

Review on Medicinal climber: *Momordica charantia*

¹Mayur R. Patil, ²Neha D. Sonavane, ³Naresh R. Patil, ⁴Nilesh C. Jaiswal

Shastry Institute of Pharmacy
Erandol, Jalgaon 425109

Abstract- *Momordica charantia* (bitter gourd, family Cucurbitaceae) is a valuable medicinal vegetable crop found primarily in tropical Africa, the Middle East, and America. Bitter melon has been used as a folk treatment to treat tumors, asthma, skin infections, and hypertension. The plant has been utilized as a traditional medicine in China, India, Africa, and the Southeastern United States. It has a non-nitrogenous neutral principle called charantin, which when hydrolyzed yields glucose and sterol. Bitter gourd plays an essential function in the human diet by providing carbohydrates, proteins, vitamins, minerals, and other components required for good health. Bitter gourd is considered a desirable vegetable due to its hypoglycemic qualities. This crop most likely originated in India, with China serving as a secondary center of variation. Bitter gourd (*Momordica charantia*) is a regularly consumed vegetable. The fruit pulp contains soluble pectin but not free pectic acid. Galactouronic acid is also derived from meat. Bitter gourd contains thiamine, beta-carotene, folate, riboflavin, as well as minerals such as calcium, iron, phosphorus, magnesium, zinc, and dietary fiber. Regular consumption of bitter gourd juice improves physical stamina and prevents chronic weariness. Bitter gourd contains beta-carotene, which helps to treat eye problems and improve vision. Bitter melon contains anti-tumor, anti-inflammatory, antioxidant, anti-diabetic, hypolipidemic, and hypoglycemic effects. Common phytochemical components include alkaloids, charantin, flavonoids, glycosides, phenolics, tannins, and terpenoids. This plant is rich in numerous saponins, including momordician momordin, monordiciside, karavilagenin, karaviloside, and kuguacin, all of which have been documented to contribute to its curative effects, including antibacterial, antifungal, antiviral, and antiplastic illnesses.

Key Words: *Momordica charantia*, Bitter gourd, Anti-plastic, Anti-oxidant.

Introduction.

Due to its nutritional value and medicinal qualities, bitter gourd (*Momordica charantia* L.), one of the most significant monoecious cucurbits, is cultivated throughout India. In India, 101.43 million tonnes of bitter gourd are produced annually on an area of 6.76 million hectares under cultivation.[1]

One significant cucurbitaceous vegetable is the bitter gourd. *Charantia*'s diverse morphological features offer a comparatively wide range of phenotypic species variation.[2]

It is now shown by modern research that bitter gourds contain active polysaccharides that have antimicrobial, anti-inflammatory, hypoglycemic, and lipid-lowering properties. These properties can help boost immunity. (3)

The Cucurbitaceae family includes the bitter gourd (*Momordica charantia* Linn.), which is regarded as one of the bitterest fruits. In reality, it came from India and made its way to China in the fourteenth century (Aboa et al., 2008). Climbing is both tropical and subtropical. For example, the Japanese term for bitter gourd is Goya, but the English name is bitter melon or bitter gourd. In several Indian languages, it is referred to by numerous common names, such as Karela in Hindi, Karvelli in Sanskrit, Karli in Marathi, Karelo in Gujarati, Baramasiya in Bangali, Karali in Kannada, Kaypa in Malayalam, Pakar in Tamil, and Kakara in Telugu.

