The present study was conducted in five major districts fall under the Thar desert of the Rajasthan, India namely; Bikaner, Nagaur, Churu, Jodhpur and Jaisalmer district during the years 2010-2013. The objective of the study was to evaluate the most favourite and traditional cucurbitaceous vegetables and their utilization pattern for nourishment and sustenance of the dwellers in these districts. A total of 270 respondents (farmers) were selected to get intended information and to draw the desirable inferences of the study. During the study, it was found that kachari (Cucumis callosus Rott. Cong.), snap melon (Cucumis melo var. momordica), mateera loia (Citrullus lanatus Thunb.), round melon (Citrullus vulgaris var. fistulous) were the most favourite traditional cucurbitaceous vegetables which were grown and used by 67-100% farmers of the selected districts of the Thar desert as fresh or in the form of value added products throughout the year. These vegetables were mainly grown during the rainy season under mixed cropping system extensively and as sole crops at small scale. The farmers who had irrigation facilities grew these vegetables as sole crops at small scale during summer season also. These vegetables were mostly used freshly for preparation of vegetable in current season and various value added products were also prepared from the same for utilization in future in different forms. The major value added products of these vegetables prepared were: dehydrated slice/pieces/nuggets, pickle, fried chutney, dry chutney, powder, juices, hajmola, squash, jam, papadi, shek, cold drinks, sweets, rousted seeds, highly nutritive magaj (kernels of seeds), mateera oil, rayata, magaj laddu, etc. The respondents of the Thar desert got substantial income from above vegetables and value added products of the same. These vegetables also play a vital role as source of traditional herbal medicine to cure several diseases and health problems of the respondent (farmers) in Thar desert areas of the western Rajasthan.

**Keywords:** Traditional vegetables, Cucurbitaceous, Nourishment, Thar desert, Value added products, *Meena, Dhanaka* tribes

**IPC Int. Cl.:** A61K 36/00, A23B, A23B 7/00, B26D

The Thar desert area covers 12 district of the western Rajasthan. It spreads over 61 % area of Rajasthan state and characterized by an annual rainfall between 100 – 500 mm with a coefficient of variation (CV) varying from 40 – 70 %, low and erratic rainfall combined with extremes of temperature (450-500 cal/cm²/day), low relative humidity, high sunshine and abundant solar energy leading to high rate of evapo-transpiration value ranging from 1600 to 1800 mm in eastern and western part of the region respectively. Other important characteristics of the Thar desert (hot arid region) are hot winds with high velocity, poor soil condition, poor ground water with brackish and saline in reaction, poor vegetation, frequent occurrence of drought and frost, difficult to execute agro-techniques, difficulty in post harvest handling and marketing owning to limited and inefficient transportation and marketing facilities, etc. Even in such hard and harsh climatic condition, the farmers/dwellers of Thar desert of western Rajasthan, India, grow several traditional cucurbitaceous vegetables for their own use and sale the surplus for earning money and livelihood security. These vegetables are used not only as fresh in current season but also throughout the year by converting them in the form of preservation or value added products. They are the major source of nutrition and daily food stuff. The respondents used to prepare various traditional value added products of above vegetables using their own talent/traditional knowledge for their own consumption and selling surplus to local people/markets to earn money too. Some of the tribes like *Meena* and *Dhanak* of the desert areas used
Mateera fruits to protect themselves from the troubles/diseases like constipation, cardiac and kidney troubles. They also supposed that the consumption of mateera seeds helps in regulate blood sugar levels, maintain the nervous system, etc. However, the trends of consumption and utilization of the cucurbitaceous vegetables is not crystal clear yet. Hence, the present study was conducted to find out the most favourite traditional cucurbitaceous vegetables and their utilization pattern in nourishment and sustenance of dwellers in Thar desert of the western Rajasthan, India.

Methodology

The present study was conducted in five major districts of Thar desert of the western Rajasthan namely; Bikaner, Nagaur, Churu, Jodhpur and Jaisalmer during 2010-2013. These are the major districts fall under the Thar desert and majority of the farmers of these districts grew cucurbitaceous traditional vegetables for their own consumption in fresh as well as in value added form. Therefore, these districts were selected purposively. Further, two Tehsil were selected randomly from each selected districts for the study purpose. Thus, a total of 10 Tehsils were selected randomly amongst all above districts. Further, 03 villages were selected from each of the selected Tehsil. To avoid sampling biasness one big, one medium and one small village were selected from each of selected Tehsil. Thus, a total of 30 villages were selected for the study. Further, 09 farmers (03 big, 03 medium and 03 small farmers were selected to avoid sampling biasness) were selected randomly from each of the selected 10 villages. In this way, a total of 270 farmers (respondents) were selected for the present study to get their targeted responses and draw the desirable inferences of the study. The respondents were individually and interviewed and group discussions were also hold with respondents as per need. The data/ responses were recorded on a semi-structured interview schedule, specially prepared for the purpose. At the end, the targeted data/information so collected were coded, decoded, compiled, tabulated and analyzed with help of reliable statistical tool and techniques to draw the final inferences/results of the study.

