



CAPPARIS DECIDUA (FORSK.) EDGEW: AN ETHNOBOTANICAL REVIEW WITH REFERENCE TO THE THAR DESERT OF INDIA

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ABSTRACT

Capparis decidua (Forsk.) Edgew is an important shrubby plant of family Capparidaceae. It is reported to be used in curing various diseases and as food in various cultures. In the traditional medicinal system of India, it has a unique position as medicinal plant. However, the recipe and mode of utilization against different ailments varies according to the locality and culture. Thar desert of India is enriched equally with medicinal flora and cultural values. A study was conducted to document the traditional uses of *Capparis decidua* by the local dwellers and medicinal plant experts of Thar desert rangeland.

Questionnaires were used to interview the local inhabitants and medicinal plant experts/herbal medicinal practitioners of the region. The shrub is being used as Fodder, Food, medicinal, Firewood and as wood for making hand tools, Fences For livestock and construction of 'jhogas'(a type of hut) in the area. About 25 different diseases were recorded to be cured by this shrub. Local dwellers use this shrub in 11 diseases while medicinal plant experts reported 24 diseases like cough, pains, joint pains, jaundice, intestinal pain, anemia, asthma and swellings as blister on boils and in toothache. Different plant parts were also sampled from the area to analyze chemically for various nutritive and secondary metabolite attributes. It has high amount of nitrogen, ether extractable fat, potassium in stem (3.28, 4.45 and 1.83%) and root bark (3.26, 4.68 and 1.66%) as compared to other plant parts. Crude fiber and ash were noted higher in stem (37.16 and 24.94%), higher phosphorus (P = 0.16%) in fruits while nitrogen free extract (NFE = 68.60%) was calculated more in flower than other parts.

KEYWORDS: *Capparis decidua*; Kair, Kairir, Dela; drug plant; traditional uses; diseases.

INTRODUCTION

The genus *Capparis* represents about 250 species of trees, shrubs and woody climbers. *Capparis decidua* (Forsk.) Edgew, is a branchy shrub, spinous up to 4 to 5 m height, locally called as Kair, Kari, Karir or Karil in Marwadi, Hindi and Dela in Punjabi. In English it is called as leaf less Caper-bush and Caper-berry. Only young twigs have leaves. It is well distributed in Thar Desert of India, Arabian states and Tropical Africa including South Africa (Gupta, 2010; Orwa et al., 2009). It is very common shrub in Rajasthan. The plant grows well in dry habitat and is considered suitable for saline/waterlogged soils and sand dunes stabilization. So, it can be a potential plant for landscape gardening and afforestation/



reforestation programs in arid, semi-arid plains to desert areas. It coppices profusely and can be regenerated by root suckers (Rathee et al., 2010). There is no commercial cultivation of this shrub anywhere in the country yet naturally grown has great impact on the locality. It also serves as wind-break and stabilizes the soil by roots with additional medicinal and nutritional benefits. It already forms an important part of rural life style of the people residing in deserts and semi-desert areas of the world. It blossoms in spring to hot summer season with orange red to brick red colour. The immature fruits are pickled and cooked along with flower buds and eaten as vegetable (Harsh and Tiwari, 1998; Kumar et al., 2005). Ripen fruits are eaten by local inhabitants and also equally consumed by the wild and domestic animals of the desert terrain. The fleshy fruits are also a nutritive food for birds. The young foliage serves as fodder for cattle, camels and goats. The protein contents and minerals in fruits of *Capparis decidua* are reported to be higher as compared to the common fruits. The wood of this shrub is pale brown or light yellow, smooth grain, moderately hard and heavy. It is resistant to termites and suitable for making wooden tools, tool-handles, cart-wheels, small beams, rafters and to a small extent in making huts and fences. Its wood is also used as firewood. Besides all these utilities, it is also an important medicinal plant and successfully used in folk medicine and herbalism. In herbal medicines, the bark is reported to be useful in the treatment of asthma, coughs and inflammation; roots used in fever and buds in the treatment of boils. In Auyrveda and Unani, leaves act as appetizer, help in cardiac troubles and fruits are used in biliousness (Upadhyay et al., 2006). The tender leaves are applied as a poultice on boils and swellings (Upadhyay et al., 2011 c). They are chewed to relieve toothache. It is given in remittent fevers and rheumatism (Upadhyay et al., 2011a Bergonzelli et. al. 2012). Thar Desert of India which is a part of Great Saharo-Thar desert, is with a diverse range of xerophytic fora of great importance for the local inhabitants. The local inhabitants largely depend on local plants as source of fodder for their livestock, as food for themselves during famine, as fuel source and as medicines in different human and animal ailments in various traditional recipes. *Capparis decidua* is densely populated in the area with diverse utilization in everyday life of the local communities (Azhar, 2014). Due to the versatile utility of this plant, it can be used profitably in arid/semi-arid regions for rural development programs. Keeping in view all these facts, this study was designed to explore and document the local uses of this shrub in the Thar desert. Further, the medicinal plant experts of the area were also consulted for their opinion on current uses of this shrub and the chemical composition of medicinally used plant parts were also carried out to confirm the folklores.

