documents the role of the Raika in conserving the landscape.

The Raika Biocultural Protocol records the role of the Raika community in the management of biological diversity, including their livestock breeds and general ecosystem management, and documents the complex links between their animal genetic resources and ecosystem health. It covers grazing rotation systems, which maintain soil fertility and propagate the seeds of trees and other plants; lopping of selected trees and browsing to stimulate new foliage; grazing of dry grass and other ground cover to prevent forest fires and keep a check on termite numbers; and activity to control the spread of harmful invasive species. Their pastoral lifestyle has helped to develop the co-evolved ecosystem of Rajasthan's forests which they have traditionally conserved and sustainably used. In areas such as the Kumbhalgarh forests, they accept some loss of livestock to leopards and wolves, as a natural consequence of living in balance with the environment.

The Raika BCP has had a significant amount of international attention. Community Leader Mrs Dailbai Raika has travelled to Canada, Kenya, Germany and other countries to present and speak about the Raika Biocultural Protocol.

Biocultural Protocols help communities achieve recognition of their customary rights and traditional knowledge. A recent IIED briefing paper[10] explains their significance for business and government and their role in local sustainable development. Speaking at the UN biodiversity summit in October 2012, India's Prime Minister emphasized the need to ensure that benefits from traditional resources and knowledge are shared fairly with local communities.

Download the Raika Biocultural Protocol at www.pastoralpeoples.org[11].

The legal framework
Biocultural protocols and forest rights

The Kumbhalgarh camel breeders make an important contribution to the conservation of biodiversity. For this and other reasons they have a number of rights under national and international legal frameworks.

The United Nations Convention on Biological Diversity (CBD) and the Raika Biocultural Protocol

The Convention on Biological Diversity (CBD) came into force in December 1993 and is a legally binding framework to which India is a signatory. This convention recognises the central role of indigenous and local communities in biodiversity conservation through their traditional and sustainable practices and knowledge systems. In Article 8j, the Convention commits its contracting parties to

'subject to national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity ...'.

The Godwar Raika community has claimed status as an 'indigenous or local community embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity' by establishing a Biocultural Community Protocol (BCP). Through this process, they have become aware of national and international laws – such as the CBD – that underpin their right to *in situ* conservation. The Raika BCP has had significant international attention. India's National Biodiversity Authority (NBA) is also promoting Biocultural Protocols.

The Forest Rights Act

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006 received assent of the President on 29 December 2006 and came into force on 31 December 2007. It provides use and conservation rights not only to people living in the forest, but also to seasonal forest users, including nomadic pastoralists if they can provide proof of having had customary use of the forest for three generations or 75 years. The Raika and other communities from the village of Latada have submitted their claims under this Act; many others are in the process of doing the same. In an order dated 15.7.2011 and passed by the Supreme Court in the Godavarman case, the following was decided:

Item No.315 (I.A. No. 2637 of 2009)
'Application is disposed of giving liberty to the applicants to approach the Notified Authority under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 and it is for the Notified Authority to consider their applications and to take appropriate decisions in accordance with law. Petitioners, if so advised, may also approach the State Legal Services Authority for legal assistance.'

PHOTO © HASHIM TYABJI

Walking with nature

One of the most forward-thinking National Park projects in India has achieved international recognition for its community-based management solutions.

Authorities in Satpura National Park in Madhya Pradesh, a tiger reserve renowned for its natural landscapes and wildlife, including an important sloth bear population, needed low-impact tourism solutions which could help integrate traditional communities dependant on forest resources into the management plan.

Community canoes help conservation

One of the concerns for park management in Satpura was the local fishing community around Satpura Lake. A Supreme Court ban prohibiting fishing had left them struggling to survive and bitterly opposed to the National Park. The situation was transformed when the Forest Department worked with the fishermen to introduce canoe safaris on the lake. With expert leadership and training, the canoe safaris have become one of Satpura's biggest attractions. For the fishermen, this has shifted the focus from a subsistence economy and living off the land to a viable and self-sustaining livelihood. For visitors, the canoe safaris are a highlight, providing a unique, gentle and deeply rewarding way to experience the beauty of the National Park as well an adaptive, community-based solution that works.

Walking in the wilderness

The idea of walking in the wilderness as a low-impact tourism activity was already part of development guidelines for Satpura, but placing the emphasis on involving local people and providing expert training has proved the key to success, making a major contribution to conservation in the park. A programme of carefully regulated small-group walking safaris is led by experienced safari guides, who work alongside trained local people from villages within the park. This not only makes it possible to conduct safaris safely and means that tourism can be controlled to avoid pressure on any one area, but brings inestimable benefits in terms of reducing the impact from jeep safaris, providing foot patrols in areas liable to disturbance from villagers, and building local commitment to conservation.

Satpura has achieved international recognition for its innovative conservation initiatives, with positive reporting in national and international media and the model now being considered and adopted by other sanctuaries.

Community-based solutions which are in balance with nature are proving to be the most sustainable conservation choices for the future.

Innovation in tourism

The potential of camels for enhancing the Kumbhalgarh Protected Area

The camel herds of Kumbhalgarh are one of the most unique features of the landscape and an endless fascination for visitors, for whom they represent a completely authentic glimpse of old Rajasthan.

The camels of Kumbhalgarh provide a major tourist attraction and offer an enormous potential for eco-tourism. This is only place in India – and maybe anywhere in the world – where one can visit camel breeding herds and walk among the resting camels. The friendly nature of the female camels is providing an unforgettable experience to tourists.

Camel trekking would provide an eco-friendly way of enjoying nature in the planned National Park and could become its unique selling proposition.

Working closely with the community, there is potential to develop innovative, experiential tourism products of high quality which could achieve international recognition for Kumbhalgarh as the only National Park with expert-led, culturally authentic camel safaris.

An additional attraction is provided by the unique range of camel products that has been developed right here in Sadri.

The camels of Kumbhalgarh have signficant potential for enhancing the landscape and tourism potential of the new National Park.

The development of community-based ecotourism initiatives and training members of local communities as camel safari and nature guides, together with provision for ongoing support and quality control, can deliver low-impact tourism activities which are both conservation-led and community-oriented.

Working with the community there is potential to develop an innovative, experiential tourism product of real quality which could achieve international recognition for Kumbhalgarh as the only National Park to offer culturally authentic camel safaris.

The camels of Kumbhalgarh
Summary and recommendations

- Camels have been grazing in the Aravalli Hills during the rainy season for hundreds of years. They are part of the local eco-system and of the unique Raika culture, renowned for its guardianship of biological diversity and its expertise in animal breeding as keepers of genes.

- The camel population in Desuri and Bali tehsils is very low – it has already reduced by 60-70% in the last 15 years and is set to reduce further or become extinct, unless supportive measures are taken up.

- There is no evidence for camels being harmful to the vegetation. International scientists that have studied camel foraging behaviour have concluded that camel browsing is usually beneficial to tree growth; this observation is also supported by local camel keepers.

- It cannot be excluded that occasionally some temporary damage may occur. However, this is a question of management, and can be prevented, if proper incentives are given.

- A survey should be undertaken and camel numbers and grazing areas determined in a collaborative effort between the Forest Department and camel breeders.

- Implementation of the Joint Forest Management system in Kumbhalgarh should recognise and make provision for the inclusion of the camel herders.

- The Kumbhalgarh camels are a unique selling point for the planned National Park. The most obvious opportunity is in providing camel treks and guided tours on camel back. But more innovative possibilities are also there, such as visits to camel herds, going camel herding and spending a night camping out with the camel herders.

- Such activities could generate extra income for the local people and thereby contribute substantially to increasing acceptance of the National Park. A unique eco-tourism model could be created along progressive approaches for protected area management.

- Lokhit Pashu-Palak Sansthan would be pleased to collaborate with the authorities in developing an integrated and community-based management approach for the National Park.

Endnotes

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1 Srivastava, V. K. 1993. **On Religion and Renunciation: The Case of the Raikas of Westerrn Rajasthan**. Ph.D. Thesis. Cambridge: Faculty of Archaeology and Anthropology, University of Cambridge.

2 *Gauchars* (or ***gochars***) are village-owned pastures.

3 *Orans* are wooded areas that are protected by local deities and in which tree cutting is prohibited.

4 H. Gauthier-Pilters and I. Dagg. 1981. **The Camel. Its Evolution, Ecology, Behavior, and Relationship to Man**. The University of Chicago Press. p. 33.

5 H. Gauthier-Pilters. 1969. **Observations sur lécologie du dromadaire en moyenne Mauritanie.** Bulletin IFAN 31A: 1259-1380.

6 For instance, there are also said to be 36 communities *(chattees kom)* that compose the village population around the Kumbhalgarh Sanctuary.

7 P. Robbins and A. Chhangani. 2009. **Protecting wolves from sheep. People and Wildlife in the Aravalli**. pp. 211-224 in Culture, Polity and Economy (V. Joshi and S. Singh, eds.), Rawat Publications, Jaipur.

