International Journal of Botany Studies
ISSN: 2455-541X; Impact Factor: RJIF 5.12
Received: 20-10-2020; Accepted: 05-11-2020: Published: 21-11-2020
www.botanyjournals.com
Volume 5; Issue 6; 2020; Page No. 232-237

Potential of underutilized traditional cucurbits for contribution to food and nutritional security

Monisha Rawat[1*], Rupinderjeet Kaur[2], Annameti Sai Rishi[3], S Prakash[4], Gowshikkumar[5], Harpreet Singh[6]
[1] Assistant Professor, Department of Horticulture, School of Agriculture, Lovely Professional University, Phagwara, Punjab, India
[2] B. Sc. Student, Department of Horticulture, School of Agriculture, Lovely Professional University, Phagwara, Punjab, India

Abstract
Cucurbits are the key part of human diet and additionally they provide nutrients like vitamins and minerals. The development of cucurbits increased the production and it was possible due to the development of improved varieties and hybrids. The outstanding growth was contributed by the varieties of cucurbitaceous vegetables. In the agro climatic conditions of India, over sixty cucurbitaceous crops are widely cultivated. The crops which are not grown commercially on a large scale are known as underutilized crops. The minor cucurbits grown locally are well suited as they can withstand both biotic and abiotic stresses, yield more per unit area and can easily grow with low cost inputs. An attempt has been made in this paper to explore the diversity and potential of underexploited cucurbits, with special reference to provide nutritional and income support in rural areas as these not only can help to increase the employment and boost up the income of village areas but also contribute to the Indian economy.

Keywords: underutilized cucurbits, nutritional value, health benefits, propagation, income

1. Introduction
Cucurbits are the important vegetables which belongs to the family cucurbitaceae. They are cold sensitive and also bears tendrils. They are found in the tropical and subtropical areas around the world. The family comprises 118 genera and 825 species which are distributed in the tropical and subtropical areas of the world. The term 'cucurbits' was coined by Liberty Hyde Bailey for the developed types of the family Cucurbitaceae. But at present this term is used for all the species of the family. These are the vegetables which are well known for their nutritional and medicinal values, and also the potential sources of crop diversity. Cucurbits are consumed in various forms such as salad (cucumber), sweet (ash, pointed gourd), pickles (gherkins), deserts (melons) and some are used for culinary purposes. Some of them (e.g., bitter gourd) are well known for their medicinal properties (Dhaliwal, 2017) [4]. Underutilized cucurbitaceous crops are cultivated, traded and consumed locally. The popularity of these vegetables differs from crop to crop and also from one region to another, however, their consumption can be enhanced to a greater extent through promotions. Additionally, these are cheap, readily available and also have numerous advantages. These can be grown easily as these are hardy in nature and have the ability to yield even under adverse soil and climatic conditions. Most of these are very rich in vitamins, minerals, and other important nutrients like carbohydrates, proteins and fats. The underutilized cucurbits have a long history of consumption, and generally the local people are more aware about their nutritional and medicinal properties.

2. Underutilized cucurbits
Underutilized cucurbits are a rich source of vitamins, minerals and also have profound medicinal values and are normally utilized for their food, fiber, feed, oil and other healing properties. Some of these crops are discussed below:

2.1 Spine gourd (*Momordica dioica*)
It is a dioecious, perennial climber which is having tuberous roots. Commonly known as bristly teasle gourd, or kantola in India, these are flowering plants of the gourd family and is used as a vegetable in most of the parts of India. The vine bears tendrils, has underground tubers and small yellow flowers, dark green coloured round or oval fruits with smaller leaves. Plants are drought tolerant, frost sensitive and intolerant to poorly drained soils. Spine gourd grows well under warm humid weather conditions. This can be grown properly in the areas where temperature ranges between 24-40°C and the suitable time for sowing is February-March.
The fruit contains high amount of vitamin C, good amount of iodine and ascorbic acid. 100 g of fruit contains fibers (3.0 g), carbohydrates (7.7 g), proteins (3.1 g), moisture (84.1%), fats (3.1 g) and minerals (1.1 g). It contains steroids, alkaloids, glycosides, triterpenoids, saponin, flavonoids, triterpenes of urisolic acid and saturated fatty acids, vitamin A, riboflavin's, ascorbic acids, bitter principles, strearic acid, lectins etc. Various parts of this plant are used as traditional herbal remedies for various treatments such as diabetes, snake bite, inflammation caused by lizard, against fever, eye diseases.

Juice of roots is used as immune stimulant and antiseptic (Janani and Balusamy, 2019, Jha *et al.*, 2017) [6, 8].