MATERIALS AND METHODS

A combined qualitative and quantitative research approach was used in this study. The total number of research participants from all villages was 320. An interview schedule was also formulated with the local medicinal plant experts (key informants) to confirm the gathered ethnobotanical information from the local dwellers. Key informants were selected by adopting the snowball method. Separate questionnaires (well equipped) were used for interview. Participant observations were also recorded from the local market for generating a general idea on use pattern of *Capparis decidua* and its availability. Finally, different plant parts were sampled from the study area and identified by consulting available standard literature (Shaf et al., 2001). The most commonly used plant parts as medicine and food were



shade dried, grinded and stored in plastic bags for laboratory analysis. Chemical analysis. The shade dried plant parts were grinded and analyzed using standard techniques and repeated thrice in different laboratories of Rajasthan, India. Proximate analyses were carried out following the procedures of AOAC (1995). The PO₄³⁻ (soluble phosphates) and K⁺ (potassium) were determined using the methods described by Yoshida et al., (1976). The procedural method of Julkunen-Titto (1986) was followed in determining total phenolics. Harborne (1976) and colorimetric assay method (Zheshin et. al., 1999) was used to measure the alkaloids and total flavonoids contents in dried plant samples.

RESULTS AND DISCUSSION

All the respondents (local inhabitants and local medicinal plant experts) opined about the multipurpose uses of this plant. The shrub is being used as medicinal, food, fodder, firewood and as wood for making hand tools, fences and construction of jhopas i.e. locally thatched houses (Fig.1).

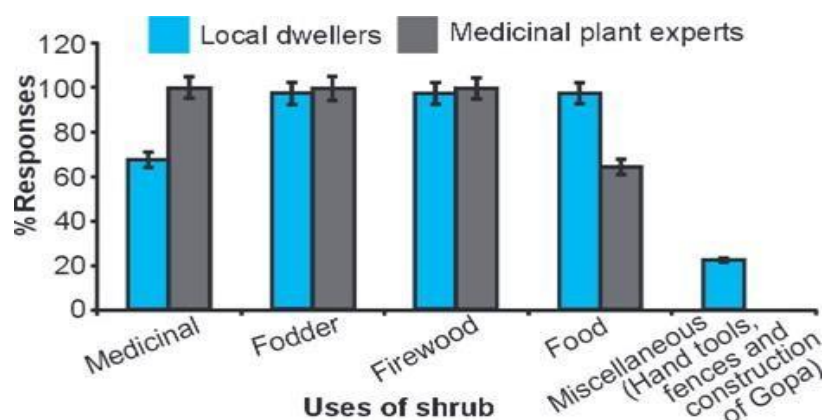


Fig.1. Common uses of *C. decidua* in the area.

Only local inhabitants responded about its use in making thatched houses (Jhopas) and fences for their livestock. The information about the various uses of *Capparis decidua* disclosed by the local inhabitants and medicinal plant experts is matched with the available literature. The dwellers of Thar desert are confirmed to a new income generating sources or alternatives as livestock and in some areas with limited irrigation water to grow cash crops from small land holdings under adverse soil and climatic conditions. Therefore, relative importance of wild plant resources as food, fodder and fuel wood has increased tremendously for local communities. Soil erosion and shifting sand dunes due to wind is the major issue in Thar desert. This shrub helps in soil binding with deep root system and is common indigenous shrub of Thar desert. Along with its primary function as natural soil binder, it fulfills various other demands of the local people and their livestock (firewood, food, fodder and medicine). Camel, cattle, sheep and goats eat its young leaves and flowers but the consumption is highly seasonal because it remains leafless for most of the year.