Results and discussion

The extensive-intensive surveys were conducted during 2010-2013 in five selected districts of Thar desert of western Rajasthan and intended information/data were collected. During the study it was observed that even in so harsh climatic conditions, the respondents of the selected districts grew various traditional cucurbitaceous vegetables where other crops were very difficult to grow. Due to the uncertainty of rainfall and hard-harsh climatic conditions of the region (study areas), the sole cropping was very risky and not profitable. Therefore, the respondents followed mixed cropping system in the study areas during rainy (kharif) season. There were several potential landraces of the cucurbitaceous vegetables in Thar desert of western Rajasthan which were highly drought hardy and most suitable in existing adverse climatic conditions of the region. Therefore, majority of the farmers preferred to grow these traditional cucurbitaceous vegetables, mainly under existing mixed cropping system for their economical, nutritional and livelihood security. However, some of the farmers grew these traditional cucurbitaceous vegetables as sole crops also during rainy as well as summer season at small scale.

Most favourite traditional cucurbitaceous vegetables of the Thar desert

Cucurbitaceous vegetables are the largest group of vegetables among all vegetables grown in the Thar desert area of the western Rajasthan. During the study, it was recorded that there were various potential and unique cucurbitaceous vegetables which were grown traditionally and used/consumed widely by the respondents in the desertic part of the western Rajasthan (India) in various ways using their own traditional knowledge and methods. Among these, the most favourite and most accepted traditional cucurbitaceous vegetables of the study areas as observed during the study were: kachari (Cucumis callosus Rott. Cong.), snap melon (Cucumis melo var. momordica), mateera loia (Citrullus lanatus Thunb.), round melon (Citrullus vulgaris var. fistulosus) as given in Table 1.

Most of these vegetables were consumed throughout the year either in fresh or in preserved/different value added forms. The respondents of the region utilized the immature/mature fruits and other parts of these traditional cucurbitaceous vegetables (Table 1) to prepare the nutritious vegetables and various kinds of value added products to nourish themselves and others. In Thar desert areas, the cucurbit vegetables were of great economic and nutritional importance.
They were excellent source of vitamins, minerals, carbohydrates and traditional herbal medicines. They were very good sources of staple food stuff and income/entrepreneurship both in fresh as well as preserved/value added forms.

Utilization or consumption pattern of the traditional cucurbitaceous vegetables

1. Kachari (Cucumis melo var. callosus Rott. Cong)

Kachari was observed the most favourite, suitable and drought hardy cucurbitaceous traditional vegetable of the Thar desert/study areas of the western Rajasthan which grown here from ancient time. Kachari, belongs to the family- Cucurbitaceae, genus- Cucumis, species- melo and var. callosus/agrestis. It is commonly known as small gourd/wild musk melon (English), kachari (Gujarati), kachari/kachariya (Hindi), chibdin (Konkani), chibbad (Punjabi), shinde (Marathi), gurmi (Nepalese), etc. In study areas, it was mainly grown during the rainy season under the mixed cropping system at large scale or as sole crop at small scale. Some of the respondents who had irrigation facilities grew the kachari as sole crop during the summer season also. Kachari is an annual climber. Its vines grow up to 1.5 m and spreads on the ground. The fruits are obovoid/ellipsoid/oval-round shaped with green variegated stripes, 4.0–7.5 cm in size, generally with dark green stripes looks like a miniature of mateera/watermelon. Initially, the immature fruits of kachari are green in colour with hairy surface and have bitterness. As soon as the fruits reach at maturity, their hairs and bitterness disappear and become smooth and with relish taste having sourness/acidic taste².

(i) Kachari as source of nutritious vegetable/food stuff: Kachari was observed the most favourite traditional vegetable of the study areas of the Thar desert where it was utilized/consumed by 90-100 % respondents as fresh vegetable and in value added forms (Table 2). The fresh as well as dehydrated fruits of the kachari were mainly used for preparing vegetable (pure/ mixed with other vegetables), pickle and chutney. It has high nutritional value and work as mean of food seasoning or relish of the diet of the respondents in study areas of the Thar desert. The kachari is one of the components of the dry mixed vegetable stuff, locally called Panchkuta [consist of dehydrated tender pods of khejri (Prosopis cineraria (L.) Druce), fruits of ker (Capparis deciduas Edgew), fruits of kachari (Cucumis melo var. callosus Rott. Cong), fruits of lasora (Cordia myxa Roxb) and seeds

Table 1—The most favourite traditional cucurbitaceous vegetables grown extensively and used widely by the respondents (farmers) of the Thar desert of the western Rajasthan (India).