Spine gourd

Buffalo gourd

2.2 Buffalo Gourd (*Cucurbita foetidissima*)

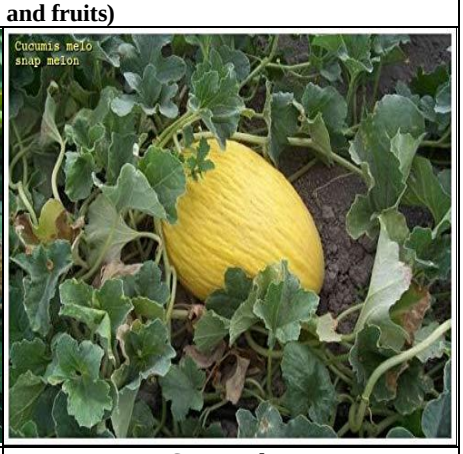
It is a perennial crop which grows from an outsized tuberous root. The stem, leaves and roots are used for medicinal purposes and the fruits and seeds are consumed.

2.3 Snake gourd (*Trichosanthes cucumerina*)

It is a tropical and annual vine which climbs by means of tendrils. The leaves are long palmately lobed and it grows up to 25 cm long. The flowers are unisexual, white and opens at night. It is locally called as podalangai in southern region. Common names are serpent gourd, chichinda and padwal. Fruits can grow up to 200 cm long, at maturity it is deep red in colour.

Snake gourd (flower and fruits)

Wild snake gourd



Snap melon

2.4 Wild snake gourd (*Trichosanthes cucumerina* subsp. *cucumerina*)

It is an annual, climbing plant produces stems up to 6 m long that can sprawl over the ground or climb into other plants for support, by means of tendrils. This is the wild species from which edible snake gourd has been developed. The leaves of wild snake gourd are round, kidney-shaped or broadly ovate, fruits are ovoid, spindle shaped, 5-6 cm long, 3.5-4 cm broad, pointed at both ends, white striped when young, red or orange when mature. Seeds ovate-oblong, enclosed within red pulp. It is grown in India, Pakistan, Sri Lanka and parts of south east Asia.

2.5 Snap melon (*Cucumis melo* var. *momordica*)

It is an annual plant, able to climb with the help of tendrils, but more commonly sprawling along the ground. Its vine length can reach 1.5 m. Fruits are small and smooth, cylindrical in shape, dark green in colour. Somewhat insipid or slightly fleshed. The average weight of fruits is 700 g and flesh colour is whitish pink with low sugar content. The fruits have cooling effect and can be used as intestine

cleaner. They are also used as a treatment for burns and abrasion and as natural moisturizer for the skin. The fruits improve appetite, cure stomach pain and help in relieving constipation and vomiting. The seeds are antitussives, digestive and vermifuge, and its roots are diuretic and emetic. The sprouting seed produces a toxic substance in its embryo so it should not be consumed. The immature and mature fruits are used as vegetable and desert, respectively. Immature fruits can be cooked or pickled and used as dehydrated value-added products during off-season. Mature fruits are eaten with salt. Though the flesh is mealy and tasteless, its ripe fruit are mostly cherished as dessert, in pickles, chutney, squash and as dehydrated.

2.6 Chow-chow (*Sechium edule*)

It was originated from the cool mountains of central America. Firstly, it was domesticated by Aztecs (Newstrom, 1991) [9]. It is also called chayote or squash in India. It is a herbaceous, monoecious plant and is a climber. It is grown mostly in the high hill stations. The inflorescence of chayote is group of male blooms and one/two female blooms. It produces mostly starchy roots and fruits which are edible. It also produces tendrils for support. It is mainly propagated by planting the whole fruit. In Mizoram, it is cultivated for its tender fruits, shoots, young leaves and tuberized roots which are eaten as vegetable, mixed with meats or as an ingredient of soup and other preparations (Singh *et al*. 2012, Singh *et al*. 2013) [15, 16]. Tuberous roots are used like potatoes.

Nutritional value per 100 g of chayote fruit: It contains 19 kilocalories energy, 4.51 g carbohydrates, 0.2 g starch, 0.13 g fat, 0.34 mg iron, 17 mg calcium and 0.03 mg thiamine.

