Indian Journal of Traditional Knowledge
Vol. 8(4), October 2009, pp. 581-585

Traditional wisdom and value addition prospects of arid foods of desert region of North West India

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Received 13 July 2007; revised 12 June 2008

Desert region is endowed with valuable natural resources with special mention of arid fruits and vegetables. Arid foods are largely used by the native people of North West India as a prime source of food with their own traditional wisdom with less effort for value addition. However, processing of traditionally important arid foods into more useful and convenient product can improve livelihood security of the people residing in the desert regions. Thus, traditional wisdom and value addition prospects have been studied and reported along with their nutrient composition for such arid foods.

Keywords: Traditional wisdom, Processing, Arid foods, Value addition

IPC Int. Cl.[8]: A01K61/00, A61P1/02, A61P1/14, A61P1/16, A61P5/00, A61P5/50, A61P9/14, A61P11/00, A61P17/00, A61P17/02, A61P35/00

The arid zone of India is characterized by scarce, highly erratic and low rainfall days per year with extreme variation in annual temperature (-2.5° C in winter and 50^0 C in summer), high potential evaporation rate (6 mm/day) and wind velocity (30 km/hr). The whole tract of Rajasthan desert is sandy in texture with unfavourable physical condition of soil and poor quality of ground water. In general, the soils are poor in organic matter and high infiltration rate (15-30 cm/hr). The coarse textured soils of sandy plains are called desert soils[6]. It is widely accepted that desert horticultural produce are of explicit quality with great nutritional, medicinal, organoleptic, economic and traditional importance. Some of the arid vegetables and fruits just grow wild on barren land and are available free of cost to provide food and nutrition security. Most of the arid food resource is available in plenty during a particular season but all have not been utilized to desired extent due to many reasons. Thus, people residing in arid areas hardly get considerable advantage from the abundantly available resources. The solution of the problem lies only in evolving the techniques of value addition and providing market to such underutilized commodities. Processing of arid fruits and vegetables into more useful and convenient products, ultimately improves the economic value of any product, which is the most vital component of value addition[5]. Arid fruits and vegetables have not yet been given due consideration for value addition. This is the high time to think about this most important and economically gainful area of horticulture. Present study, therefore, is an effort to unfold the prospects of arid foods in the field of traditional wisdom, value addition and nutrient compositions.

Methodology

The common arid plants available in Bikaner zone of western Rajasthan during different season were enlisted. The relevant information regarding therapeutic uses and processing potentials of the arid foods was collected by surveying and information obtained form100 middle aged house wives (40-50 yrs) residing in Bikaner with the help of a pre-tested questionnaire. Based on the results of survey and experimental possibilities of available arid foods, various value added products were developed and standardized using sensory evaluation technique in the laboratory of Food and Nutrition[11]. The nutrient composition of the surveyed arid food was also analyzed in the laboratory using standard methods[1].

Results

Bikaner is situated in Northwest part of Rajasthan and presents an arid geographical area with different

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food habits. People consume variety of arid foods due to availability, palatability, traditional values and medicinal importance. During survey, it was noted that women of study area being accustomed to difficult topography, harsh climatic conditions, inaccessibility to basic health amenities, busy from dawn to dusk are thoughtful enough to practice their traditional wisdom to cure basic ailments at various life stages. These practices have little or no cost, are readily available, socially desirable and sustainable. Such practices are transferred from generation to generation and across various dimensions of the community. Traditional wisdom pertaining to the therapeutic uses of arid foods was identified by surveying the middle aged house wives. Therapeutic uses, prospects of their value addition and nutritional composition of arid foods have been enlisted (Tables 1-3).