<table>
<thead>
<tr>
<th>S.No</th>
<th>Common name of vegetable</th>
<th>Scientific name of vegetable</th>
<th>Growing season</th>
<th>Part utilized/consumed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kachari</td>
<td>Cucumis callosus (Rott.) Cong.</td>
<td><em>Kharif &amp; summer</em></td>
<td>Fruits, seeds, roots, leaves</td>
</tr>
<tr>
<td>2</td>
<td>Snapmelon</td>
<td>Cucumis melo var. momordica</td>
<td><em>Kharif &amp; summer</em></td>
<td>Fruits, seeds, roots, leaves</td>
</tr>
<tr>
<td>3</td>
<td>Mateera</td>
<td>Citrullus lanatus (Thunb.)</td>
<td><em>Kharif &amp; summer</em></td>
<td>Immature small fruits (<em>loia</em>), seeds, roots, leaves</td>
</tr>
<tr>
<td>4</td>
<td>Roundmelon</td>
<td>Citrullus vulgaris var. fistulos</td>
<td><em>Kharif &amp; summer</em></td>
<td>Fruits, seeds, roots, leaves</td>
</tr>
</tbody>
</table>

Table 2—Utilization/consumption pattern of the traditional cucurbitaceous vegetables for the nourishment and sustenance of the respondents (farmers) of the Thar desert area of the western Rajasthan (India).

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Vegetable</th>
<th>The modus operandi of utilization and consumption forms of the traditional vegetables in nourishment</th>
<th>Producer &amp; Consumers (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kachari</td>
<td>Preparation of vegetable (pure and mixed both), dehydrated slice/pieces/ whole fruit (<em>kachri goite</em>), pickle, fried chutney, dry chutney, powder, juice, hajmola, squash, jam, papadi, spices mouth freshener.</td>
<td>90-100</td>
</tr>
<tr>
<td>2</td>
<td>Snapmelon</td>
<td>Preparation of vegetable (pure and mixed both), Khelara (<em>Dehydrated pieces/slices</em>), pickle, <em>Jem</em>, <em>shek</em>, chutney, cold drinks, sweets, <em>laddu of kernel of seeds</em>, etc.</td>
<td>87-100</td>
</tr>
<tr>
<td>3</td>
<td>Mateera</td>
<td>Preparation of vegetable of <em>loia</em>, dehydrated nutritive roasted seeds, highly nutritive <em>magaj</em>, mateera oil, juice, chutney, <em>rayata</em>, cold drinks, sweets, <em>laddu of kernel</em> (<em>magaj</em>) of seeds, etc.</td>
<td>68 – 88</td>
</tr>
<tr>
<td>4</td>
<td>Roundmelon</td>
<td>Preparation of vegetable, <em>foflia</em> (dehydrated pieces/slices) pickle, <em>rayata</em>, <em>chatney</em>, etc.</td>
<td>67 – 84</td>
</tr>
</tbody>
</table>
of kumat (Acacia senegal). Kachri fruits have very good amount of nutrients like vitamins, mineral, carbohydrates, etc. The 100 gm of fresh edible portion of kachri has 88.8% water/moisture, 7.45% carbohydrate, 47-54 Kcal energy, 0.28% protein, 1.28% fat, 1.21% fibre, 1.46% total ash, 0.09mg calcium, 0.0029mg phosphorus, 0.182mg iron, 0.0046mg copper, 0.052mg zinc and 29.81mg vitamin C. In 100 gm dry powder of kachri, 63.68% carbohydrate, 2.41% protein, 11.0% fat, 10.41% fibre, 12.50mg minerals, 17.02mg Vit.c, 0.8 mg calcium, 1.56mg iron, 0.025mg phosphorus, 0.45 mg copper, etc. 

The mature fruits of kachri (Cucumis callosus (Rottler) Congniaux) are available abundantly in South Western Rajasthan also and it is one of the components of the delicious mixed vegetable popularly known as panchkutta. It has 1.28 mg fat, 1.21mg fibre, 43 Kcal energy and 29.81 mg vitamin C in 100 gm of fresh fruit of kachri.1

(ii) Kachari as source of preserved food/value added products: Kachari was considered as a source of pure form of vegetable/food stuff in the study areas of the Thar desert. In addition of vegetable, the respondents of the desert region prepare various traditional value added products of kachari using their own experiences/traditional knowledge/methods for their own consumption and selling out the surplus in the markets. The utilization and consumption pattern of traditional value added products of kachari for the nourishment and sustenance of the respondents in desert areas were recorded during the study. The major value added products of kachari prepared and used by the respondents of the study areas in their daily diet and selling out the surplus of the same in local market/mandies/localities are depicted in Table 2. The leaves with tender stems of the kachari are used as feed of animals too.