8 FES 2010. **Assessment of Biodiversity in Kumbhalgarh Wildlife Sanctuary: A Conservation Perspective**.

9 Duteurtre G., 1999. **La valorisation du lait de chamelle au Niger, bilan et perspectives des opérations menées sur le thème par le Projet filière caméline.** Rapport de mission CIRAD-EMVT n°99-029, Montpellier, 41 p.

10 2012. **Consent and conservation: getting the most from community protocols.** International Institute for Economic Development, London. PDF download at http://pubs.iied.org/17137IIED.

11 Raika Samaj Panchayat, 2009. **Raika Biocultural Community Protocol.** PDF download at http://www.community-protocols.org or www.pastoralpeoples.org.

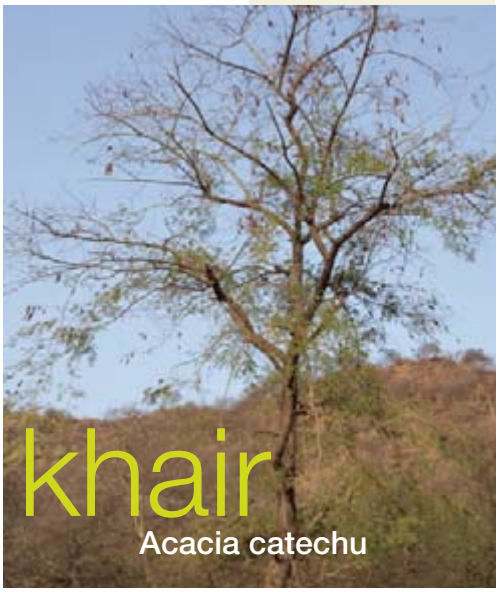
Useful websites

www.lpps.org

www.pastoralpeoples.org

Appendix
Camel forage plants in Kumbhalgarh

black cutch tree



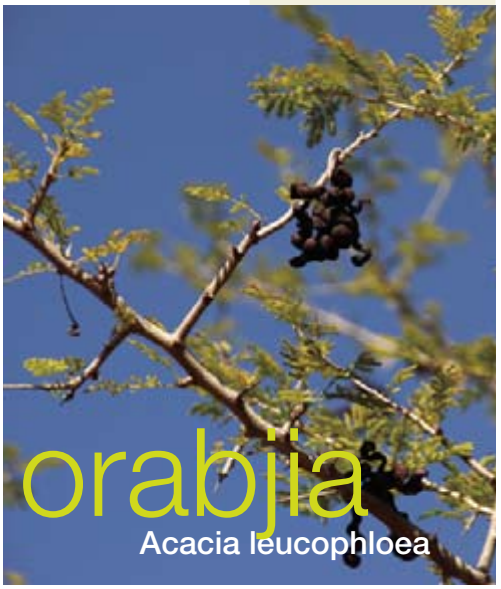
Camels eat both leaves and fruits of the khair tree, especially in the rainy season. It has a positive effect on milk yields. But its numbers have been declining and it has become quite rare.

Flowering period ❀ June to July.

Medicinal uses The medicinal uses for *Acacia catechu* are diverse, playing an important part in Ayurvedic medicine since ancient times. The roots of the tree are used in treating mouth sores, body pains, gravel, bronchial asthma, and indigestion. The bark is especially useful as an astringent as well as a cure for coughs, diarrhoea, cancer, piles, sore throat, ulceration, eczema, and certain forms of leprosy. Most often, an extract is produced by boiling the wood in water and evaporating the resulting brew. In France, *A. catechu* is used in breath-freshening spice mixtures.

Other uses The khair tree has many practical uses. A pale yellow, mucilaginous gum exudes from the tree, yielding one of the best substitutes for true gum Arabic. The wood contains catechin, catechutanic acid, and tannin. The wood is used for making tools and furniture. It is also used in the preparation of *paan*.

white barked acacia



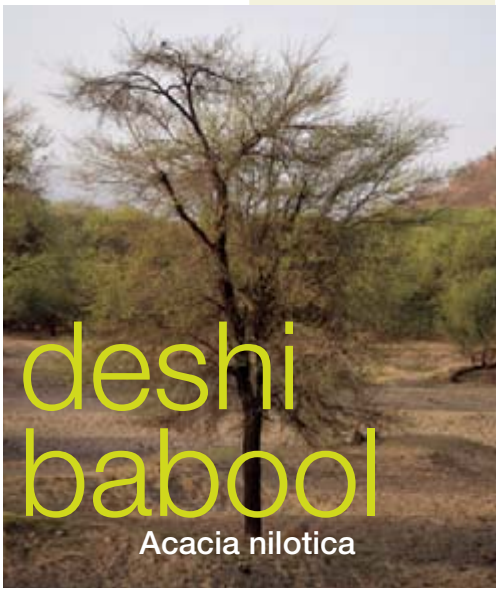
In winter and summer, camels eat both the leaves and pods of this tree whose numbers are declining.

Flowering period ❀ rainy season, late August to October.

Medicinal uses The seeds of this plant are a rich source of minerals such as calcium, magnesium, phosphorus, iron and manganese. The gum is especially useful for indigenous medicine. The bark is traditionally used as an astringent and in traditional treatments for bronchitis, nagging coughs, vomiting, wounds, ulcers, diarrhoea, dysentery, internal and external haemorrhages, dental caries, mouth sores, proctoptosis, stomatitis, and intermittent fevers.

Other uses The gum is used as an emulsifying agent. The bark fibre is used for fishing nets and the wood for tools.

egyptian mimosa



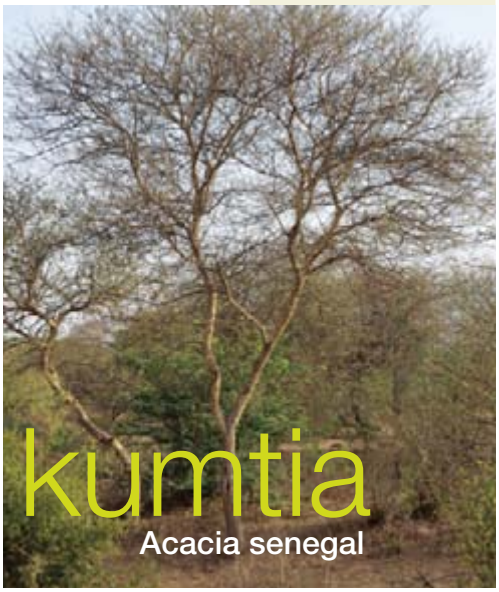
An important, very thorny camel fodder tree, especially in the winter period. Camels eat both leaves and pods.

Flowering period ❀ starting in June, throughout the rainy season.

Medicinal uses *Acacia nilotica* is a popular medicinal plant in many countries. The bark is used to treat coughs and as an astringent, and in remedies for diarrhoea, dysentery, leprosy, asthma, excessive external bleeding, problems related to urination or menstruation, diabetes, infections, allergies, skin ailments, hair related problems, sore eyes, impotency and other ailments. The Masai of Kenya drink a decoction made from the bark as part of a ritual to impart courage or as an aphrodisiac, while the root is said to cure impotence. In West Africa, the gum is used to treat tumours, indurations of liver and spleen, condylomas, and excess flesh. In Lebanon, the resin is mixed with orange flower as an infusion for typhoid convalescence. In Tonga, people use the root as a treatment against tuberculosis. Egyptian Nubians believe diabetics can eat unlimited carbohydrates as long as they also consume the powdered pods.

Other uses Bark and pods are used in tanning and the wood for tools and carving. The gum has uses in printing, dyeing and paper manufacturing.

gum arabic



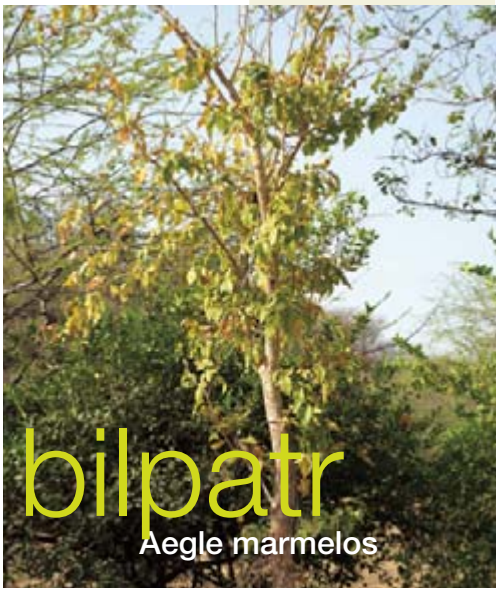
This is a very important fodder plant which makes the milk sweet.

Flowering period ❀ late May and early June.