Chow-chow | **Sweet gourd**

2.7 Sweet Gourd (*Momordica cochinchinensis*)

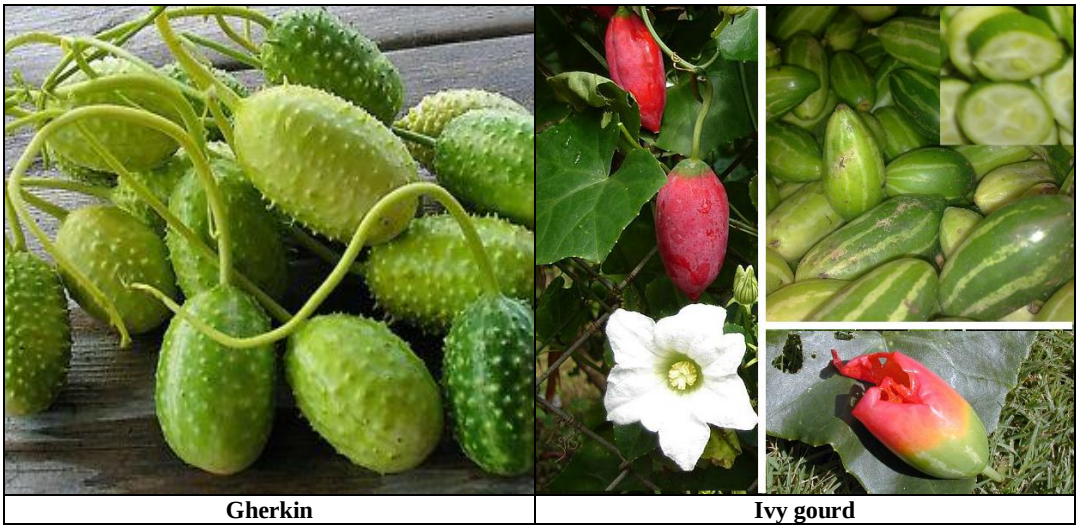
It was originated from south-east Asia. This fruit is mainly distributed from China to Australia. It is a dioecious, perennial plant. Stem is glabrous, leaves are sub-orbicular. It consists of 5 lobed flowers, white or pale yellow, black at base inside. Fruits are ovoid, 10-15 cm long, pointed densely aculeate turning red at maturity. Seed ovoid 26- 28 mm long, sculptured and compressed. It has high nutritional values like high protein, vitamin C and vitamin A. Tender fruits and younger leaves are edible. The seeds are used mostly for treating swelling and ulcers, anaemia, cardio-vascular diseases, eye sight, depression, cancer and prevents ageing.

Nutritional value per 100 g of fruit: It contains 40 kilocalories, 3 g protein, 30 mg calcium, 3.5 mg iron, 1516 IU and traces of vitamin C (Choudhury, 1983; Bose and Som, 1986 and Swarup, 2006) [1].

2.8 Gherkin (*Cucumis anguria)*

It was originated from southern Africa and mostly grown in warm climate all over the world. It is also known as bur gherkin or west Indian gherkin. These are mostly grown for their edible fruits. These fruits are served either as pickles, cooked or in raw form. Mostly gherkins are used commercially for pickling purposes.

Nutritional value per 100 g of fruit: It contains 0.6 g fibre, 0.1 g fat, 1.5 g carbohydrates, 10 kilocalories and 0.7 g protein.



Gherkin | **Ivy gourd**

2.9 Ivy gourd (*Coccinia grandis*)

Commonly known as ivy gourd, tindora, baby watermelon, kowai fruit and scarlet gourd, is a unique tropical vine. It mostly grows in southern states of India such as Tamil Nadu, Karnataka, Gujarat, Kerala, Andhra Pradesh etc. It is cultivated in Asia from India to Indonesia. Because of its extensive growth it grows very quickly and easily spreads on walls, fences, trees, shrubs and on other supports. It is cooked as a vegetable and has many medicinal properties. For proper growth and development, it requires warm and humid climate. Ideal temperature for the cultivation of ivy gourd is 20˚C to 30˚C. Summer and rainy seasons are favourable for fruiting. It naturally grows in semi-arid areas in dry forests and wooden grasslands. It grows in a variety of soils, most frequently in well drained sandy loam soils. The optimum pH range should be 6.0-6.5. It can be easily cultivated throughout the year. It is propagated by means of stem cuttings.

It lowers blood sugar level, roots prevents obesity (Bunkrongcheap *et al.*, 2014) [2], protects the nervous system, maintains a healthy metabolism, fibers keeps our digestive system healthy, prevents kidney stones. Every part of this plant is useful as medicine weather it is root, flower, fruit or leaves. There are various uses of this plant in skin diseases such as: small pox, ring worm, psoriasis, scabies, skin itching and ulcers etc.