(iii) Kachari as mean of income generation and trade specific opportunities: During the study, it was found that the kachari production was a very good mean of income generation and trade specific activities for the respondents in the study areas of the Thar desert. The respondents produce the kachari fruits in considerable amount for own consumption and sale surplus in the local markets/mandies. In addition to preparation vegetable, the respondents of the study area, prepared several value added products of kachari fruits (Table 2). These products were sold in the local markets/mandies/localities at high price to earn substantial amount of money from the same. The major value added product prepared by the farmers/rural dwellers of the Thar desert (study areas) for the income generation and business purpose were: dehydrated kachari (whole/as pieces/slices), kachari pickle, dry chutney, fried wet chutney, spicy powder, mouth freshener, etc. The fresh and dehydrated kachari was sold by the respondents in the markets/mandies/localities @ Rs. 18-45 and Rs. 140 – 185 per kg, respectively (Table 3). Likewise, the pickle, readymade dry chutney and fried wet chutney of kachari were sold by respondents in the markets/mandies/localities @ Rs. 120 – 160, 140 - 200 and 130 – 150, respectively and a thumping amount of money is earned for their livelihood security and prosperous life. The production of kachari seeds was also observed a very good source of income and business opportunities for the farmers/rural dwellers in the desert region. More than 20 % respondents produced the seeds of the available potential landraces as well as improved varieties of

Table 3—Generation of income from traditional cucurbitaceous vegetables for sustenance and livelihood security of respondents (farmers) of the desert area of the western Rajasthan (India).

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Common name of vegetable</th>
<th>Scientific Name of vegetable</th>
<th>Edible part sold</th>
<th>Farmer’s market price* per Kg (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kachari</td>
<td>Cucumis callosus (Rott.) Cong.</td>
<td>Fresh Fruits</td>
<td>18 – 45</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dehydrated fruits/slice</td>
<td>140 – 185</td>
</tr>
<tr>
<td>2</td>
<td>Snap melon</td>
<td>Cucumis melo var. momrdica</td>
<td>Fresh fruits</td>
<td>10 – 25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dehydrated fruits/slice</td>
<td>120 – 160</td>
</tr>
<tr>
<td>3</td>
<td>Mateera loia</td>
<td>Citrullus lanatus (Thunb.)</td>
<td>Immature fruits/loia</td>
<td>22- 45</td>
</tr>
<tr>
<td>4</td>
<td>Round melon</td>
<td>Citrullus vulgaris var. fistulos</td>
<td>Fresh Fruits</td>
<td>14 – 35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dehydrated fruits/slice</td>
<td>110-155</td>
</tr>
</tbody>
</table>

* Farmers’ market price of concerned vegetable/value added products depends on season, quality of produce, production, market demand and supply factors of the produce, bargaining of middleman, etc.
kachari and sold them in local markets/mandies/localities @ Rs. 400 - 2000 per kg, depending on type, quality, locality, season, demand and production factors of the seeds. Two percent innovative farmers produced the seeds of improved varieties (AHK-119, CIAH) of kachari and sold the same up to Rs. 2000 – 2500 per kg. Thus, the production and selling of kachari seeds at such high rates and earning of a great amount of money were very good source of income generating and business activities among the respondents in the Thar desert which led to livelihood security and sustenance of the respondents of the study areas.

(vi) Kachri as mean of traditional herbal medicine and therapy: The kachari was mainly consumed as a vegetable in Thar desert of the western Rajasthan but it has good herbal medicinal/therapeutic value too. The respondents of the study areas of the Thar desert used the kachari fruits, seeds, juice or their combinations for health care and to cure different health problems. The kachari fruits were used as a cooling light cleanser or moisturizer for the skin. They were also used as a first aid treatment for burns and abrasions. The flowers of the kachari were used as expectorant and emetic while fruits were used stomachic. The seeds were used to cure digestion and urinary problems and also in vermifuge activities. They were considered to possess significant antioxidant, anti-inflammatory and analgesic value. Roots of the kachari were used as diuretic and emetic. Thus, it proves that the kachari plays very important role as a nutritious food stuff, means of income generation, entrepreneurial activities and source of traditional medicine/therapeutic value in proper nourishment and sustenance of the respondents of the Thar desert of the western Rajasthan.