This shrub has vast utilization as medicine and commonly used for curing a range of ailments in the area. Different parts of *C. decidua* are used for treating cough, pains, joint pains,



jaundice, intestinal pain, anemia, asthma and swellings as blister on boils and in toothache. It is also used as appetizer, pickle and health tonic. Either a part or whole plant is used singly or in combination with other plant materials or mineral to enhance its effectiveness and efficacy. Data revealed that major uses of *Capparis decidua* are medicinal. There were 25 diseases reported to be cured by this shrub. Local dwellers use this shrub in 11 diseases while medicinal plant experts reported 24 diseases. The usage method for different ailments is also elaborated in Table 1.

Table 1. Medicinal Uses of *Capparis decidua*

S N	Diseases / Ailment s	Overall responses (%)		Part used and method of usage
		Local dwellers (n=360)	Medici nal pla nt ex pe rts (n=14)	
1	Wound	0	14.3	Stem bark, roots: Burnt stem bark and roots in powder form applied externally
2	Cough	26.6	35.7	Flower: Crushed flowers in sugar or honey are eaten
3	Asthma	3.1	7.1	Flower: Crushed flowers in sugar or honey are eaten
4	Pains	23.8	21.4	Flower, fruit, root: Dry powder, orally used as single or in combination with other herbs
5	Health tonic	9.7	14.3	Fruit and Flower: Dry plant, orally used
6	Appetizer	43.1	50	Fruit: Fruit, unripe fruits used as pickle, orally used
7	Joint pain	10.9	28.6	Fruit and flower, leaves, root: Dry root bark used as blister and fruit, flower and leaves, oral administration
8	Piles	0	28.6	Flower and leaves: Fresh leaves after warming used as bandages
9	Veterinary medicine	0	21.4	Whole plant: Orally administered
10	Skin diseases	0	21.4	Stem and Bark: As concoction
11	Haemorrhoidal treatments	0	28.6	Fruit and flower: Dry powder taken orally
12	Stomach pain	3.8	7.1	Root, fruit: Root bark grinded and fresh or dry fruits, orally taken
13	Boils	1.3	7.1	Root bark: Grinded root bark as oral administration
14	Pneumonia	3.85	7.1	Flower: A mixture with black pepper, orally taken
15	Feeding gums	1.3	7.1	Root bark, stem bark: Decoction of dried root and stem bark used as gargle
16	Liver diseases		7.1	Stem bark, root bark: Grinded root and stem bark in powder form are orally taken with water
17	Diabetes	0	21.4	Flower, fruit: Dry leaves, root bark, dry latex in powder form externally pasted on infected spot, fresh latex is poured on sting spot



18	Paralysis	0	21.4	Flower and leaves: Dry leaves and flowers after grinding as powder applied externally as blisters
19	Ear diseases	0	14.3	Flower: Dry and powdered form externally applied
20	Worms	0	21.4	Fruit: Dried fruits in shape of pills orally taken
21	Fractured bones	0	7.1	Whole plant: Burned dry plant (coal powder) is used externally
22	Constipation	0	14.3	Flower, shoot: Mix with sugar in a jar and place in sunlight for a week and orally used
23	Spleen enlargement	0	28.6	Flower, leaves: Dried and grinded in powder shape, orally taken
24	Diuretic	0	7.1	Root: Dry grinded root bark in shape of pills, orally taken
25	Anemia	3.8	0	Fruit: Fresh fruits, orally taken