Medicinal uses Kumtia gum is most often used for soothing mucous membranes of the intestine and to treat inflamed skin. It is also a treatment for excessive bleeding, bronchitis, diarrhoea, gonorrhoea, leprosy, typhoid fever and upper respiratory tract infections. *Acacia senegal* is highly soluble, with low viscosity and a high soluble dietary fiber content and is an important ingredient in nutritional beverages, meal replacement and weight loss products. It is used topically for healing wounds and has been shown to inhibit the growth of periodontal bacteria and the early deposition of plaque. In some cultures the gum is believed to have aphrodisiac qualities.

Other uses Wood for tools, bark fibre for ropes, cordage and fishing nets. The plant is also popular for live fencing.

stone apple



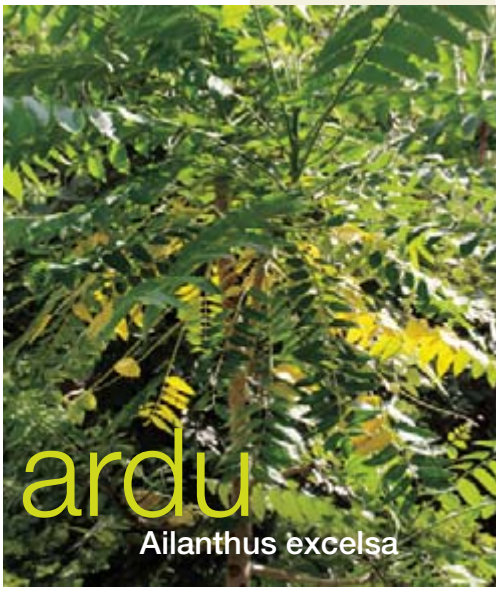
This small tree, which is also regarded as sacred, has a positive effect on milk yields.

Flowering period ❀ late May.

Medicinal uses The unripe fruits are astringent, digestive and stomachic; they are used for diarrhoea and dysentery.

Other uses The wood is very hard and durable. The gummy substances around seeds is used as an adhesive, as a varnish for pictures and for adding brilliancy to water colour paints.

tree of heaven



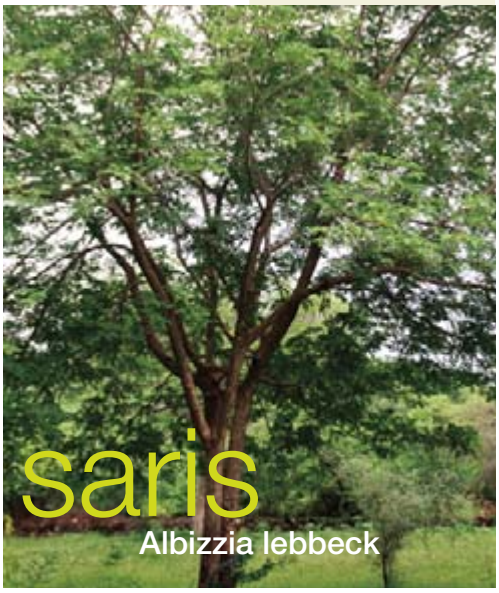
This tree is cultivated by farmers for its leaf fodder. It is accepted by camels.

Flowering period ❀ March.

Medicinal uses The bark of this tree is regarded in India as a powerful fever cure and tonic. It also works as an anthelmintic, expectorans, is antispasmodic, and is used for asthma and bronchitis and as a dysentery treatment. The leaves and bark are thought to operate as a good tonic after hard work. Konkans use extract from the leaves and fresh bark as a remedy for after-pains.

Other uses The wood is used for making toys, small boxes and packing cases.

east indian walnut



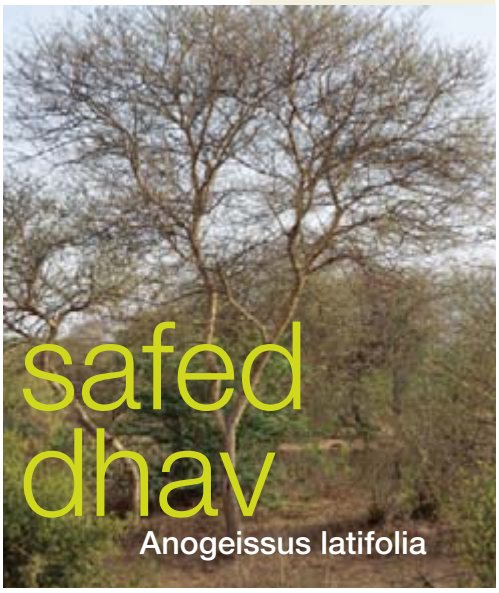
This fast growing medium sized tree is often planted as a source of shade near farm houses. Its pods make a rattling sound in the wind.

Flowering period ❀ April.

Medicinal uses Saris is used as a remedy for leprosy in Indian folk medicine. The bark has astringent qualities and anti-inflammatory effects. In some places it is administered in cases of boils, cough, eye infections and against tumours.

Other uses The dark heartwood of this tree was used for making fine furniture and cabinets in the colonial period and exported as 'East Indian walnut'. It is still used in certain agricultural implements.

axlewood

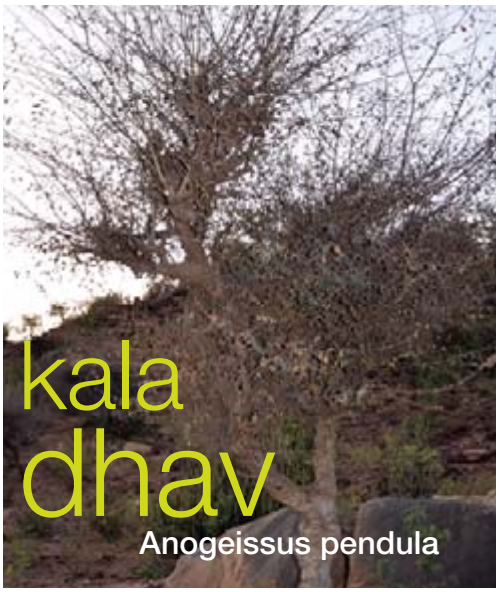


This plant is eaten by camels during the rainy season, although it is not a favourite.

Flowering period ❀ June to September.

Medicinal uses This plant can treat abdominal disorders. The bark is used to take care of wounds, inflammations, diabetes, skin diseases, liver diseases and more.

Other uses The wood is used for furniture, tools, and construction. The gum is used as a substitute for Gum Arabic and in Gum Ghatti (Indian Gum) for sizing papers and calico printing.



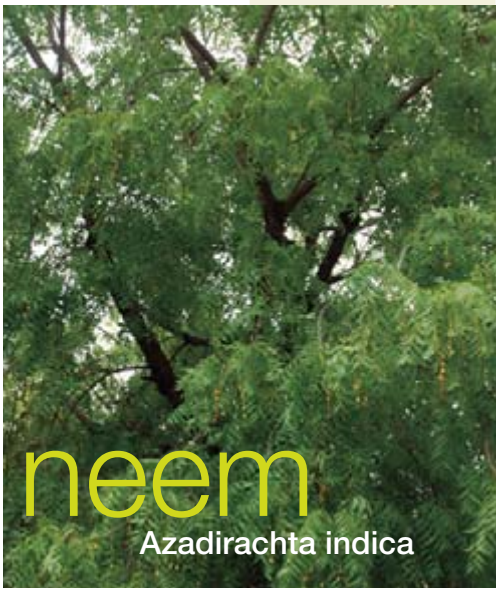
kala dhav

Anogeissus pendula

A valuable fodder tree in the rocky ridges of the Aravalli hills, this tree is popular with camels and makes the milk sweet.

Flowering period ❀ June to September.

Uses It has no medicinal use. Its wood, used for domestic items and agricultural implements, is very tough, but not durable.



neem

Azadirachta indica

The camel is one of the few animals that eat neem, but it makes the milk salty and smelling.

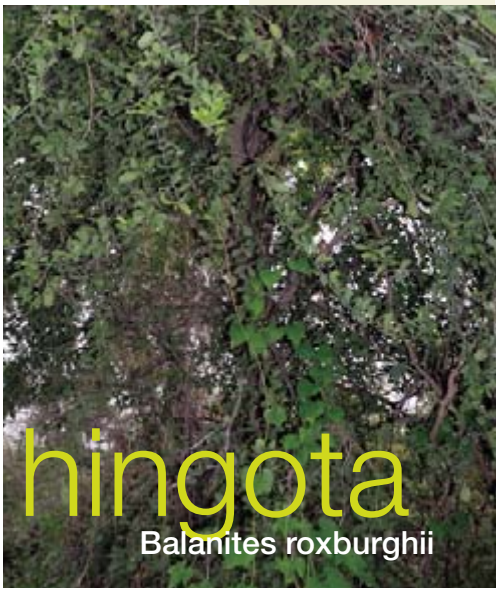
Flowering period ❀ April.