2. Snap melon (Cucumis melo var. momordica)

Snap melon was also observed as another most favourite, most suitable and drought hardy vegetable of study areas of the Thar desert in western Rajasthan. It belongs to family- Cucurbitaceae, genus- cucmis, species-melo and var. - momordica. It is locally known as 'phoot or photo kakadi, kakadia. Snapmelon is a monoecious, an annual climber, its stem are generally covered with rough hairs and vines grow up to 1.5 m which spreads on the ground. The flowers of the same are small, yellow, solitary or rarely in pairs or threes. Initially, the immature fruits of the snap melon are green in colour with hairy surface and have bitterness. As soon as the fruits reach at maturity, their hairs and bitterness disappear and become smooth with relish acidic taste. There is wide variability among the shape, size, appearance and colour of the snapmelon fruits. Most of the fruits of snapmelon are cylindrical, 10-22 cm length with 18-32 cm central girth, green-yellow/redish-yellow/creamy-yellow or green with yellow/greens strips/pots at maturity stage. After maturity, fruits reach to over maturity stage and at this stage the fruits start to crake automatically which are known as phoot.

(i) Snap melon as source of nutritious vegetable/food stuff: Like kachari, the snapmelon was also one of most liked vegetable of the desert region of the western Rajasthan where it was consumed by 87 -100 % respondents of the region as vegetable and in different value added forms (Table 2). The fresh as well as dehydrated slices of fruits of snap melon were mainly used for preparing vegetable (pure/ mixed with other vegetables). The fruits of phoot (over mature fruits) stage have a special pleasant smell and taste like pine apple. These phoots are of sweet-sour in taste and eaten directly as fresh fruit very eagerly by the respondents of the study areas/desert region. The fresh mature fruits of the snap melon were also used for salad purpose. Like kachari, snap melon was also considered as a source of pure form of vegetable/food stuff in Thar desert areas. It has high nutritional value and work as a mean of food seasoning or relish/palatability of the diet for the respondents of the study areas. The 100 gm of fresh edible portion of snap melon has 79.93gm water/moisture, 15.56gm carbohydrate, 79.29 Kcal energy, 0.36gm protein, 1.12gm fat, 1.34gm fibre, 1.64gm total ash, 0.76mg calcium, 0.0088mg phosphorus, 0.843mg iron, 0.1.04mg copper, 0.202mg zinc and 18.6 mg Vit. C. In 100gm dehydrated slices (kheltra) of the snap melon has 77.66gm carbohydrate, 395.28 Kcal energy, 1.84gm protein, 5.6gm fat, 6.72gm fibre, 8.18gm ash in which 3.8 mg calcium, 4.3mg iron, 0.44mg phosphorus, 5.2 mg copper,1.1mg zinc, 10.30 vitamin C, etc.3.

(ii) Snap melon as source of preserved food/value added products: The snap melon is one of the important source nutritious pure food stuff in Thar desert of western Rajasthan. The respondents of the desert region (study areas) prepare various kind traditional value added products of snap melon using their traditional knowledge and methods for their own consumption and selling out the surplus in the
markets. The modus operandi of the exploitation and production of traditional value added products of snap melon and their mode of consumption for the nourishment and sustenance of the respondents in Thar desert were recorded during the study as depicted in Table 2. The major value added products of snap melon as prepared and used by the respondents of the study areas in their daily diet and selling out the surplus of the same in local market/localities were dehydrated slice/pieces (khelra), pickle of snapmelon, fried chutney, jam of snap melon, etc.

(iii) Snap melon as mean of income generation and trade specific opportunities: During the study, it was found that the production of snap melon and its value added products opened very good opportunities for generating the income and trade specific activities for the respondents of the Thar desert. The respondents produced the snap melon fruits in large amount and sale them freshly in local vegetable markets/mandies/localities price ranging from Rs. 10 – 25 per kg., depending on quality of produce, season, selling location, demand and supply/production factors. In addition to preparation of vegetable, the respondents prepared several value added products of fruits of snap melon as shown in Table 2. These products were sold in the local markets/mandies and respondents earned thumping amount of money from the same. The major value added products of snap melon prepared and used by the respondents of the study areas in their daily diet and selling out the surplus of the same in local market/localities were: dehydrated slices (khelra) and pickle of snap melon, etc. The dehydrated slices (locally called khelra) of snapmelon were sold by the respondents in the markets/mandies/ localities @ Rs. 120 – 160 per kg (Table 3). These dehydrated slices (khelra) were used to prepare vegetable (mixed or pure), fried chutney or as a food seasoning agent throughout the year. The pickle of the snap melon was sold @ Rs. 100 – 125 per kg and earned substantial amount of money by the respondents for their livelihood security. The production of seeds of snap melon is also a very good source of income and entrepreneurship/ business opportunities for the respondents in study areas of the desert region. More than 70% respondents produced the seeds of the available potential landraces and improved varieties of the snap melons which were sold in localities/local markets/mandies @ Rs. 300 - 2000 per kg., depending on type, quality, and locality of sale, demand and production factors of the seeds. The seeds of local varieties/land races were sold at lower rates while the seeds of improved varieties were sold at higher rates. More than 3% farmers used to produce the seeds of improved varieties (like AHS-119 as developed by the CIAH, Bikaner) of snap melon and sold the same @ Rs. 2000 or more per kg. Thus, the production and selling of seeds of the snap melon at such high rates and earning of a great amount of money were very good income generating and entrepreneurial/business activities among the respondents in the Thar desert areas which played important role in sustenance of the respondents of the study areas.