Table 1—Therapeutic uses of the arid plants

Plant name/ Family Common name	Local name	Therapeutic uses
Aloe barbedensis Mill Liliaceae Indian aloe	*Guarpatha* (Rajasthan)	Antioxidant, bactericidal, fungicidal, purgative, controls arthritis, diabetes and cholesterol level.
Ziziphus nummularia (Burm.f.) Wight & Arn. Rhamnaceae *Ber*	*Ber* (Rajasthani)	Helps in blood purification & improves digestion
Cyamopsis tetragonolobus (L.) Taub. Leguminosae Clusterbean	*Guar* (Rajasthani, Gujarati)	Controls constipation, anorexia, diabetes, arthritis, colic pain hair fall and body pain
Cucumis callosus (Rottl.) Cogn. Cucurbitaceae	*Kachri* (Rajasthani)	Exert cooling effect, improve appetite, easy bowl syndrome, relives stomach pain, vomiting and constipation
Capparis deciduas Edgew. Capparidaceae	*Ker* (Rajasthani)	Cure stomach pain, vomiting, arthritis, diabetes and hypertension.
Leptadenia pyrotechnica (Forsk.) Decne Asclepiadaceae-	*Khimp* (Rajasthani) *Khip* (Gujrati)	Cures constipation, arthritis and good for health.
Prosopis cineraria Druce Mimosaceae	*Khejri* (Rajasthani)	Helps in blood purification, cures skin diseases, respiratory problems and piles, cures ring worm infection, dyspepsia and fevers.
Citrullus lanatus (Thunb.) Matsumura & Nakai Cucurbitaceae Watermelon	Tarbuj (Hindi) *Mateera* (Rajasthani)	Relieves constipation and diarrhoea, cardiac and kidney troubles.
Calligonum Polygonoides L. *Polygonaceae*	Phog *(Rajasthani, Punjab, Sind)*	Exert cooling effect and good for health
Cucumis melo L. utilissimus Duthie & Fuller Cucurbitaceae Snapmelon	Kakri (Hindi, Rajasthani)	Exert cooling effect, improve appetite, cure stomach pain, vomiting and constipation.

Table 2—Prospects of value addition to arid plants

Arid foods	Value added products
Aloe vera (*Aloe barbedensis*)	Pickle, squash, juice, jam, biscuits, *ladoo, papad, vadi,* mouth fresheners and dehydrated powder
Ber (*Ziziphus nummularia*)	Pickle, preserve, candy and squash
Cluster bean (*Cyamopsis tetragonaloba* L)	Pickle, guar gum, and dehydrated
Kachri (*Cucumis callosus*)	Pickle, dehydrated powder and mouth fresheners
Ker (*Capparis decidua*)	Pickle and mouth freshener
Khimp (*Leptadaenia pyrotechnica*)	Pickle, biscuits, vegetable and dehydrated
Khejri pods (*Prosopis cineraria*)	Pickle, biscuits, *ladoo* and dehydrated
Mateera (*Cirtullus lanatus*)	Ready to serve juice, squash and candy
Phog (*Calligonum polygonoides*)	*Raita* and dehydrated
Snapmelon (*Cucumis melo*)	Pickle, jam, chutney, squash and dehydrated (raw)

Table 3—Nutritional composition of arid foods and vegetables (per 100 gm on fresh weight basis)

Arid foods	Moisture (g)	Protein (g)	Fat (g)	Ash (g)	Fiber (g)	Carbohydrate (g)	Energy (Kcal)	Vit C (mg)	Iron (mg)	Calcium (mg)	Phosphorus (mg)
Aloe vera (*Aloe barbadensis* Mill)	97.2	0.06	0.09	0.75	0.42	1.42	7.0	53.0	0.27	N.A.	N.A.
Ber (*Ziziphus nummularia*)	70.3	N.A.	N.A.	N.A.	N.A.	4.75	N.A.	85	0.6	N.A.	N.A.
Clusterbean (*Cyamopsis tegragonolobus* L.)*	81.0	3.2	0.4	1.4	3.2	10.8	16.0	49.0	1.08	130	57
Kachri [*Cucumis callosus* (Rottl.) Cogn.]	88.3	0.28	1.28	1.46	1.21	7.45	43.0	29.81	0.18	0.09	0.003
Ker (*Capparis deciduas* Edgew.)	69.5	4.24	2.0	1.8	4.24	18.2	107.0	50	0.76	N.A.	N.A.
Khimp (*Leptadenia pyrotechnica*)	58.70	3.13	1.84	3.32	23.18	9.83	68.0	39	3.48	156	317
Khejri pods (*Prosopis cinearia*)	72.2	5.1	0.52	1.33	6.7	14.15	82.0	N.A.	0.48	0.41	0.05
Mateera [*Citrullus lanatus* (Thunb.) Matsumura & Nakai]	91.4	0.15	0.02	0.3	0.39	7.71	32.0	6.0	6.69	7.80	1.0
Phog (*Calligonum polygonoides* L.)	7.80	6.05	11.81	1.30	15.73	57.31	360.0	4.30	3.52	211	427
Snapmelon (Cucumis melo L.)	80.0	0.37	1.12	1.64	1.34	15.60	74.0	18.6	0.84	0.76	0.088

N.A. = Not available

Aloe (*Aloe barbadensis* Mill.)