Medicinal uses Neem is famous for a variety of medicinal uses. The products of the tree are anthelmintic, antifungal, antidiabetic, antibacterial, antiviral, contraceptive and sedative.

All parts of the tree have medicinal properties. Neem leaf paste, for example, is a common treatment against acne. Neem can treat fever especially if caused by malaria. It improves eyesight, removes foul odor from the mouth and strengthens gums and teeth. It is useful as a vermifuge, insecticide, astringent, tonic and antiseptic and is given to treat stomach problem, worms and ulcers. The leaves can also be used to treat chicken pox and acne.

Other uses Neem powder is used to keep pests away. Its timber is termite proof.

desert date



hingota

Balanites roxburghii

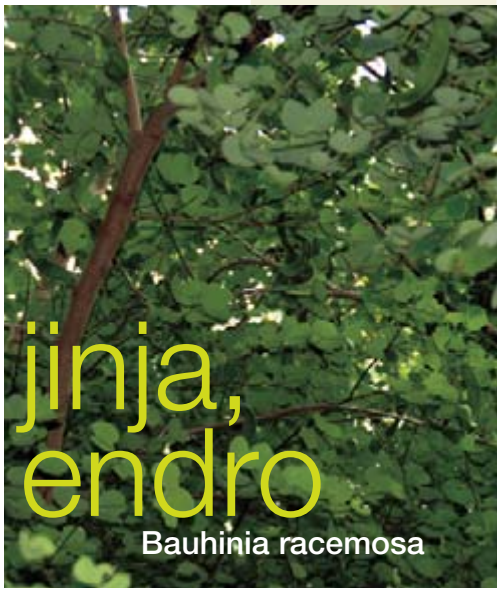
Hingota improves milk yields and it is used locally for treating eye problems and parturition problems.

Flowering period ❀ late April to early May.

Medicinal uses *Balanites roxburghii* is used as an antihelminthis, purgative, vermifuge, febrifuge and emetic. It may be found in remedies for a variety ailments including skin boils, leucoderma, malaria, wounds, colds, syphilis, liver and spleen disorders, and aches. The fruits can treat liver and spleen diseases. The bark is useful against abdominal pains.

Other uses The seeds yield a fatty oil that can be used for soap making. The wood is useful for walking sticks.

Burmese silk orchid



jinja, endro

Bauhinia racemosa

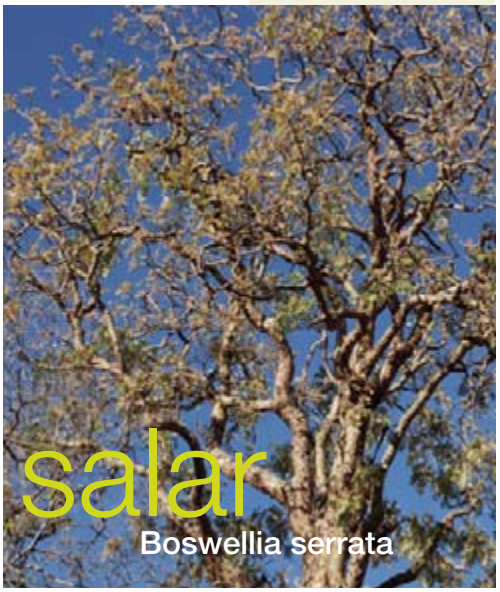
This tree is good for milk yields and makes the milk sweet.

Flowering period ❀ May.

Medicinal uses *Bauhinia racemosa* is widely used in ayurvedic practices: the bark treats malaria, dysentery, and diarrhoea. It is also used as an astringent. Other uses for this plant are bleeding hemorrhoids, excessive coughing, heartburn, hematuria, indigestion, menorrhagia, skin diseases, tuberculosis and intestinal worms. It is said that a decoction made from the root also prevents obesity and also that the tree has anti-tumour properties and can be used to treat the first stages of cancer.

Other uses The bark is used as a source of strong fibre.

frankincense tree



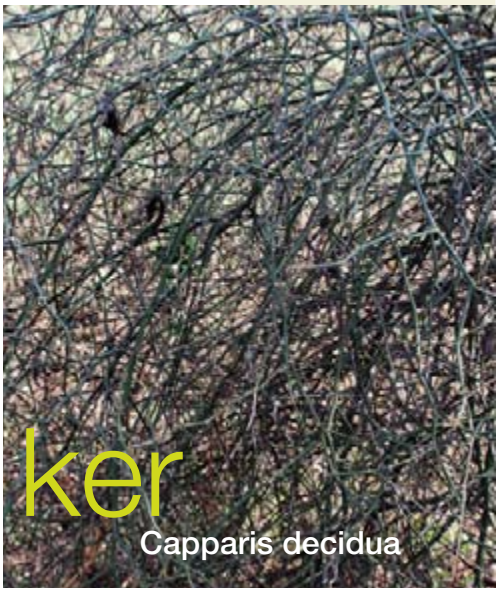
This tree is not that popular with camels and is eaten only occasionally during the winter and rainy season.

Flowering period ❀ December to March.

Medicinal uses This plant has been used over centuries for treating arthritis and is also an ingredient in the manufacture of the supposed anti-wrinkle agent 'Boswelox'. The *Boswellia serrata* extract 'Boswellic acid' has been studied for anti-neoplastic activity, especially in experimental primary and secondary brain tumours, indicating potential efficacy from in vitro and limited clinical research. The gum works as an anti-inflammatory agent when applied externally. Internally, it has expectorant effects and improves immunity, and is also used in treating asthma.

Other uses The wood is used for paper production, plywood, veneer, cheap furniture, boat masts, toys and carving. It is a source of turpentine and resin (Indian frankincense) and is used as incense as well as in high-grade paints, varnishes, lacquers, and printing inks.

bare caper



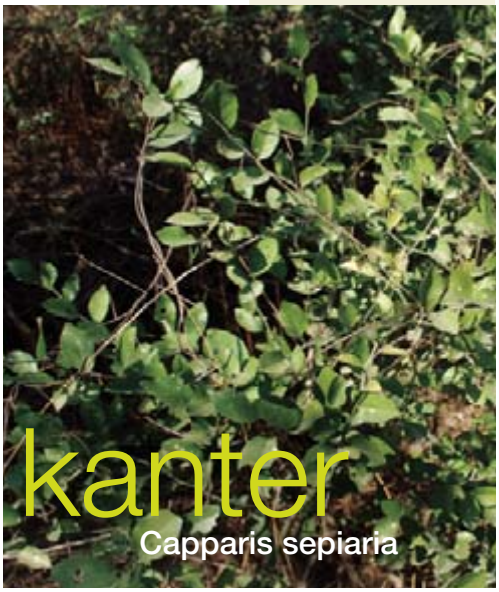
The camel feeds on the whole plant during the winter months.

Flowering period ❀ from April to June and August to October.

Medicinal uses The plant has applications in traditional medicine and herbalism for treating swelling, asthma, vomiting, intestinal worms, cardiac debility, gout and other conditions. The bark is used for coughs and asthma.

Other uses The spicy fruits are edible and are used for preparing vegetables, curry, and fine pickles. The flower buds are also eaten. The wood is used to make axles for cart wheels and for tool handles.

wild caper bush



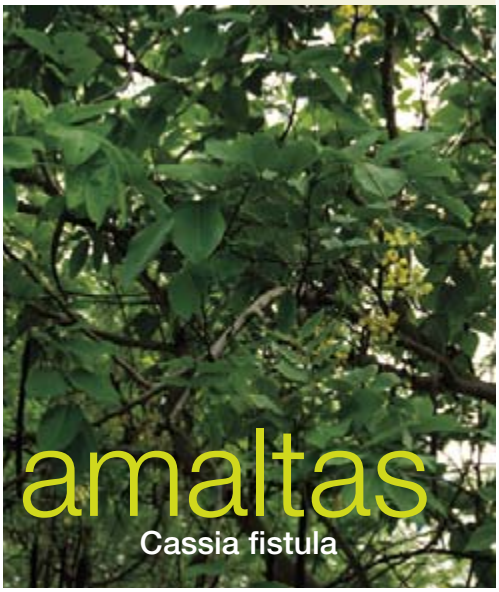
This shrub is liked very much by camels and is good for milk yields. Unfortunately, its numbers are declining.

Flowering period ❀ May to September.

Medicinal uses The bark, stem and leaves of this plant are useful when treating eczema, dandruff and as a febrifuge for reducing body heat. Traditionally, *Capparis sepiaria* is used as an appetizer, blood purifier, stomachic, and tonic. Its flowers, leaves, and roots also treat excessive coughing and toxaemia while the root powder is used for snakebite. It is also used in the treatment of skin diseases, tumours, inflammation and diseases of the muscles. An extract of the leaves may be helpful in controlling diabetes.