(iv) Snap melon as mean of traditional medicine and therapy: In study areas, the snap melon was mainly consumed as a vegetable but it has herbal medicinal/therapeutic value also. Like kachari, the respondents of the Thar desert areas used the snap melon’s fruits, seeds, juice and their combinations for health care and to cure different health problems. The fruits of the snap melon were also used as a cooling light cleanser or moisturizer for the skin. They were also used as a first aid treatment for burns and abrasions. The seeds of snap melon were used to cure digestion and urinary problems. Roots of the snap melon were used as diuretic and emetic. Plant seeds were considered to possess significant antioxidant, anti-inflammatory and analgesic value. Thus, it proves that the snap melon played very important role nourishment and sustenance of the respondents of the Thar desert regions of the western Rajasthan. In Rajouri district of J & K, India, the various parts of the 42 medicinal plants species belonging to 36 Genera and 25 families were also traditionally used by the Gujar- Bakerwal tribes for the treatment of variety of non - communicable diseases.6

3. Mateera loia (Citrullus lanatus Thunb.)

In desert areas of western Rajasthan, another most preferable cucubit was mateera loia. The scientifically, mateera is known as Citrullus lanatus (Thunb.) Matsum. and Nakai which belongs to the family Cucurbitaceae. It is commonly known as Kalind (Sanskrit); Kalingad (Marathi); Tarbooaj (Hindi); Mateera (western Rajasthan); Kalingda (Gujarat). It an annual vine/ creeper. Mateera has well developed strong tap root system with a highly branching/lateral roots extending up to 1 m deep or more into the soil. The stem of the mateera is
herbaceous, highly branched vines up to 3 m long (but may be up to 8-10 m). The younger shoots are covered with long, woolly curved hairs protecting the plant from overheating. Flowers are staminate (male), perfect (hermaphroditic), or pistillate (female). However, monoeccious types are most common, but there are found andromonoecious (staminate and perfect) types also. The surface of fruits varies from single colour to various striped patterns. The mature fruits of the mateera consist of exocarp, mesocarp and endocarp. The endocarp (placenta) is seed containing part that is consumed as food (edible part) and the mesocarp and exocarp are usually referred to as rind having thickness of 10 to 40 mm. The colour of pulp may be white, pink or reddish-pink\(^7,8\). It is one of the most drought hardy and multipurpose cucurbit. It was preferably grown during rainy season under traditional mixed cropping system extensively. However, the farmers which had irrigation facilities grew it during the summer season as a sole at small scale also. It was grown for vegetable purpose, for eating as fresh fruits and particularly, to get its protein and oil rich seeds to supports the livelihood of respondents a big way. The mateera has a great importance not only as a vegetable and oilseed crop but also plays a vital role in livelihood and nutritional security in Thar desert regions.

(i) Mateera as source of nutritious vegetable/food stuff: The tender fruits of 'mateera' locally known as 'loia' (immature fruits of 100-150gm) were traditionally used by respondents widely to prepare vegetable or raita, chutney and also for sale surplus in the local market/mandies/localities. The mature fruits of mateera were eaten freshly and much relished. The roasted seeds of mateera were generally taken as a common snack in arid region. After removal of seed coat, the kernel of the mateera seeds, locally known as 'magaj' was mainly used in preparing sweets, laddu and cold drinks. The kernels (magaj) of the seeds were used in restaurants/hotels as source of flavor, taste and thickeners in vegetable preparation. After extraction of oil, the byproducts seeds serve as a quality animal feed which was supposed to increase the milk yield of the milch animals. The mateera fruits and seeds are very rich source nutrients and minerals. Mateera fruits have 1.75 % nitrogen, 10.93% protein, 0.011 % phosphorus and other valuable nutrients. The seeds of the mateera are very rich source of crude protein and oil besides other minerals. The mateera seeds oil contains > 80.0% unsaturated fatty acids with linoleic acid being the dominant fatty acid. The seeds kernels (magaj) are rich in edible oil (40%), crude protein (30%), etc\(^9\). The another study revealed that the seeds of mateera/watermelon has 28% crude fat and 23% crude protein while in kernel corresponding values observed were 49 and 40%, respectively\(^10\). The further analysis of seed kernel for mineral composition is reported considerable amount of phosphorus (1279 mg/100 gm), potassium (1176 mg/100 gm), magnesium (542 mg/100 gm) and calcium (150 mg/100 gm)\(^11\). The leaves with tender stems and fruit rinds of the mateera are used as a very good feed of animals.

