



REGULAR ARTICLE

VARIATION IN NUTRITIONAL VALUE OF *GREWIA TENAX* FRUITS FROM DIFFERENT REGIONS OF RAJASTHAN, INDIA

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ABSTRACT

In the present investigation, an attempt has been made to identify the variation in nutritional value of *Grewia tenax* fruits from different regions of Rajasthan, India. Fruits were collected from Jodhpur (Kailana, Bilara) and Barmer (Siwana) region and analyzed nutritionally. Maximum ash and vitamin C content was obtained in samples from Siwana (4.73% and 56.47% respectively). Maximum fat content (2.66 %) was obtained in samples from Bilara. Maximum sugar and protein content was obtained in samples from Kailana (35.51% and 8.4% respectively). They are rich in vitamin C (39 mg/100 gm) content. The fruits are also rich sources of minerals such as Ca (0.32 ± 0.03 g/100g), K (1.26 ± 0.31 g/100 g) and Na (1.49 ± 0.32 g/100g) than the cultivated crop plants. Trace elements such as Fe, Zn, Cu, Mn and Mg were also analyzed. These results of nutritional composition were compared with those collected from Bilara and Siwana area of Jodhpur region. Many medicinal applications of *G. tenax* viz. as remedy for colds and chest complaints have also been reported. Thus, the importance of *G. tenax* in the rural economy is highly significant.

Keywords: Sugar, Protein, Nutritional, Supplement, Mineral, Fruits, Vitamins

INTRODUCTION

During times of famine, people suffer for finding food sources and depend on wild food plants for survival [1]. There is a growing interest on the ways to utilize the lesser known plant resources existing in the wild to explore food alternatives. Many indigenous plants are being utilized as food plants, but the studies regarding to their biochemical activities are less [2, 3].

Indigenous fruit trees and shrubs are essential as they provide important nutrients to the diet. The genus *Grewia* (Family-Tiliaceae) is native to Africa, Asia and Australia and comprises of 150 species with untapped potential. The species of *G. tenax* can be a useful horticulture plant. It is a small leaved shrub which produces quality fruits growing in semi-arid and sub-humid tropical regions in Rajasthan. The shrub is drought tolerant and can grow on most soil types along the ravine areas, bush land, along watercourses and depressions where moisture is available usually at low elevations. In Sudan it is widely used as a source of iron and used to increase hemoglobin levels by native people. The fruits of *G. tenax* have a number of uses and are most valued for their high nutritive value. They are either eaten fresh or left to dry for later consumption. The fruits juice is reported to be used as refreshing drink. *Grewia tenax* (Forsk.) Fiori is a much branched shrub distributed in Punjab, Rajasthan and Tamil Nadu [4]. It is a deciduous fruit producing shrub or small tree that may

attain a height of 1 to 3 meter. Fruits contribute significantly to the food and energy needs of rural populations [5]. They have good taste that is acceptable to the human palate and are eaten either fresh or left to dry for consumption at a later usage.

Fruits of *G. tenax* are rich in many nutritional constituents and minerals like iron [6] and used to treat many diseases like anaemia and malaria [7]. Porridge, called Nesha, is usually prepared from the fruit, and is helpful to lactating mothers [8]. The plant contains medicinal properties and can use against bone fracture and swelling [9], trachoma, tonsillitis, infections [10, 11] and can be used to prepare ointments [12]. Antibacterial activity and many other medicinal actions are reported earlier [13-17]. The research on exploitation and utilization of *Grewia tenax* fruits are scanty, therefore, this study to focus on the nutritional potential of this species.

MATERIALS AND METHODS

Fruits of *G. tenax* were collected from three places: Kailana, Bilara area of Jodhpur and Siwana from Barmer, washed and shade dried. Finally, pulped portion of fruits was separated, dried, ground and stored in a refrigerator.

Proximate analysis

Moisture, ash, total dietary fibre (TDF), crude protein, sugar (TSS) and fat were analyzed by the methods described in AOAC [18].

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Mineral analysis

Mineral element contents were determined by wet digestion methods using Atomic Absorption Spectrophotometer (AAS, Perkin Elmer) An acid digestion procedure was used for sample preparation in the determination of elements. A weighed amount of plant material was placed in a digestion tubes (Kjeldahl flasks) and a mixture of HNO₃ and 70% HClO₄ was added to each sample and then mixture was heated slowly at a low temperature. After digestion, the samples were diluted to the appropriate volume with deionised water and determined the concentration of the elements of interest. Standards prepared by suitable dilution of the stock standard solutions described in the "Standard conditions" for each element.