2.10 Balsam apple (*Momordica balsamina*)

It is a monoecious, perennial climber which produces annual stems which can grow up to 5 meters long. The stems can lie down on the ground or climb onto the other plants or supports with the help of their tendrils. Ivy gourd is cultivated in almost all the tropical areas in small scale as a medicinal and vegetable crop. Although it is reported that sometimes ripe fruit may cause diarrhoea, vomiting and may be poisonous. Balsam apple is also known as indigenous crop of Asia (India), Africa, Australia and Arabica. This is a plant of tropical region that can be grown in warm temperate and subtropical areas but doesn't survive in frost. Both unripe and ripe fruits are harvested. Fruits are cooked and have bitter flavour. The fruit can be used to make pickle and after soaking it can be cooked and used for sauce making and soup. Although the immature, green fruits are edible but mature fruit are not used because it causes diarrhoea or vomiting. Leaves of this plant can be used for the fever, syphilis, hepatitis, excessive uterine bleeding and many skin disorders. Fruits of this plant are also used to heal wounds in some countries. This plant is also having anti-HIV properties. Leaf sap of this plant is very effective for metal cleaning. Leaves of this plant forms slightly soapy solution in water and used for body and hand wash (Thakur *et al.*, 2009) [18].

2.11 Meetha karela (*Cyclanthera pedata* (L.) Schrad.)

Also known as wild cucumber, it is a minor cucurbit grown mostly in the western and eastern Himalayan regions, but this species is quite popular as a vegetable especially in north-eastern parts of India, Nepal and Bhutan as compared to the western Himalayas. It is an annual plant which is mostly propagated through seeds. The pods are harvested when it turns pale green in colour and the central cavity is filled with loose black coloured seeds. Peru/Ecuador region is considered as the centre of origin (Pandey *et al.*, 2019) [10].

Balsam apple

Meetha karela

2.12 Mango melon (*Cucumis melo* var. *chito*)

Also known as lemon melon, orange melon and apple melon. The fruits are small i.e. orange sized. Mango melon also known as the It is used for making jam, juice, pickles and preserves. Size of the mango melon is bigger than a golf ball or smaller than a tennis ball. The fruit has white flesh and yellow skin. Mango melon is grown as both annual and perennial. It is propagated through seeds. When fruits change their colour from green to yellow then it is ripe and ready to harvest. If the mango melon is used as pickles then it is harvested at green stage before yellowing of fruits.

Mango melon	Casaba melon
	
Oriental picking melon	

2.13 Casaba melon (*Cucumis melo* var. *inodorus*)

It is a winter melon with dark yellow peel and some green shade on peel. Irregular shallow furrows run from end to end and inner part of the fruit has white or very light-yellow colour flesh. It is a rich source of vitamin C, B6, potassium and magnesium. Dry and hot climate is the best for its growth. It can be grown in humid and cold winter climate but under precautions against cold temperature and humidity. When the fruits turns from green to dark yellow with green strips then fruit is at mature stage.

2.14 Oriental pickling melon (*Cucumis melo* var. *conomon*)

It is also known as Chinese white cucumber and sweet melon. The fruits have variable shapes and are smooth, glabrous and without musky flavour. It is an annual plant, mostly propagated through seeds. It is widely distributed in the Peninsular region of India (Kerala) and valued for its young tender fruits (Pandey *et al.*, 2019) [10].

3. Constraints

1. Lack of education and awareness about these underexploited cucurbits among the farmers.
2. Lack of planting materials and desirable seeds.
3. Limited application of advanced agriculture techniques.
4. Lack of post-harvest management practices.
5. Less number of marketing facilities and infrastructure facilities for storage, processing and transportation.
6. Low financial support and improper institutional arrangements for horticultural based industrial units.
7. Very poor recognition of underexploited cucurbits in horticultural promotional programs.
8. Lack of researchers.
9. Lack of many cultural techniques for increasing the yield of these underutilized cucurbits.

4. Strategies to promote underutilized cucurbits

1. Localization of wild species through farmstead cultivation can be enhanced to avoid the overutilization of natural resources. In terms of multiplication of planting material, they require support.
2. Facilities of infrastructure should be expanded for the priority of development of market, communication and transport needs to be done.
3. Rejuvenation and afforestation of degraded forests may be carried out with prominence on enriching and supplementing biodiversity of horticultural and edible food crops. Programmes like joint forest management should be facilitated to spread ITK available with local communities on sustainable collection and utilization of various edible plant species.
4. These crops are rich in nutritional value and adapted to very low agricultural inputs. More Research and Development efforts in underutilized crops will add significantly to food security and nutrition vis-a-vis human welfare.
5. Underutilized crops are mostly grown under the traditional cultivation practices by diverse tribal communities. Focus to increase documenting indigenous knowledge is essential.
6. Strategies need to be worked out particularly at regional and national levels to make available and develop good seed material, promising varieties, in-vitro cultured material etc. These all will meet local needs, enhance production, and also generate income sources for small scale farmers.
7. For the development and research work only limited number of species should be targeted. Research needs to be targeted upon both crop/species essential subsistence farming and those exhibiting potential to become commodity crops.
8. These crops have poor yield and quality which effects the productivity. Though, some steps needs to be taken for the development of commercial exploitation of these crops. The criteria may be market demand, high productivity, diseases or insect-pest, high nutritive value, availability of production technology and easier post-harvest management. Though, special efforts are needed to develop package and practices of these crops involving conservation of genetic resources and development of superior varieties.
9. Special emphasis should be given on programmes for export-oriented production and border trade involving high value produce.