Aloe barbadensis, a small, stem less, herbaceous perennial plant with shallow root system contains alloin, a yellow coloured liquid and colourless aloe gel. Aloe gel is reported to be rich in amino acids, minerals, vitamins, enzymes, proteins, polysaccharides and biological stimulants[7]. Aloe has long been used for curing various diseases such as digestive disorders, arthritis, diabetes mellitus and high cholesterol levels. Daily intake of 150 ml *Aloe vera* juice for a period of three months had indicated significant improvement in glycemic control, lipid profile and BMI of Type 2 diabetics, which may be due to the presence of high molecular compounds in aloe[3]. Nutritionally, it is rich in Vitamin C (53 mg %) with antioxidant and medicinal properties. The tender aloe, free from bitter content, is commonly used for vegetable purpose. The pulp of sweet strains may be used for other culinary purposes.

***Ber* (*Ziziphus nummularia* (Burm.f.) wight & Arn.**

Ber, a common fruit available during winter is well known for its ability to thrive under adverse conditions of salinity, drought and poor soils. It is grown throughout the country especially in arid and semi-arid region. Fruits of *ber* are quite nutritious (85 mg% Vit C), delicious, palatable and thus commonly used for fresh eating and dehydration. *Ber* pulp is used for making drinks[8]. *Ber* helps in blood purification and digestion.

Cluster bean (*Cyamopsis tetragonoloba* (L.)

Fleshy green tender pods of cluster bean, a typical tropical warm climate vegetable crop, grown in subtropical area during summer are used as vegetable (Fig. 6). The rough shined hairy types are used as fodder for the cattle and as green manuring crops. It is rich source of protein (3.2%), fibre (3.2%), carbohydrate (10.8%), calcium (130 mg%), phosphorus (57 mg%), and iron (0.6 mg%). Galactomanan, the essential ingredient of guar gum is highly mucilagnous and used in various industries. Guar gum of cluster bean being rich in soluble fibre, i.e. non starchy polysaccharides is useful for patients suffering from obesity, diabetes and Hyperlipidemia[2].

***Kachri* (*Cucumis callosus*)**

The mature fruits of *Kachri*, a drought tolerant cucurbitaceous vegetable found growing abundantly during rainy season in the arid and semi-arid regions of North-western India, particularly in Rajasthan are

usually cooked with various vegetable preparations (Fig. 1). *Kachri* is one of the components of the delicious vegetable popularly known as *panchkuta* in the desert district of North western India[9]. *Kachri* powder is used as souring agent in combination with other spices to make spice premixes and mouth fresheners. Powder of *kachri* with other spices is commonly used for various therapeutic purposes to cure stomach pain, nausea, vomiting and constipation. The dehydrated *kachri* is coughicide, vermicide, cooling, diuretic and gastric stimulant. Rural people grow *kachri* fruits with other rainfed crops for their food security.

Ker (*Capparis decidua* Edges)

Ker, an unconventional or lesser known food of arid and semi-arid regions is used in the community for medicinal value in diabetes, rheumatism, hypertension and various stomach problems (Fig. 2). Tender leaves and shoots of *ker* are used for plastering boils, when chewed relieve toothache and the bark is used against intermittent fever and rheumatism. *Ker* wood being very strong and durable, is used to make the foundation around the well and as firewood. Fresh *Ker* fruits after processing are very commonly used as vegetable and pickle. After ripening, *ker* fruits turn into red or pink and can be eaten raw. Immute fruits are also dried for subsequent use as vegetable in off season[15].

Khimp (*Leptadenia pyrotechnica* (Forsk) Decne

Khimp, a much branched, nearly leafless shrub distributed in Northwest India after drying is used for making roofs of *khuccha* houses of the villagers (Fig. 4). *Khimp* pods, locally known as *Khimpoli ki phali* are rich in calcium (156 mg%) and phosphorus (317 mg%). *Khimp* vegetable is prepared by adding onion, garlic with spices. The plant contains good quality fiber hence there is good scope for making bags, clothes, mats, carpets and other articles. It is traditionally used as antihistamine and an expectorant. The high alpha cellulose and low lignin contents of the fiber with favourable length and breadth ratio of the ultimate cell makes it suitable for use in blending with cotton or polyester fiber to produce blended textile yarn and in pulp and paper industries[5].