(ii) Mateera as source of nutritious of preserved food stuff/value added products: The respondents of the study areas prepared various preserved food stuff /value added products of the mateera fruits and seeds which play very important role in nourishment and sustenance of the population of the desert regions. Such kind of major preserved food stuff/value added products of the mateera prepared by the respondents of the study areas as recorded (Table 2) during the study were: dehydrated nutritive rousted seeds, highly nutritious magaj (kernel of seeds), mateera oil, juice, cold drinks, sweets, laddu and powder of magaj and some other preparations in different combinations.

(iii) Mateera as mean of income generation and trade specific opportunities: The immature young fruits of mateera locally known as loia were used not only as most relished green vegetable but also work as a very good source of income for respondents of the Thar desert region. These 'loia' fruits were picked up when weighing around 100-150 gm, generally 8-10 days after fertilization. The Table 3 revealed that tender fruits (loia) which had enormous demand and sold in local market to fetch very good price (Rs. 22-45 per kg). Hence, respondents could get very good income after 40-50 days of crop sowing particularly under aberrant weather conditions where crop failures were very common phenomenon. The mateera seeds were of great importance in the markets due to its protein and oil rich kernels popularly known as magaj. The seeds of the mateera offered good remunerative price in local market (5000-9000 per quintal). The green as well as dry rind portion of the fruits locally called as khuparia was used as livestock feed which substantially reduce the feeding cost.
(iv) **Mateera as a mean of traditional medicine and therapy:** Traditionally, fruit juice of *mateera* was used against sun strokes by the respondents of the study areas. The regular use of the *mateera* fruits was supposed to cure the stone formation and have cooling effect on the body. *Mateera* fruits were used to relieve constipation and also supposed useful in cardiac and kidney troubles. The seeds of *mateera* were supposed to regulate blood sugar levels, increase energy, maintain the nervous system and promote healthy skin. The respondents of the study areas were of the opinion that the fresh eating/consuming of *mateera* (water melon) led to increase the blood, purification of blood, improve blood flow and may helps reducing the risk of heart disease. It helps in reducing the hypertension of the body. The *mateera* juice contain electrolytes, hence has cooling effect and save the people from harmful effect of high temperature (*Loo*) and dehydration of the body. The respondents believed that the use/eating of *mateera* and its products work as an anti-inflammatory, anticancerus, diuretic, laxative, antihypertensive, and antidepressant. The *mateera* was used to eradicate the urinary problems, weakness.  

4. Round melon (*Citrullus vulgaris var. fistulous*)  
*Citrullus vulgaris var. fistulous*, commonly known as squash melon, roundmelon, round gourd (in English) and *tinda* (Hindi) belongs to family-Cucurbitaceae, genus-*Citrullus*, species- *vulgaris* and var.- *fistulous*. It is an annual climbing or trailing herb with tendril, slender, robust, villous hairy stem. The plant is monoeccious. The flowers of the round melon are usually solitary in leaf axils, comparatively small, regular, pentamemorous, calyx campanulate, petals connate, yellow, and hairy. The male flowers are with three stamens and female flowers with inferior, globose and hairy ovary. The fruits of the round melon are globose or depressed-globose berry (hispid when immature), pale to dark green outside and creamy white to pale green inside with many seeds. Seeds are ovate-oblong, compressed, long, with ridged margin, smooth with blackish seed coat.  

(i) **Round melon as source of nutritious vegetable/food stuff:** The round melon (*tinda*), especially local type, was also observed as one of the important and favourite sources of green vegetable in the Thar desert areas of the western Rajasthan. It was consumed by 67-84 % respondents of the study areas in different forms (Table 2). Roundmelon was considered as a pure form of traditional vegetable/food stuff Thar desert areas. The fresh as well as dehydrated fruits of the round melon were mainly used for preparing vegetable (pure/mixed with other vegetables), *rayata* and chutney. It has high nutritional value and work as food seasoning item of the diet of the respondents of the study areas. The 100gm of edible portion of round melon has 93.5% moisture, 1.4% protein, 0.2% fat, 3.4% carbohydrates, 21 Kcal energy, 1.0% fibre, 21-25mg calcium, 14mg magnesium, 24mg phosphorus, 0.9mg iron, 35mg sodium, 24mg potassium, 0.12mg copper, 23I.U. vitamin A, 0.04mg thiamine, 44mg chlorine, 0.08mg riboflavin, 3.3mg nicotinic acid, 18mg vitamin C, 2.0mg oxalic acid, 13 µg carotene and 0.3mg niacin. During the scarcity of fodder, the whole green vine, fruits, rinds of fruits, etc., were used as good quality fodder for the animals.  

