

RESEARCH ARTICLE

Cordia gharaf: An important lesser known fruit tree of Rajasthan

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SUMMARY

Cordia gharaf is a small bushy tree or a large shrub belonging to family Boraginaceae found growing in the arid and semi-arid tropics. It is mainly important due to its ethnopharmacological and chemotaxonomic properties but also has edible fruits which contribute significantly to the food and energy needs of rural populations. Fruits are sweet and mucilaginous and much relished by children. These are either eaten raw or cooked, often put in porridge and used as a sugar substitute. They are often sold in the local market of Jodhpur, Rajasthan, at about Rs. 80-100/- per kg. Owing to edible and medicinal importance of fruits these were collected and analyzed for their nutritional composition. Morphological data was recorded and ash, protein, sugar, fat, dietary fibre and mineral content were determined by standard AOAC methods. Fruits were found to be rich in protein (11.37-12.85%), sugar (8.14-15.13 %) and minerals viz., Ca 0.27-0.76 mg/100g, Fe (6.7-11.85 mg/100g) and Zn (2.0-2.7 mg/100g), Mg (60.7-86.5 mg/100g), Mn (0.3-1.1 mg/100g) and Cu (1.3-1.6 mg/100g). Results indicated that *Cordia gharaf* fruits can be used as a supplementary food in this region and promotion of these trees can help generate livelihood for the local mass.

Key Words : Nutritional, Minerals, Underutilized, Supplement, Sugar, Protein

How to cite this article : Rathore, Mala and Kumar, Hemant (2021). *Cordia gharaf*: An important lesser known fruit tree of Rajasthan. *Internat. J. Plant Sci.*, 16 (2): 131-134, DOI: 10.15740/HAS/IJPS/16.2/131-134, Copyright@ 2021: Hind Agri-Horticultural Society.

Article chronicle : Received : 04.03.2021; Revised : 23.04.2021; Accepted : 04.05.2021

C*ordia gharaf* (Goondi) is a tall, erect, compact, densely growing multi-stemmed branched shrub or tree upto 4 -8 m in height belonging to family Boraginaceae. In Rajasthan it is found in both arid and

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semi-arid areas in Ajmer, Barmer, Sirohi, Jhalawar, Jodhpur. It is often found occurring in grasslands, open deciduous woodlands and riverbanks, usually on sandy or rocky soils. Tronco con corteza de color pardo o marrón, muy agrietada en los ejemplares más viejos. Leaves are opposite or subopposite, rarely alternate, oblong or oblong-lanceolate, with entire margin, pubescent on the beam and scarious on the underside. Flowers are white, tubular-bell, tube is slightly shorter than the calyx, El fruto es una especie de baya ovoide de color rojo. Flowering and fruiting occurs in March-June. In some

regions a second phase of flowering is also observed in September –November. Fruit is a kind of soft red ball (Bhandari, 1990).

The Genus *Cordia* is widely studied for its pharmacological properties. It is widely distributed in the world with about 300 species. In India two species *Cordia dichotoma* and *C. myxa* are found to occur throughout the continent. *Cordia gharaf* has limited distribution mainly in arid and semiarid areas of Rajasthan and Gujarat. Its accepted name is now *Cordia rothii* or *Cordia sinensis* (WOI, raw materials, 1950; Ahmed, 1990; worldagroforestry.org/usefultrees/pdflib/Cordia_sinensis_KEN). The plant is commonly utilized locally as source of food and medicine. It is occasionally cultivated for its fruit. Florece en el Sahara , generalmente tras las lluvias, fructificando unos 2 meses después.

Fruits and gum are edible. Fruits contribute significantly to the food and energy needs of rural populations. Berry is eaten raw and sold in market @Rs. 80-100/kg (Local market survey). The sweet and sticky tasty pulp of the fruit is eaten fresh. The fresh fruits are squeezed in water to dissolve the pulp. The fresh juice may also be drunk or fermented (Khyade *et al.*, 2009). Fruits are sweet and mucilaginous and much relished by the children. These are either eaten raw or cooked, often put in porridge and are used as a sugar substitute.