5. Conclusion

Reasons of low production of underutilized cucurbits are the insufficiency of availability of planting material, lack of awareness and knowledge about its medicinal and nutritional value. So the government should help and encourage the farmers to grow underutilized cucurbits in their field. Government can also help the farmers and producers by taking up programmes on genetic resources, exploration and management which can ultimately increase the national economy, employment and income of farmers.

6. References

1. Bose TK, Som MG. Vegetable Crops in India. Naya Prakash, Calcutta-Six India, 1986.

2. Bunkrongcheap R, Hutadilok-Towatana N, Noipha K, Wattanapiromsakul C, Inafuku M, Oku H, *et al*. Ivy gourd (Coccinia grandis L. Voigt) root suppresses adipocyte differentiation in 3T3-L1 cells. Lipids in health and disease. 2014; 13(1):88.
3. Chaudhury B. Vegetables, Pub: National Book Trust, New Delhi, 1983.
4. Dhaliwal MS. Handbook of vegetable crops, Edition: 3rd, Chapter: Cucurbits. Publisher: Kalyani Publishers, 1997, pp: 77-147.
5. Imbumi MD. Coccinia grandis (L.) Voigt In: Grubben, G.J.H. & Denton, O.A. (Editors). PROTA 2: Vegetables/Légumes. [CD-Rom]. PROTA, Wageningen, Netherlands, 2004.
6. Janani P, Balusamy A. Spine gourd- An underutilized Cucurbitaceous vegetable. Kerala Karshakan e-journal, 2019, 45-47.
7. Jena AK, Deuri R, Sharma P, Singh SP. Underutilized vegetable crops and their importance. Journal of Pharmacognosy and Phytochemistry. 2018; 7(5):402-7.
8. Jha, DK, Koneri R, Samaddar S. Potential Bio-Resources of Momordica dioica Roxb: A Review. Int. J Pharm. Sci. Rev. Res. 2017; 45(2):203-209.
9. Newstrom LE. Evidence for the origin of chayote, Sechium edule (Cucurbitaceae). Economic Botany. 1991; 45(3):410-28.
10. Pandey Anjula, NS Panwar, Rakesh Singh, Ahlawat SP. Vegetables: Status and Priorities for Exploration and Germplasm Collection in India. ICAR-National Bureau of Plant Genetic Resources, New Delhi, India, 2019, 97p + i-xxvii
11. Rai N, Asati BS, Patel RK, Patel KK, Yadav DS. Underutilized horticultural crops in north eastern region. ENVIS Bulletin Himalayan Ecology. 2004; 13:46-52.
12. Roy B, Biswas SC. Development of Spine Gourd with Unique Fruit Morphotype through Farmer-Scientist Participatory Breeding. J Agric. Technol. 2014; 1(2):104-106.
13. Rubatzky VE, Yamaguchi M. Cucumber, melons, watermelons, squash, and other cucurbits. In World Vegetables. Springer, Boston, MA, 1997 577-639.
14. Saade RL. Chayote, Sechium edule (Jacq.) Sw. Promoting the conservation and use of underutilized and neglected crops. 8. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy, 1996.
15. Singh BK, Pathak KA, Ngachan SV. Exploring underutilized chow-chow in Mizoram. Indian Hort. 2012; 57(5):3-5.
16. Singh BK, Ramakrishna Y, Verma VK, Singh SB. Vegetable cultivation in Mizoram: status, issues and sustainable approaches. Indian J Hill Farm. 2013; 26(1):1-7.
17. Swarup V. Vegetable science and technology in India. Kalayani Publishers, 2006.
18. Thakur GS, Bag M, Sanodiya BS, Bhadauriya P, Debnath M, Prasad GB, *et al*. Momordica balsamina: a medicinal and neutraceutical plant for health care management. Current pharmaceutical biotechnology. 2009; 10(7):667-82.