Khejri pods (*Prosopis cineraria* Druee)

Khejri, known as queen of the desert or *Kalptaru*, is highly salt tolerant (Fig. 3). *Khejri* is slow growing leguminous tree having deep and intensive root system and thus can withstand against drought years together. The unripe green pods of *khejri*, commonly known as *sangri* are rich in protein (5.1%) and fibre (6.7%) contents. The thicker wood of the plant is used as timber, lopped branches as fuel wood, leaves as fodder, green tender and dehydrated pods for vegetables, dried pods (*khokha*) for fresh consumption, flour for making *chapati* and also as

Fig. 1 *Cucumis callosus*

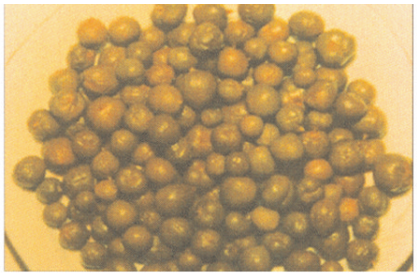

Fig. 2 *Capparis decidua*

Fig. 3 *Prosopis cineraria*

Fig. 4 *Leptadaenia pyrotechnica*

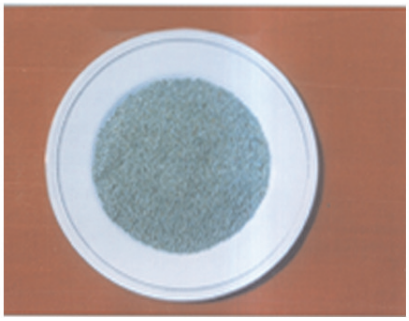

Fig. 5 *Calligonum polygonoides*

Fig. 6 *Cyamopsis tetragonoloba*

cattle feed. It is believed to help in blood purification & skin diseases. The stem and bark is used for curing boils, leprosy, dysentery, asthma, piles and tumours[14].

***Mateera* (*Citrullus lanatus*) (Thumb.) Matsumena & Makai**

Ripe fruits having sweet, juicy, refreshing and cooling pulp are used in the form of dessert, fresh juice, wine and squash. The fruit is quite nutritious and rich in iron (6.6 mg%). Sweetness (TSS) in *mateera* varies from 5-15% depending on glucose, fructose and sucrose contents, which increases with fruit maturity, ripening and temperature. Immature small, green and tender fruits of about 100 gm weight (*loiya*) are used extensively as vegetable. The seeds are rich in protein (25-32%) and yield very nutritive oil (30-40%). Seed kernels (*magaz*) extracted in large scale are used in sweets, beveragesr, snackes, bakery and ice creams[12].

***Phog* (*Calligonum polygonoides* Linn.)**

Calligonum polygonoides L., an evergreen xerophyte of semi-arid zones of Rajasthan, is used for feeding animals during severe drought (Fig. 5). It is commonly used as fuel. The decoction of roots mixed with catechu is used as gargle for sour gums. The wood is used in building huts and coal prepared from the plant is used by iron and goldsmiths. The seeds of *phog* are rich in protein (6.05%), fibre (15.70%), energy (360 kcal%), iron (3.52 mg%), calcium (211 mg%), and phosphorus (427 mg%). It is consumed in dried form especially with curd based preparation. It is a shrubby plant helps in soil binding and thus preventing erosion and stabilizing sand dunes[13].

Snap melon (*Cucumis melo* var Linn. *momordica*) Duthie & Fuller.

Unripe fruits of snap melon or *phoot kakari* commonly known as *kakadia*, are used to prepare curd based preparation and vegetable. Ripe fruits are used as dessert or as salad and can be preserved in the form of jam. Milk shake of snap melon is served as refreshing drink. Unripe fruits, locally called as *khelra* are also dehydrated for off-season use. Seed kernels are extracted commercially and after removing seed coats they are extensively used in sweet, bakery products and traditional drink (*Thandai*). The mature fruits generally exert cooling effect, improve appetite and relieve constipation[10].

Discussion

Ten arid plant species belonging to 7 families are commonly used as important arid fruit resource. All arid foods under study had great nutritional, medicinal and sensory appeal. There is a considerable traditional wisdom available on various therapeutic uses of arid foods along with a great potential in the field of processing and value addition. Therefore, a good future scope lies in the field of value addition in view of abundant availability, palatability, quality and therapeutic uses of arid fruits and vegetables.

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