Other uses The wood is durable and is also collected as firewood.

indian laburnum



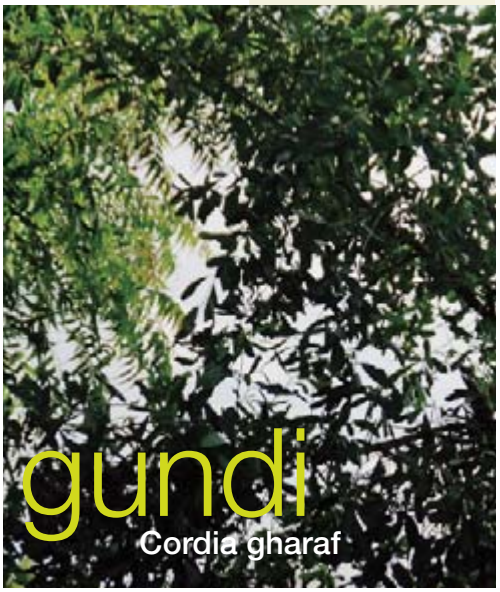
Sometimes known as the golden shower tree for its abundant yellow blooms.

Flowering period ❀ late April to mid May.

Medicinal uses In ayurvedic medicine this plant is known as *aragvadha*, the premier disease killer. Its fruit works as a mild laxative, fights fevers and arthritis and treats diseases of the nervous system, various types of bleeding, cardiac conditions, and stomach problems such as acid reflux. The root is used in indigenous medicine as a very strong purgative. An infusion is used to dissolve kidney stones. The flowers are bitter, acrid, cooling, emollient, and purgative and are used in ayurveda as a balancing treatment for burning sensations, leprosy and skin diseases. *Cassia fistula* is also used for cardiac disorders, intermittent fever and general debility.

Other uses Sometimes planted as a shade tree. The wood may be used for farm implements and in construction. The bark is used in tanning hide.

narrow leaf sepistan



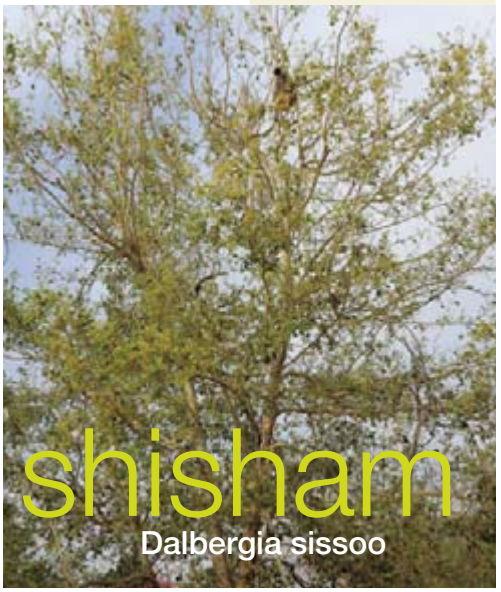
Gundi is good for milk quantity and quality. But its numbers are declining.

Flowering period ❀ April to June.

Medicinal uses The plant is used to heal cuts and injuries.

Other uses Both the fruits and the gum are edible. The orange berries are often sold in the market and are cooked as a vegetable and processed into chutney. The stems are used to make walking sticks and kitchen implements such as wooden spoons and stirrers.

indian rosewood



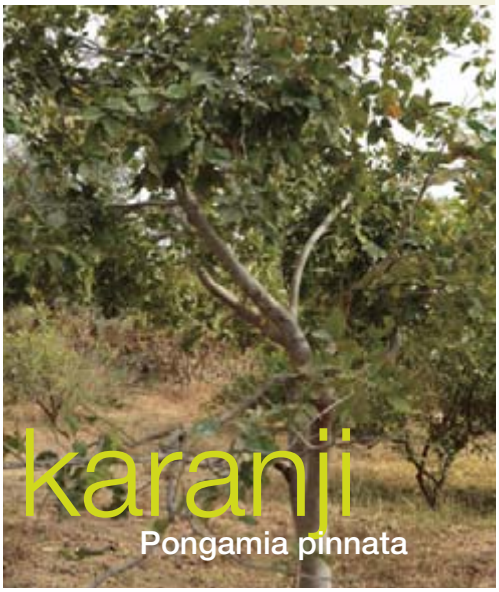
Camels occasionally nibble on this tree which can lead to stomach problems.

Flowering period ❀ mid March.

Medicinal uses *Dalbergia sissoo* is reported to be a stimulant in folk medicine and remedies. A brew of the leaves is used in treating gonorrhoea and the root is astringent. The wood is alterative and treats leprosy, boils, eruptions and allays vomiting. This plant may have analgesic and anti-inflammatory uses.

Other uses The wood is used for making high quality furniture, railway sleepers and musical instruments. It also yields an oil.

Indian beech



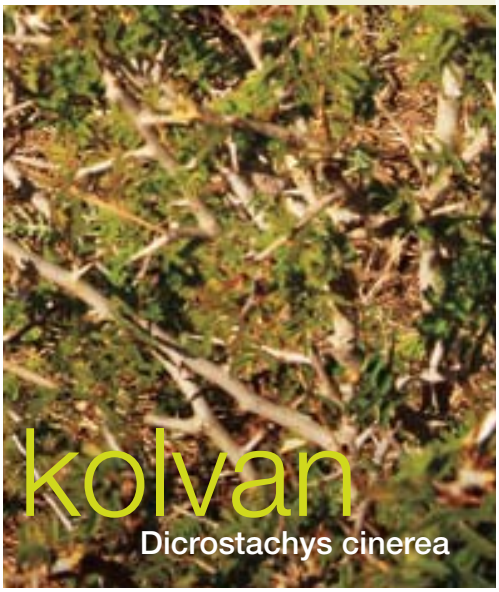
A versatile tree which is valuable for fodder.

Flowering period ❀ mid April to late May.

Medicinal uses This plant is used to treat many diseases. The fruits and sprouts are used in folk remedies for abdominal tumors in India, and the seeds have been used to treat skin ailments. This tree yields a black gum that has historically been used to treat wounds caused by poisonous fish. Juices from this tree, as well as the oil, are antiseptic and resistant to pests. The oil is used as a liminent for rheumatism and the leaves take care of micrococcus. The juice of the leaves treats cold, cough, diarrhoea, dyspepsia, flatulence, gonorrhoea and leprosy. The juice and the oil are antiseptic and helpful for itching and herpes. The roots can be used for cleaning gums, teeth and ulcers. The bark is used internally for bleeding piles. The flowers can treat diabetes.

Other uses The oil from the fruits is popularly used to treat camels against mange. The oil may be used in the manufacture of soaps and candles.

sickle bush



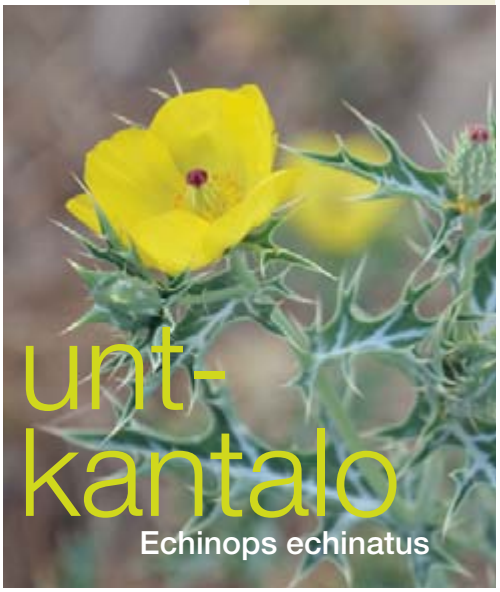
Camels eat both the leaves and the fruits of this shrub which is good for milk yields.

Flowering period ❀ June to September.

Medicinal uses The bark of this plant is used to alleviate headaches, toothaches, dysentery, elephantiasis while root infusions are consumed to treat leprosy, syphilis, coughs. Kolvan also serves as an anthelmintic,purgative and strong diuretic. The pulp from beaten leaves is used to treat epilepsy and can also be taken as a strong diuretic and laxative while its powder can be used when massaging fractures. The roots are known well as a treatment for bites or stings. In Botswana the plant is used as a tapeworm cure. The plant is also used in the treatment of wounds, rheumatism and renal problems.