Several uses in traditional medicine have been reported for different parts of *Cordia gharaf*. The fruit pulp is astringent, antidiarrhoeal and antiseptic (Chauhan and Chavan, 2009). Roots and bark are used for stomach disorders. Decoction of boiled roots is used to treat malaria. Bark and roots are mixed to treat conjunctivitis in cattle. The bark is astringent and is used to prepare a gargle. The leaves are used alone or in mixture with other medicinal plants as a treatment against fever (Al-Musayeb *et al.*, 2011; Eltayeib and Ishag, 2015). From fruit mucilage D-glucose, D- fructose, D-xylose, D-rhamnose and galactouronic acids have been isolated. Secondary metabolites *viz.*, Protocatechuic acid, Trans-caffeic acid, Methyl rosmarinate, Rosmarinic acid, Kaempferide-3-O- β -d-glucopyranoside, Kaempferol, Quercetin have also been found to be present in the plant (Hajabhai *et al.*, 2012).

MATERIAL AND METHODS

Collection and processing of material:

Reconnaissance survey was conducted in three different districts of Rajasthan *viz.*, Jodhpur (Kailana),

Udaipur and Jalore (Jaswantpura) for collection of *Cordia gharaf* fruits for three consecutive years 2012-2014. Plant twigs and leaves were removed by handpicking from the collected fruits. Fruits were then washed with water to remove dirt and foreign materials. These were stored in refrigerator in closed containers. When required they were deseeded and pulp was dried in oven at 50°C. It was finally ground and used for chemical analysis.

Nutritional analysis:

All the chemicals used in the study were of analytical grade and procured from Merck. Standards were procured from SIGMA. All the experimental values are mean of three readings.

Proximate analysis:

Moisture, fat, crude protein, total sugar (TSS), ash and dietary fibre (TDF), were determined using standard methods (AOAC, 1984). Moisture was determined by oven drying method. Ash content was determined by incineration of the sample in a muffle furnace at 600°C for 6 h. Total Dietary fibre was determined by assay kit (SIGMA). It is a combination of enzymatic and gravimetric methods. Samples were gelatinized with heat stable α -amylase and then enzymatically digested with protease and amylo-glucosidase to remove the protein and starch present in the sample. Ethanol is added to precipitate the soluble dietary fibre. Total sugar content was estimated by phenol-sulphuric acid method. Total nitrogen was estimated by the Kjeldahl method. Crude protein was calculated by multiplying the value by 6.25. Fat was determined by petroleum ether extraction in a Soxhlet apparatus. Vitamin C was determined by Indophenol Method (AOAC, 1984).

Mineral analysis:

Mineral elements (Cu, Zn, Fe, Mn, Mg) were determined by wet digestion methods using Atomic Absorption Spectrophotometer (AAS, Perkin Elmer). An acid digestion procedure was used for sample preparation. A weighed amount of plant material were placed in a digestion tube (Kjeldahl flasks) and a mixture of HNO₃ and 70% HClO₄ was added to each sample. Mixture was heated slowly at a low temperature. After digestion, the samples were diluted to appropriate volume and the concentration of the elements was determined. Standards for each element were prepared by suitable

dilution of the stock standard solutions. K, Ca and Na were estimated by flame photometer (Systronics).

RESULTS AND DISCUSSION

Moisture content in *Cordia gharaf* fruits collected from different regions varied from 67.2 to 75.13%. Pulp was more in fruits from Jodhpur but fruits weight was more in samples from Udaipur. Also fruits from Udaipur were comparatively bigger in size (Table 1).

Nutritional analysis was carried out and results are given in Table 2. Ash content varied from 8.98% to 9.89% in samples from Udaipur, 6.27% to 7.73% in samples from Jodhpur and 5.8 to 6.01% in samples from Jaswantpura (Jalore). Fat content was found to vary from 4.53 to 4.97 % in samples from Udaipur, 2.2 % to 3.7% in samples from Jodhpur and 3.89% to 4.77 % in samples from Jaswantpura. Sugar content varied from 8.14 to 14.46 % in samples from Udaipur, 20.8% to 34.4% in samples from Jodhpur and 17.81% to 20.75 % in samples from Jaswantpura, Jalore. Protein content varied from 11.37% to 13.45% in samples from Udaipur, 13.25% to 20.12% in samples from Jodhpur and 8.17% to 14 % in

samples from Jalore. Vitamin C content was found to vary from 65.75 to 86.02 mg/100g in samples from Udaipur, 83.8 to 107.52 mg/100g in samples from Jodhpur and 54.79 to 68.99 mg/100g in samples from Jaswantpura, Jalore.