(ii) **Round melon as source of preserved food/value added products:** The respondents of the Thar desert areas of the western Rajasthan prepared/produced various traditional value added products of round melon using their own experiences/traditional knowledge/methods for their own consumption and selling out the surplus. The Table 2 reveals the utilization and production pattern of traditional value added products of round melon and their mode of consumption for the nourishment and sustenance of the respondents in Thar desert areas. The major value added products of round melon as prepared and used by the respondents of the study areas in their daily diet and selling out the surplus of the same in local market/localities were: *fofalia* (dehydrated pieces/slices), pickle, *chutney*, etc.  

(iii) **Round melon as source of income and trade specific opportunities:** During the study, it was recorded that the respondents of the study areas produced the local type (green) round melon extensively under mixed cropping system during the rainy season and prepared the various value added products of the same. Thus, the production of round melon in large amount and its value added products (Table 2) open very good opportunities for generating the income and business activities for the respondents of the Thar desert areas. The respondents produced the round melon fruits in large amount and sale them freshly in local vegetable markets/mandies/localities with price ranging from Rs. 14-35 per kg., depending on quality of produce, season, selling location, demand and supply/production factors. The
dehydrated slices (locally called *fofalia*) of snapmelon were sold by the respondents in the markets/mandies/localities @ Rs. 110 – 155 per kg. These dehydrated slices (*fofalia*) were used to prepare vegetable (mixed or pure), fried *chutney* or as a food seasoning agent throughout the year. The pickle of the snapmelon was sold @ Rs. 80 -120 per kg and earned substantial amount of money by the respondents for their livelihood security. More than 50% respondents produced the seeds of the available potential landraces of round melon which were sold in localities/local markets/mandies @ Rs. 250–700 per kg. Thus, the production and selling of seeds of the round melon at very high rates and earning of a great amount of money were very good income generating and business activities among the respondents in the Thar desert areas which led to livelihood security of respondents were of the regions (study areas).

(iv) **Round melon as mean of traditional herbal medicine and therapy:** Traditionally, the fruit of the round melon were used to improve the digestion of the human being. The fruits of the round melon were used to cure the constipation and also considered useful in cardiac and kidney troubles. It helps in reducing the hypertension of the body. Like *mateera*, the juice of round melon was full of good electrolytes, hence has cooling effect and save the people from harmful effect of high temperature and dehydration of the body. The juice of round melon was useful in reducing the urinary problems, kidney stones, weakness, etc., as reported by the respondents. The respondents of the Thar desert areas believed that the consumption of the round melon and its products work as antioxidant, diuretic, anti-depressant laxative, anti-cancerus, anti-hypertensive, etc. In Haridwar area of Uttar Pradesh also various plant based herbal medicines were used to treat the 18 ailments of human beings like fall in sex power, stomachache, cough, cold, weakness, indigestion, anorexia, flatulence, diarrhea, decrease in semen, erectile dysfunction, piles, fever, jaundice, etc.\(^\text{17}\). 

**Conclusion**

The Thar desert of the western Rajasthan has unique plant biodiversity. This biodiversity is a great source various drought hardy and nutritionally rich vegetables which are grown traditionally by the farmers of the Thar desert or grow naturally. Among these, major are cucurbitaceous vegetables like *kachari* (*Cucumis callosus* Rott. Cong.), snapmelon (*Cucumis melo var. momordica*), *mateera loia* (*Citrullus lanatus* Thunb.), round melon (*Citrullus vulgaris var. fistulosus*). These traditional vegetable are the life line for the dwellers of the Thar desert areas. They play a great role in socio-economic development, nutritional and livelihood security of the farmers and dwellers as a whole. These vegetable are unique source of potential germplasm/genotype for the vegetable crop improvement and advancement of horticulture in harsh climatic conditions like Thar desert of the western Rajasthan. There is tremendous scope exploiting the potentiality of the above and such other vegetables with respect of their improvement, production, value addition and commercialization of the same at large scale for the socio-economic up-liftment of dwellers of Thar desert, Rajasthan. Hence, these opportunities should be harnessed at any cost for the welfare of the desert areas and the country as a whole.

**Acknowledgement**

Authors are very grateful to farmers (respondents), elders, field workers, researchers and other agencies who directly and indirectly helped us in collecting desirable and authentic data/information to enrich the outcome of this study. The authors are also very grateful to the competent authority (Director, ICAR- Central Institute for Arid Horticulture, Bikaner- 334 006, Rajasthan, India) of the parental Institute who motivated and provided all essential facilities for the successful completion and concluding this study.

**References**


Antonious GF & Kochher TS, Mobility of heavy metals from soil into hot pepper fruits: A field study, *Bull Environ Contam Toxicol*, 82 (2009) 59-63.