Other uses The wood is used for cog wheels, walking sticks and tent pegs, while the bark is a source of fibre.

camel thorn



unt-kantalo

Echinops echinatus

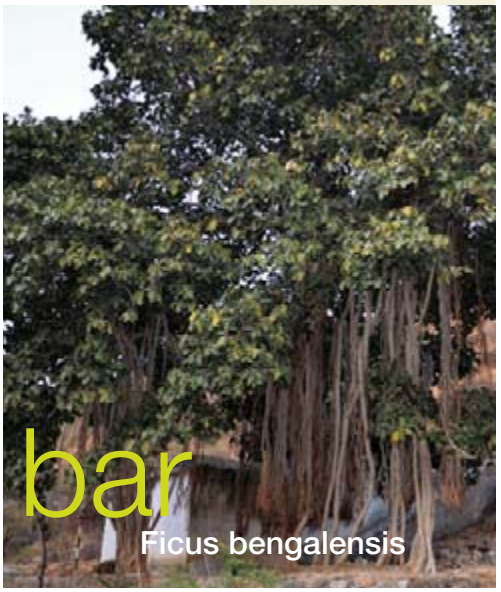
This thistle grows on agricultural fields and is eagerly consumed by camels in winter and early summer. It results in good, sweet milk.

Flowering period ❀ December to January.

Medicinal uses The medicines provided by this plant can be used internally and externally and the plant is widely known for its effective treatment of inflammation. The leaves are said to treat malaria. The plant also provides a treatment for asthma and is given to patients who are suffering from severe kidney pain. It is even believed to have aphrodisiac properties.

Other uses The powdered roots have insecticidal effects and are used to keep away lice and maggots.

banyan tree



bar

Ficus bengalensis

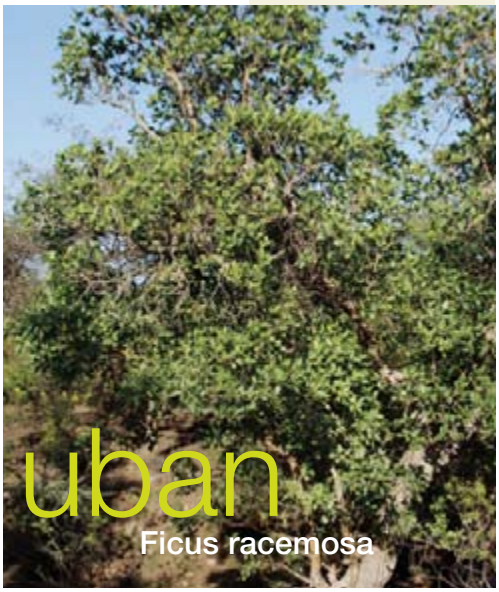
This tree is sacred in India and has been designated as the country's national tree. It is worshipped and is not allowed to be cut.

Flowering period ❀ The figs ripen between April and May.

Medicinal uses The milk and paste of this tree can be used for washing wounds. It can also be applied on skin related ailments. *Ficus bengalensis* relieves pains related to joint pains, toothache, lymphadenopathy and arthritis. It is good for treating skin problems and reducing the burning sensation. The powder is used in maintaining regular digestion and also prevents nausea, indigestion, diarrhoea, dysentery and fissure. It is said to be very effective in treating leucorrhea and other womens' health-related problems. The tree is astringent, cooling, and is considered to have diuretic properties in ayurvedic medicine.

Other uses As it is not allowed to be cut or harvested, this tree has no other uses except to shelter small shrines.

cluster fig

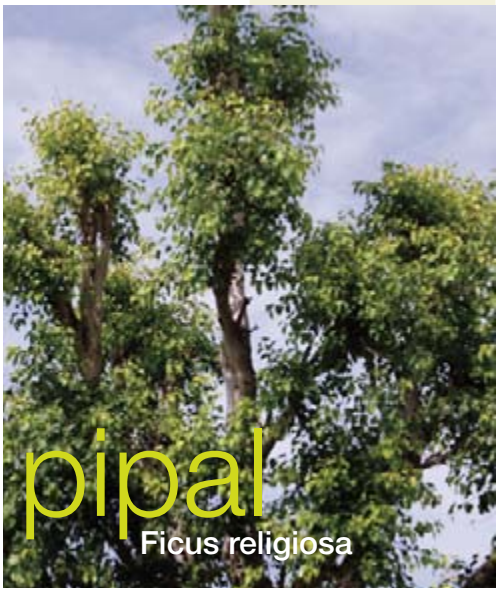


Uban, also known as the cluster fig tree, is important in both the Hindu and Buddhist religions.

Flowering period ❀ Figs grow between March and April as well as during the rainy season.

Medicinal uses This plant has great medicinal value, and is used both externally and internally. Externally, the latex is applied to chronic, infected wounds to alleviate oedema and pain and to promote healing. The decoction of the leaves is salutary in washing wounds for better cleansing and healing. A decoction of the bark is an effective gargle in stomatitis and sore throat, and application of the latex alleviates oedema in adenitis, parotitis, orchitis, traumatic swelling and toothache. When ingested, it can be used to treat a vast range of maladies. The decoction of the bark-skin is useful in diarrhoea, dysentery, and ulcerative colitis, and the bark treats asthma and piles. The fruit can treat dry cough, loss of voice, and diseases of the kidney and spleen. This plant is a good remedy for excessive appetite. The extract of the fruits is useful for diabetes and leucoderma.

sacred fig



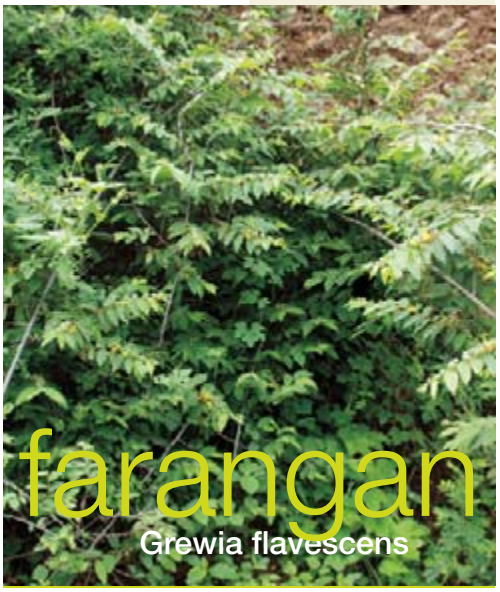
This is a sacred tree which local people protect from use and damage.

Flowering period ❀ Figs rioen in mid April.

Medicinal uses This tree is used in traditional medicine for around fifty types of disorders including asthma, diabetes, diarrhoea, epilepsy, gastric problems, inflammatory disorders, infections, and sexual disorders. The juice of its leaves is extracted by holding them near fire; this extract is then used as an ear drop. The bark is a traditional medicine used for healing various wounds while the roots are chewed to prevent gum diseases. The bark of the roots is used for stomatitis, to clean ulcers, and to promote granulation. The ripe fruits help against foul taste, thirst and heart diseases. A powder made from the fruit is taken for asthma and the seeds treat urinary problems, while the leaves are useful to treat constipation. The whole plant is useful in cancer.

Other uses The latex is used to fill up cavities in hollow ornaments. The wood is used for tools, and the bark for tanning. Its fibre was formerly used for paper production.

donkey berry

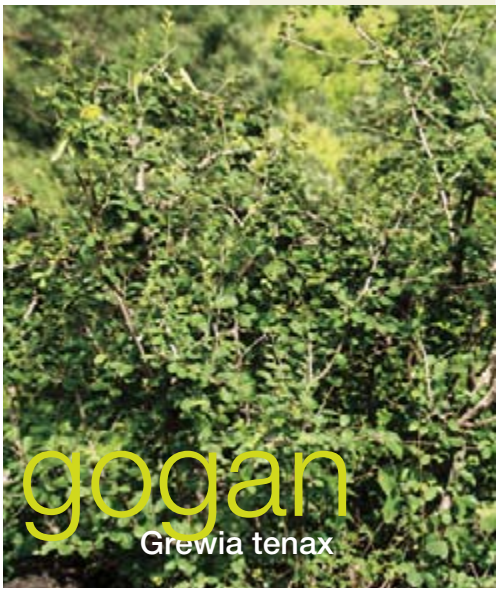


This flowering plant is a member of the mallow family.

Flowering period ❀ December to March.

Medicinal uses Both roots and stembark contain phytochemical substances with antioxidant, antibacterial and analgesic effects.

white crossberry



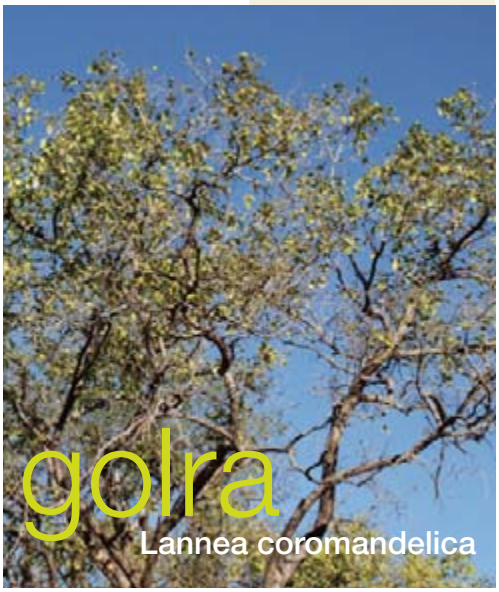
This is a drought resistant tree with good feed value.