Analysis showed that in *Cordia gharaf* fruits maximum ash (9.4%) and fat (4.69 %) content was obtained in samples from Udaipur. Maximum sugar (27.3 %), protein (16.66%) and Vitamin C content (94.44 mg/100g) was obtained in samples from Jodhpur. Considering the importance of sugar and vitamin C content, better quality fruits were from Jodhpur region. Dietary fibre was analysed in Jodhpur samples which varied from 23.33% to 27.32% in the three years with average content being 24.9%. The mineral analysis showed that fruits were rich source of copper, iron, zinc (Table 3). The current daily value (DV) for copper is 0.9 mg and iron is 8-10 mg (ICMR, 2010) which we can get by eating about 100g of *Cordia gharaf* fruits.

Another cultivated fruit of the same genus known as *Cordia myxa* (Goonda or Lasora) was considered. It contains 6.7% ash, 8.32% crude protein, 2.2% crude

Table 1: Moisture content (%) and morphological parameters of *Cordia gharaf* fruits

Region	Jodhpur	Udaipur	Jaswantpura
Moisture content (%)	68.49	75.13	67.2
Av. size of fruits (mm)	5.6 x 9.7	8.0 x 12.0	5.5 x 11.0
Pulp : Seed	1:1.2	1:3	1:3.8
Wt of 100 fruits (g)	24.6	41.0	20.8

Table 2 : Nutritional analysis of *Cordia gharaf* fruits from three regions

Year\ Region	Udaipur					Jodhpur					Jaswantpura				
	Ash	Fat	Sugar	Protein	Vit C	Ash	Fat	Sugar	Protein	Vit C	Ash	Fat	Sugar	Protein	Vit C
2012	9.89	4.53	14.46	12.85	86.02	6.8	2.2	20.8	13.25	107.52	5.9	4.41	17.81	8.17	68.99
2013	9.33	4.58	8.14	13.45	70.34	6.27	3.1	26.7	20.12	91.99	5.8	3.89	18.32	8.75	68.99
2014	8.98	4.97	15.13	11.37	65.75	7.73	3.7	34.4	16.62	83.83	6.01	4.77	20.75	14	54.79
Mean±	9.4±	4.69±	12.57±	12.55±	74.03±	6.93±	3.0±	27.3±	16.66±	94.44±	5.9±	4.35±	18.96±	10.3±	64.25±
SE	0.26	0.13	2.22	0.61	6.13	0.42	0.43	3.93	1.98	6.94	0.06	0.25	0.9	1.85	4.73

Table 3 : Content of micro and macro elements present in the fruits of *Cordia gharaf*

	Cu mg/100g	Zn mg/100g	Fe mg/100g	Mn mg/100g	Mg mg/100g	P mg/100g	K g/100g	Ca g/100g	Na g/100g
Udaipur	1.60	2.30	11.85	1.10	86.50	0.18	1.12	0.76	0.11
Jaswantpura	1.30	2.00	8.90	0.30	60.70	0.13	1.99	0.29	0.36
Jodhpur	1.30	2.70	6.70	0.95	63.80	0.38	1.47	0.27	0.19
Average	1.4±0.10	2.33±0.20	9.15±1.49	0.78±0.24	70.33±8.13	0.23±0.08	1.53±0.25	0.44±0.16	0.22±0.07

lipid, 25.7% crude fibre and 57.08% carbohydrates. Mineral ranges (mg/100g dry weight, DW) were: K (7.83), Na (1.62), Ca (0.46), Fe (0.51) and Zn (0.35) (Aberoumand, 2011). Comparing the mineral contents with recommended dietary allowances (RDA), *Cordia myxa* fruit could be a good supplement for some nutrients such as fibre, protein and carbohydrates. Compared to this popular fruit, our fruit Goondi or *Cordia gharafis* a very promising and richer in nutrition than *Cordia myxa*. Mineral content was equal to or even higher in case of : Ca (0.44 mg/100g), Fe (9.15 mg/100g) and Zn (2.33 mg/100g). It also contains higher amounts of Mg (70.33 mg/100g), Mn(0.78 mg/100g) and Cu (1.4 mg/100g). Thus, this wild fruit could be promoted as a mineral and protein rich supplement in diets of poor rural communities.

Conclusion:

There is a immense need to collect, preserve and multiply underutilized fruits to harness the inherent nutritional and medicinal potential of these fruits for sustainable livelihood of tribal people and nutritional security for the common masses. The nutritional analysis of the goondi fruit revealed that this underutilized fruit possesses high nutritional alongwith medicinal properties. These fruit trees are present in staggered manner hence their potential is unutilized. Systematic cultivation of these trees as well as efficient utilization of marketing channels for fresh fruits will lead to increased production. Additionally value added processed products can motivate the growers towards growing these crops resulting in upliftment of the economy of the country.

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