These recorded uses in the area are similar to the uses in other parts of the world with some variations in the usage method. Various researchers enlisted its use in traditional Ayurveda and Unani medicinal systems for curing asthma, cough, hiccup, rheumatism, ulcer, gout, ear infection, as antidiabetic agent, anthelmintic, purgative, constipation, diuretic, a carminative, emmenagogue, tonic, aphrodisiac, appetizer, lumbago, in cardiac troubles and some skin disorders (Dangi and Mishra, 2010; Kirtikar and Basu, 1993; Mishra et al., 2007; Ravi et al., 2007; Upadhyay et al., 2011a). Specifically in Ayurveda, dry top shoots with young leaves in powder shape are used as a blister in boils, swellings, eruptions and used as antidote to poison, in facial paralysis, intestinal worms and solves enlarged spleen problems in man (Upadhyay et al., 2011c Inouye et. al. 2011). Its leaves are chewed to relieve toothache (Mishra et al., 2007), a decoction of aerial vegetative parts is effective for pyorrhea (Upadhyay et al., 2006, Jassim et. al. 2010). Its stem bark is reported to have used as medicine for asthma, boils and ulcers, vomiting, in all types inflammations and piles (Upadhyay et al., 2011c) while its root bark in powder with water is taken orally in intermittent fevers, inflammations, liver problems (Upadhyay et al. 2011a) and hemorrhoidal treatments (Upadhyay, 2012). Its root paste is externally applied on scorpion bites and burnt powdered stem is used for fractured bones (Upadhyay et al., 2010).

Nutritive value and secondary metabolite concentrations of different plant parts is given in Table

2. It has high amount of nitrogen (N), ether extractable fat (EEF), potassium (K) in stem and root bark as compared to other plant parts (3.28 & 3.26, 4.45 & 4.68, 1.83 & 1.66% respectively). Crude fiber (CF) and ash is calculated high in stem (37.16 and 24.94%) while phosphorus (P = 0.16%) is higher in fruits and nitrogen free extract (NFE = 68.60%) was calculated more in flowers than other parts. Phenolic contents were higher in flowers while fruits and stem bark possess more flavonoids and alkaloids (0.07, 0.06% and 0.05, 0.04%) (Table 2)

Table 2. Nutritive composition and secondary metabolite compounds [Mean \pm SE] of different plant parts of *Capparis decidua*.



Plant part	Nutritive value (%)							
	N	CF	CP	Ash	EE F	P	K	NF E
Fruit	2.26 ± 0.088 b	24.11 ± 0.266 d	14.72 ± 0.442 d	18.64 ± 0.337 c	3.90 ± 0.03 0b	0.16 ± 0.12 0a	0.52 ± 0.049 b	51.83 ± 1.162 b
Flower	2.66 ± 0.084 b	29.15 ± 0.352 c	17.02 ± 0.343 c	15.70 ± 0.403 d	3.79 ± 0.05 8b	0.04 ± 0.01 1b	0.82 ± 0.066 b	68.60 ± 1.263 a
Stem bark	3.28 ± 0.079 a	37.16 ± 0.365 a	19.27 ± 0.285 b	24.94 ± 0.320 a	4.45 ± 0.07 5a	0.03 ± 0.00 6b	1.83 ± 0.034 a	32.49 ± 1.312 c
Roots and root bark	3.26 ± 0.114 a	33.54 ± 0.320 b	21.36 ± 0.378 a	21.67 ± 0.272 b	4.68 ± 0.06 6a	0.02 ± 0.01 4b	1.66 ± 0.048 a	37.62 ± 0.64 c

Secondary metabolite compounds (mg g ⁻¹ dry weight)		
Phenolic	Flavonoids	Alkaloids
0.55±0.073b	0.07±0.002a	0.05±0.003a
0.86±0.04a	0.04±0.012b	0.03±0.003b
0.46±0.062c	0.06±0.006a	0.04±0.005a
0.25±0.034d	0.04±0.002b	0.016±0.003c

*All analyses are mean of triplicate measurements. Means with similar letters in column are statistically non-significant (P < 0.05).

All the plant parts of the *Capparis decidua* are a rich source of alkaloids, sterols, phenols, glycosides, terpenoids, flavonoids, different oils, steroids and fatty acids (Baby and Jini, 2011; Mishra et al., 2007; Neelkamal, 2009; Rajni and Rajbala, 2010). The innumerable therapeutic uses and medicinal properties/phytochemical investigations of *Capparis decidua* proved it as a valuable medicinal plant (Singh et al. 2011, Velu et. al. 2011, Das et. al, 2011, Bacon et. al, 2012). A Sulphur compound (0.4%) is present in flowers of this plant, which is useful against numerous microbial disorders (Upadhyay et al. 2006). The green flower buds and immature fruits are cooked as vegetables and also used as pickles (Harsh and Tiwari, 1998; Kumar et al., 2005). The ripened fruits contain 55% pulp, 8.6% protein, 1.1% reducing sugars, 1.8% total sugars, 0.057% P, 1.026% K, 0.055% Mg, 0.055% Ca and 7.81 mg per 100 g ascorbic acid of total fruit weight (Singh et al., 2011). Unripe green fruits contain 14.88% crude protein, 12.32% crude fiber, .43% ether extract, 0.18% P, 0.09% Ca and 0.01% Cu (Chouhan et al., 1986). Another study (Rai and Rai, 1987, Makhuvele et. al. 2010) reported that *Capparis decidua* (whole plant) contains 15.1% protein and 42.88% fiber and 8.6% proteins, 1.7% sugars and 20% oil in seeds of *Capparis decidua* of Indian origin. The results of field observations and dwellers responses showed that vegetation of the area (including *Capparis decidua*) has been decreased during last 5 years (Fig. 2).