Flowering period ❀ February to August.

Medicinal uses In Kenya, parts of the gogan plant are used as a remedy for colds and chest pains; it is also a chief constituent in a specific typhoid remedy. Folk medicine makes use of this plant to cure upset stomachs and some skin and intestinal infections.

Other uses The bark is good for making ropes and in house construction. The wood is used for making bows and arrows.

indian ash tree



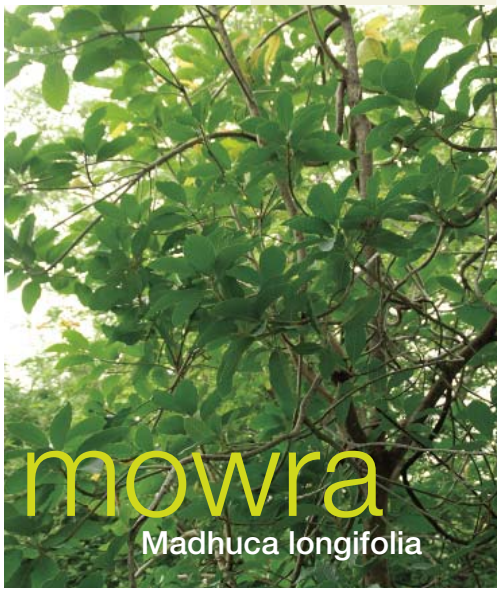
Golra is a medium sized deciduous tree that is well liked by camels.

Flowering period ❀ December to March.

Medicinal uses Medicinal uses of the bark of this tree include remedies for indigestion, toothache and debility. The bark is astringent. The leaves can be used against sprains and body aches or as a lotion for bruises, wounds, sores, and ulcers. The gum is used for asthma and as a cordial for women during lactation. The plant is used in treatments for sore eyes, leprosy and debility.

Other uses It can be cultivated as a live fence or hedge.

mawra butter tree



The mowra or mahua provides a variety of products and is highly esteemed by Adivasis. It has been called a lifeline for millions of India's poor.

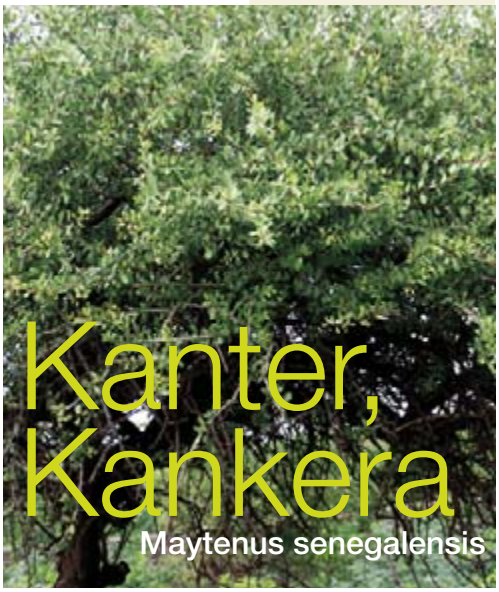
Flowering period ❀ April.

Medicinal uses The bark is useful in case of leprosy and for healing wounds, while the flowers are administered for a variety of diseases, including coughs and heart problems. The oil is used for treating skin disease, rheumatism and headache; it can also be used as a laxative.

Other uses The flowers can be eaten raw or can be dried and used to make country liquor. The seeds have a high oil content and can be made into a type of butter that is used to adulterate ghee.

The timber is hard and durable, but usually this tree is protected because of its many uses.

red spike thorn



Kanter, Kankera

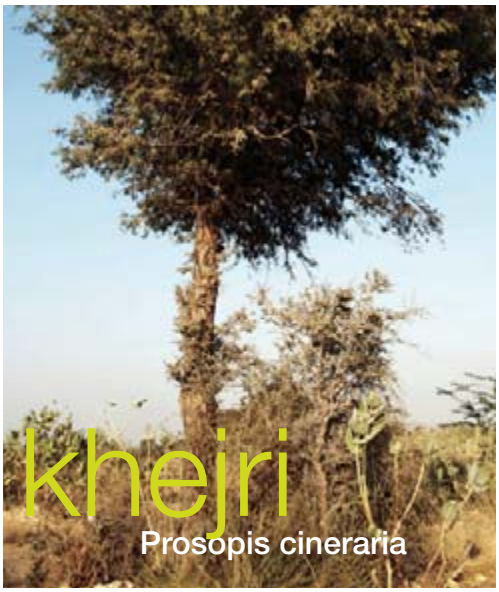
Maytenus senegalensis

A plant which grows in the semi-desert regions of both Asia and Africa.

Flowering period ❀ Various times of the year.

Medicinal uses The roots and bark are traditionally used in folk medicine for the treatment of chest pains, rheumatism, snakebites, diarrhoea, eye infection, and dyspepsia (indigestion). It is also valued as an antibacterial, antimicrobial and antibiotic. An extract of the roots and barks is used as an analgesic or anti-inflammatory for severe headaches, skin rashes, muscle spasms, excessive sweating, fevers, parasitic intestinal infections, arthritis and muscle pain and for nausea, vomiting and diarrhea The leaves are used for malaria, yellow fever, and tryanosomiasis. It is also used for fertility problems, venereal diseases, pneumonia, epilepsy, and as a tonic. The leaf, root and stem bark extracts of *Maytenus senegalensis* are effective against plasmodia, leishmaniosis and bacteria.

Other uses This tree is also used for timber.



khejri

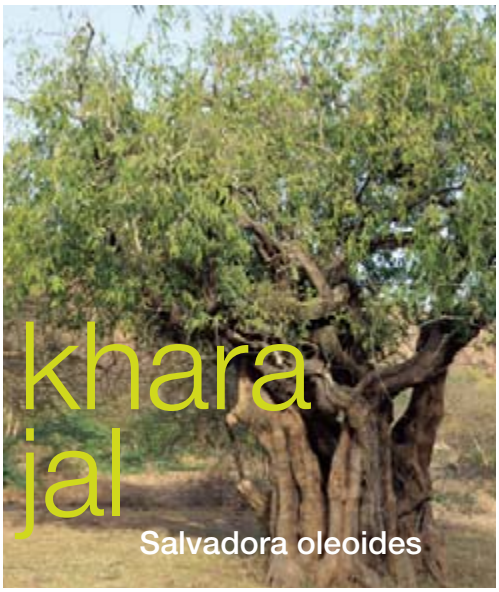
Prosopis cineraria

This tree is of immense importance for the people of the desert. Both leaves and pods are an important camel fodder. The leaves are also dried and stored as camel fodder.

Flowering period ❀ Late March to early May.

Medicinal uses The flowers of this tree are pounded, mixed with sugar and used during pregnancy as a safeguard against miscarriage. The bark serves as a remedy for rheumatism, bronchitis, dysentery, asthma and other ailments. The plant is traditionally recommended for the treatment of snakebites and prescribed for treating scorpion stings. Other medicines are prepared from the bark to treat diarrhoea, dysentery, piles, worm infestations, and skin problems. The leaves and fruits are used for nervous disorders and the nutritive gum is used by pregnant women at the time of delivery. The smoke of the tree is supposed to be useful for eye problems.

Other uses The pods are a popular vegetable (sangri) and an important source of nutrition. The wood is used in construction, for agricultural implements and for Persian wheels.



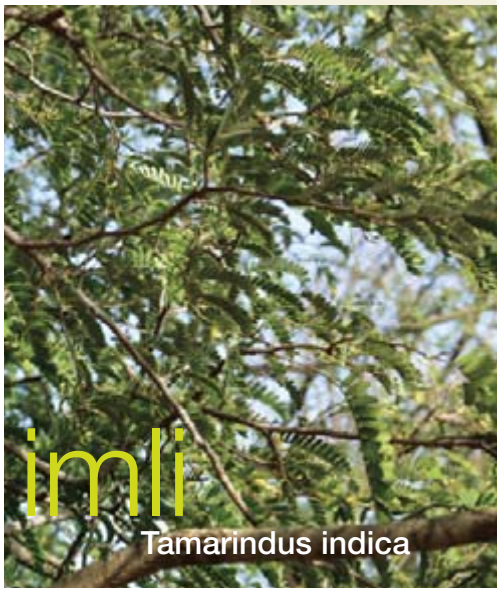
This plant is good for milk yields and the health of the camels, but it leaves the milk smelly.

Flowering period ❀ March to April.

Medicinal uses This tree was used for centuries as a natural toothbrush. The World Health Organization (WHO) promotes its use for improving oral hygiene. Other medicinal benefits include use as an antiseptic and astringent. A decoction of the leaves can be used as a mouthwash. A decoction of the root is used for gonorrhoea and stomach problems and an ointment made from the roots takes care of headaches. The root bark is a stimulant used to induce menstruation or relieve diseases of the spleen. The stem bark is good for gastric disorders. The leaves are used to treat asthma, bronchitis, cough, tumours, constipation, worms and haemorrhoids. The shoots and leaves are bitter and are used in treatments for poisons, coughs, and bronchitis. The fruits stimulate digestion. The oil of the seeds is applied to the skin for rheumatism.