RESULTS AND DISCUSSION

G. tenax is highly drought resistant species that grows wild in the desert but can also tolerate higher rainfall. It is generally found growing in rocky places on hills and slopes. Both Kailana (Jodhpur) and Barmer areas lie in the arid western plain The climate in Siwana is desert type. The average annual temperature in Siwana is 26.9 °C. The average annual rainfall is 333 mm. <http://en.climate-data.org/location/286442/>. Jodhpur (Kailana area) comes under arid western agroclimatic zone of Rajasthan with rainfall between less than 300 mm. Bilara tehsil of Jodhpur district lies in the transitional plain of luni basin and has semi arid climate with rainfall between 300-500 mm. It is swapped by luni river. Samples were collected from these 3 areas and analysed.

Average moisture content of fruits was found 68.97 % on dry weight basis. Average Seed and pulp weight ratio was found to be as 3.5:5.2. Average weight of *G. tenax* fruits (50 nos) was found as 9.36 g. The results show that the fruits from Kailana are small. Data on proximate

composition of *Grewia tenax* fruits were given in the Table-1.

The protein was found in the range from 6.02±0.48 to 8.4±1.93% collected from three different places. The value of ash content was found from 2.7±0.69 to 4.73±1.16 %. The level of total soluble sugar for the three places was found in the range from 31.55±3.27 to 35.51±3.55 %. Petroleum ether extract (fat) was estimated in the range from 2.12±0.09 to 2.66±0.17 % and level of vitamin C was estimated in the range from 30.24±8.87 to 51.1±7.39 mg/100 g. On the basis results it can be report that the fruits from Kailana and Siwana area which are drier have higher values than the Bilara area which comes in semi-arid region. The results of the protein, TDF, ash and fat content were found very much near or in the range to the study done by Mohammed Elhassan *et al.* [19] except for the sugar content The sugar content found more in the samples from Jodhpur. Nutritional evaluation of *Grewia tenax* fruits has also been done by Abdulrahman [20].

Minerals content

Among the macro elements determined sodium found higher content (mean value 1.49±0.32 g/100 gm) than the potassium and potassium found higher content (mean value 1.26±0.31g/100 gm) than calcium (mean value 0.32±0.03 g/100 gm). Phosphorus showed in traces in these samples. So far as the micro elements determined, copper found in the range from 0.30 to 0.95 mg/100 gm for the sample collected from three different places. Zinc found in the range from 1.55 to 2.80 mg/100 gm. Iron found in the range from 6.10 to 9.45 mg/100 gm. Element Manganese found in the range from 0.5 to 0.65 mg/100 gm. Magnesium showed in the range from 61 to 78.8 mg/100 gm. Results of minerals analysis showed that iron found in remarkable which is the basis of its use in treatment of anaemia. Cereal powders in the baking industry which are deficient in elements can be fortified with *Grewia* fruits can enrich the dietary properties.

Table 1: Morphological data of *Grewia tenax* fruits

Region	Kailana	Bilara	Siwana
Moisture Content	67.92%	70%	69%
Diameter (cm)	0.45-0.70	0.53-0.89	0.50-0.84
Pulp: Seed	3.5:4.8	3: 5	4.1:5.8
Wt of 50 fruits (g)	8.07	10.73	9.28
Weight of 25 dry fruits (g)	1.82	2.28	1.45

Table 2: Proximate composition of fruits of *Grewia tenax* fruits (Expressed as (%)on DW basis)

Region	Ash content (%)	Fat (PE Extract %)	Total Sugar (%)	Protein (%)	Vitamin C (mg/100 g)
Kailana	2.7±0.69	2.34±0.28	35.51±3.55	8.4±1.93	51.1±7.39
Bilara	3.27±0.93	2.66±0.17	31.55±3.27	6.02±0.48	30.24±8.87
Siwana	4.73±1.16	2.12±0.09	31.73±3.2	6.08±0.89	56.47±3.72

Table 3: Mineral composition of fruits of *Grewia tenax* from different regions

Region	Micro elements (mg/100g)					Macro elements (g/100 g)			
	Cu	Zn	Fe	Mn	Mg	P(mg/100g)	K	Ca	Na
Kailana	0.95	1.60	8.3	0.6	73.5	0.770	1.29	0.39	2.12
Bilara	0.30	2.80	6.1	0.5	61.0	1.085	0.70	0.31	1.35
Siwana	0.35	1.55	9.45	0.65	78.8	1.305	1.79	0.28	1.02
Mean	0.53±0.20	1.98±0.40	7.95±0.98	0.58±0.04	71.1±5.28	1.05±0.15	1.26±0.31	0.32±0.03	1.49±0.32

CONCLUSION

The approximate chemical composition indicated that *Grewia tenax* fruits contained good amounts of sugar and protein. Fruits from Kailana, Jodhpur, were found richer in sugar and protein. They are rich source of minerals. From the results, it can be concluded that, the use of *Grewia tenax* fruits could be highly beneficial to combat nutritional requirement of rural and urban people. The plant can serve as a source of income for the tribal and rural people. So, the conservation and domestication of this plant is highly demanding.

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