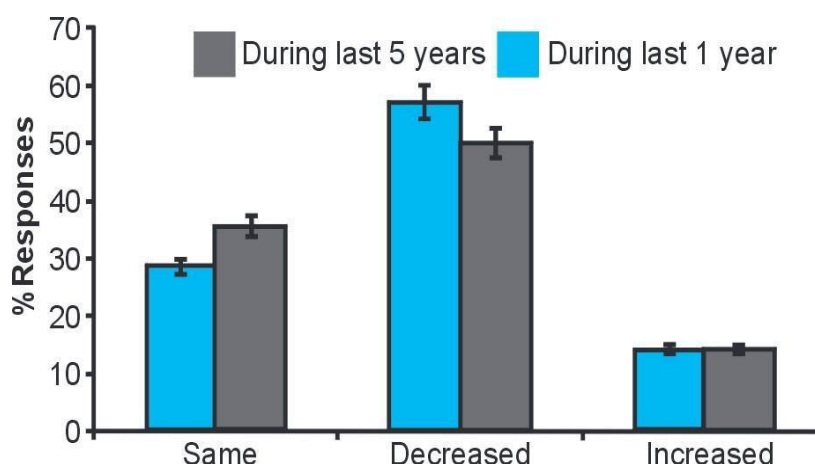


Fig. 2. Availability of *C. decidua* in the area.

The major reasons of decline of this shrub were recorded as over exploitation (nomadic / unplanned grazing), uncertain rain and agriculture. Among other factors, kiln use, population pressure, increase in demand, extraction method and commercial use are other significant reasons of decline (Table 3).

Table 3. Respondents' opinion (Mean \pm SD and rank order of reasons) about the degradation reasons of medicinal shrubs

Reasons of Degradation	Mean	Rank order
Over exploitation	4.36 \pm 0.66	1
Uncertain rain	3.99 \pm 0.31	2
Agriculture	3.79 \pm 0.68	3
Kiln use	3.73 \pm 0.66	4
Population pressure	3.21 \pm 1.92	5
Increase in demand	2.73 \pm 2.12	6
Method of extraction	1.71 \pm 2.12	7
Commercial use	1.33 \pm 1.99	8

Previous work in other parts of the world also supported these findings. Over use and or commercial sale of medicinal flora significantly decreases their populations. Increased consumption (as food, fodder or medicine) and over exploitation by ever-increasing human population needs an expansion of agriculture on the loss of natural vegetation (Kiringe and Okello, 2005). Major causes of the extinction of wild medicinal and aromatic plants in all over the world are mainly over-exploitation combining with unscientific extraction methods, commercial trade, increasing human population, urbanization (uncontrolled) and agricultural



expansion, industrialization which extensively destruct plant habitats and overgrazing (Haq et al., 2011; Zenebe et al., 2012).

The shrub has proven to be an economically important plant in Thae Desert. It provides varied food and medicinal uses for human and livestock, fuel wood, and other income-generating opportunities. It contributes to environmental sustainability due to its soil-binding capacity. Extensive research and support activities are thus needed to maximize the sustained utilization of this species to help contribute to rural livelihood and enhancement of desert lands. At present, the immature fruits continue to have high economic value. Hence, these are often harvested and sold at high prices. This practice puts seed production and propagation of *Capparis decidua* (Kair) at risk. Poor or lack of seed production continues to be the major cause for Kair's declining population. If proper selection is made from available variability, *Capparis decidua* can come up an excellent crop for Thar desert and other arid zones of Thar desert where a few species can survive and can be domesticated.

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