Other uses The fruits are edible and the wood was used in the construction of Persian wheels for irrigation. The seeds contain 40-50% of a greenish-yellow fat containing lauric and myristic acids which can be used in soaps and candles.

tamarind



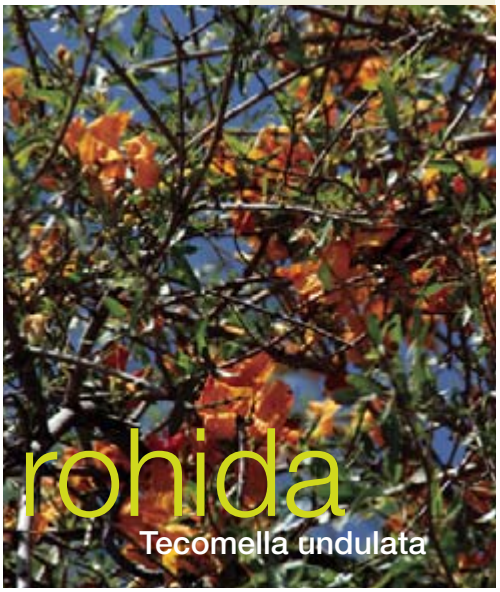
Camels eat the leaves of this tree throughout the year.

Flowering period ❀ June to August.

Medicinal uses This tree contains tannins, sapoins, sesquiterpenes, alkaloids and phlobatamins. These extracts are active against Gram positive and Gram negative bacteria and effective as a treatment for salmonella poisoning. The plant is a common health remedy throughout Asia and Africa, being used for the treatment of stomach disorders, general body pain, jaundice, yellow fever and as a blood tonic and skin cleanser. In Indonesia, Malaysia, the Philippines and the Javanese traditional healers use the leaves in an herbal infusion for malaria, while the fruit juice serves as an antiseptic and treatment against scurvy. The fruits take care of fever, intestinal diseases and diarrhoea. The pulp is useful for haemorrhoids. Tamarind is also used in Indian ayurvedic medicine for gastric and digestive problems and has cardioprotective properties. It is an ingredient in blood-sugar reducing medicines.

Other uses In addition to culinary uses, the wood is used for furniture, the leaves and flowers for dyeing and the fibres and bark in tanning.

marwar teak



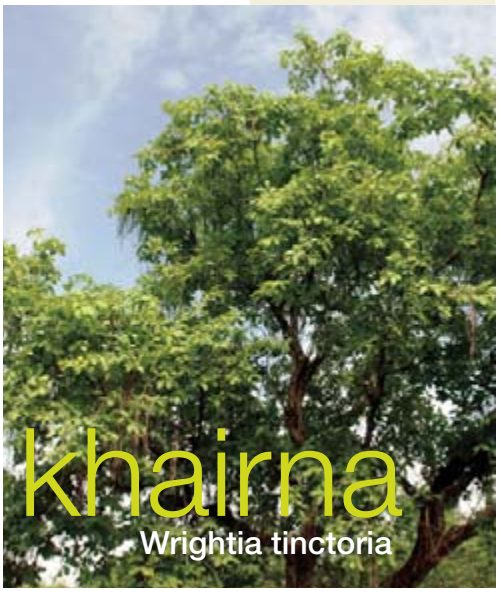
Rohida is an important drought-adapted tree with striking yellow flowers and is endemic to the Thar Desert.

Flowering period ❀ March.

Medicinal uses The bark has great internal and external medicinal value. It is useful for traumatic wounds, promoting rapid healing. To treat conjunctivitis, the juice is put into eyes. It is an excellent blood purifier and can also take care of eczema. The bark possesses mild relaxant, cardiotonic and chloretic properties and is used as a remedy for syphilis and in treatments for urinary disorders, enlargement of the spleen, gonorrhoea, leucoderma and liver diseases. The seeds can treat abscesses and in Pakistan the flower is used to treat hepatitis.

Other uses *Tecomella undulata* is a very important source of timber. Its wood is strong and durable and is traditionally used for making furniture and doors in the western districts of Rajasthan.

dyer's oleander



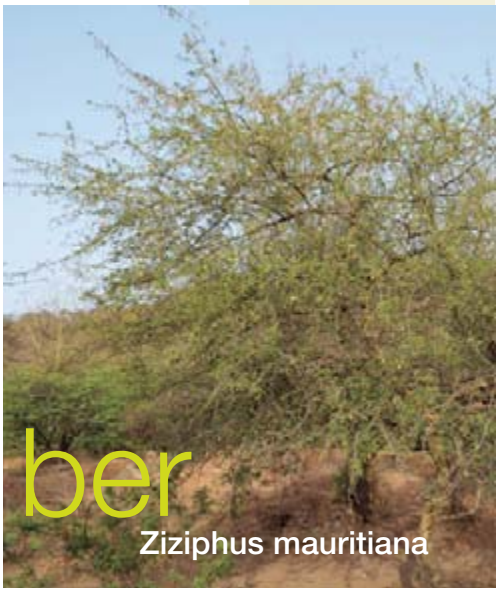
Khairna is a small deciduous tree that is named after the Scottish botanist William Wright.

Flowering period ❀ May to June.

Medicinal uses The leaves are applied as a poultice for mumps and herpes and if chewed on they can relieve toothache. The bark and seeds are effective against skin afflictions such as psoriasis and non-specific dermatitis. *Wrightia tinctoria* has anti-inflammatory and anti-dandruff properties and is often used in hair oil preparations.

Other uses A blue dye called *pala indigo* is made from the leaves. A few drops of the sap are said to prevent milk from curdling and enhance its shelf life, without the need to refrigerate. The wood is used for making toys.

toothbrush tree



ber

Ziziphus mauritiana

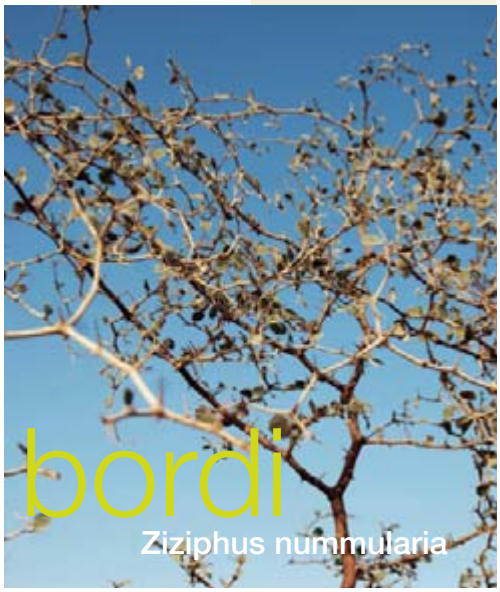
This is one of the most important camel forage pants. Its dried leaves are known as *pala* and are extremely nutritious. Its fruits are high in Vitamin C and an important nutritional resource for desert dwellers.

Flowering period ❀ July to October.

Medicinal uses The fruits are applied on cuts and ulcers and used in pulmonary ailments and fevers. They are mixed with salt and chilli peppers to treat indigestion and biliousness. The dried fruit is also a mild laxative. The fruits are regarded as a tonic and are an ingredient of a medicine used in chest complaints. The seeds are sedative and are taken to halt nausea and abdominal pains in pregnancy. Mixed with oil, they are rubbed on rheumatic areas. The leaves are applied as poultices and are helpful in liver troubles. Bark paste is applied on sores. The root is purgative and a decoction is given against fever, tapeworms or to induce menstrual flow. The powdered root is dusted on wounds and may be added to drinking water to treat poultry suffering from diarrhoea or cure indigestion in humans.

Other uses The wood is hard, strong and durable. It can be used for making agricultural implements and for tool handles. The branches are useful in the construction of traditional huts.

jujube bush



bordi

Ziziphus nummularia

This shrub is native to the Thar Desert and forms a thorny mesh up to two meters high. It is preserved in orans (sacred groves) of Western Rajasthan and is a favourite and very important camel fodder plant that makes the milk very sweet. It is extremely drought resistant and the leaves are collected and stored.

Flowering period ❀ July to September.

Medicinal uses The dried fruit are used as an astringent in gall bladder afflictions in India. The leaves are used to treat scabies and other skin diseases.

Other uses *Ziziphus nummularia* is a multi-purpose plant. The wood is used in construction, the thorny branches for fencing, the fruits are edible and the leaves provide excellent forage.

Appendix: Sources

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'Camels are my life. I cannot imagine a future without them.'

Bhanwarlal Raika
Traditional camel breeder and herder

PHOTOGRAPHY

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