One of nature's most abundant gifts, the bitter gourd is also one of the vegetables that people most often throw away due to its bitter flavor, which is caused by a substance called momordicin. Fruits of the bitter gourd contain free acids, alkaloids, glycosides, saponins, reducing sugars, resins, and phenolic components (Raman and Lau, 1996). Due to its unique culinary flavor and reputation as a high-fiber food, bitter gourd is in high demand (Gopalan et al., 2000). The young bitter gourd fruits can be dried, juiced, pickled, boiled, deep-fried, and fried to make tea (Myojin et al., 2008). Bitter gourd is a blood purifier, stomachic, laxative, stimulant, and diabetes control. (4)

Locally referred to as karala oruccha, the bitter gourd [*Momordica Charantia* L] is a significant vegetable for household gardens. Originating in South Asia, it is a warm-season climbing annual with rapid growth. The cucurbitaceae family of vines includes the tropical and subtropical bitter gourd (5)

In India, bitter gourd, also known as karela or bitter melon (*Momordica Charantia*), is a vegetable that is widely consumed. Clinical investigations have indicated that it may have benefits for people with diabetes. Fresh whole fruit aqueous extract seemed to work better in certain circumstances than dried powder or dietary ingestion as a vegetable (7)

Bitter gourd exhibits a great deal of variation. Fruit morphology exhibits significant variation in terms of color, size, and exocarp features. For example, wild, freeliving *M. charantia* var. *muricata* ecotypes produce small, round fruits, whereas Indian *M. charantia* var. *charantia* cultivars yield huge fusiform fruit (Chakravarty 1990). On the other hand, three different types are found in China: ecotypes that produce small, extremely bitter fruits (10–20 cm); those that develop relatively long, slightly bitter fruits (30–60 cm); and ecotypes that produce triangular or cone-shaped, moderately to strongly bitter fruit (9–12 cm long) (Yang and Walters 1992).

Botanically speaking, *M. charantia* var. *minima* Williams & Ng (fruit <5 cm in diameter) and *M. charantia* var. *maxima* Williams & Ng (fruit >5 cm in diameter) are the names given to the tiny ecotypes that are widely cultivated in Southeast Asia (Reyes et al. 1994). Chinese bitter gourd ecotypes, on the other hand, differ morphologically from Indian types and are not yet classified as botanical varieties.(8)

In addition to being widely utilized in traditional medicine, it is planted as an ornamental and has a wide range of culinary applications, particularly in South, Southeast, and Asia (Heiser 1979). To give a slightly bitter flavour, the fruits are packed, stir-fried, cooked with other vegetables, or added in small amounts to soups and beans.(9)

Plant profile

Biological source: Karela consists of fresh green fruits of the plant known as *Momordica Charantia*

Family : Cucurbitaceae {pumpkin family}

Botanical Name: *Monordica Charantia*

Synonym:

1. *Momordica muricata*,
2. *Momordica zeylanica*,
3. *Momordica Charantia* var. *muricata*. [10]

Chemical Constituent: [11]

1. Charantin - Steroidal saponin {lower blood sugar level}
 2. Momordicin - cathartic us {purgatives leaves}
- i. Carbohydrates –
10% ascorbic acid, mineral 1.5%
- ii. Glycoside,
mucilage and alkaloids extra

Microscopic Character [12]

Colour: Dark Green To Whitish Green

Odour: Characteristic

Taste: Intensely Bitter

Size: 5.30 Long And 2 To 5 cm Broad

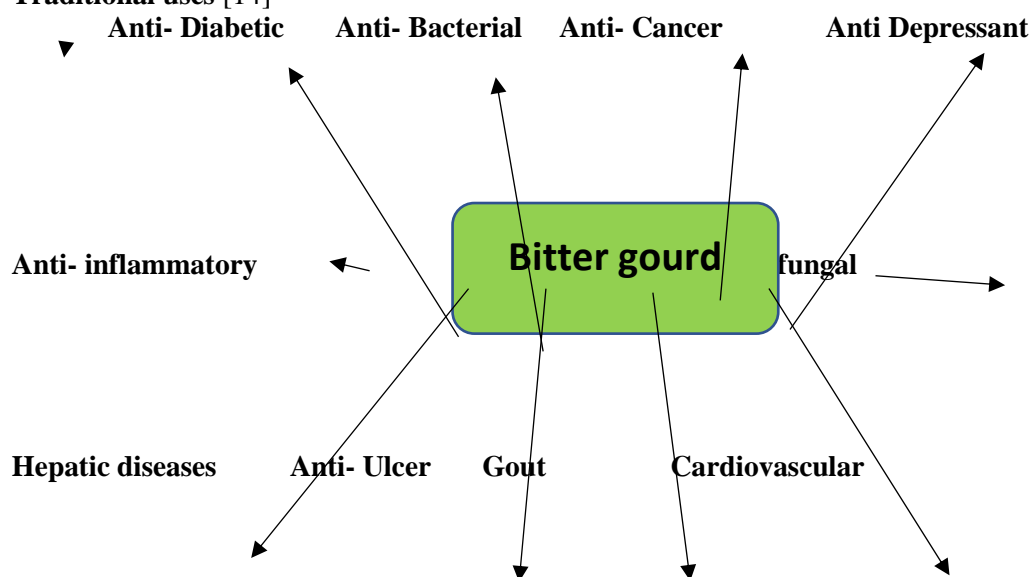
Shape:

- Fruit: pendulous, fusiform and breaked.
- Stem: slender and pubescent
- Leaves: sub-oribicular, 5-7 lobes, pubescent
- Flowers: solitary



Botanical Classification [13]

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliosida
Order	Viales
Family	Cucurbitaceae
Genus	Momordica
Species	Charantia

Traditional uses [14]**Health properties:****1. The Hypoglycaemic Instance**

According to Raman and Lau (1996) and Hirnantian et al. (2006), bitter gourds have bitter compounds such as carnation, vaccine, glycosides, and arabinosides in addition to polypeptide-p, plant insulin, which has hypoglycemic properties and raises blood sugar levels by promoting glucose absorption and glycogen synthesis in the liver, muscles, and fat cells. Another bioactive substance found in bitter melon is called lectin, and it links two insulin receptors together to provide activity similar to that of insulin. By affecting peripheral tissues and decreasing appetite in a manner akin to the effects of insulin on the brain, this lectin reduces blood glucose concentrations.

2 Activity of Antioxidants

Carotenoids' antioxidant qualities shield people from toxins and lessen the effects of free radicals, which are linked to heart disease.

3. Effects of Antifertility

Consuming too much of the bitter gourd's fruit and leaves can lower sperm production. When given to dogs and guinea pigs, bitter gourd ethanol seed extracts have also demonstrated strong male antifertility effects.

3 Viral Inhibition

Many chemical components of bitter gourd have been discovered in recent years. One such component is c-momorcharin, which simultaneously suppresses HIV (human immunodeficiency virus) activity and inactivates ribosome function by stimulating the creation of MAP30 (Momordica anti-HIV protein). Lee-Huang and associates, 1995.

5. Inhibition of Microbes

Bitter gourd leaf extracts have antibacterial properties, primarily against Salmonella, Escherichia coli, Staphylococcus, Pseudomonas, Streptobacillus, and Streptococcus. More precisely, fruit extracts of *M. charantia* L. have shown efficaciousness against Helicobacter pylori, the bacteria responsible for stomach ulcers, and tuberculosis.

6 Anti-cancerous and anti-tumours activity

Guanylate cyclase is an enzyme that has been clinically shown to be inhibited by a new phytochemical found in karela. This enzyme is hypothesized to play a role in the etiology and replication of cancer, leukemia, and psoriasis.

7. Issues with the Respiratory System

Equal parts of the paste made from Tulsi leaves and bitter melon leaves are combined. This is taken in the morning along with honey to cure and prevent respiratory issues like pharyngitis, common colds, bronchitis, and asthma.

8. Skin Infections

Scabies, ringworm, psoriasis, and other conditions require consuming one cup of bitter melon juice every morning on an empty stomach.

9. Impurities in Blood

The bitter tonic qualities of bitter gourd make it a useful blood purifier. Boils and other blood-related issues that manifest as skin conditions can be healed by it. The recommended course of therapy is to consume a cupful of bitter melon juice every morning along with a teaspoon of citrus lemon juice.

Suggested culture practice for bitter gourd

1.Climate

It is a warm season crop grown mainly in sub-tropical and hot-arid regions. They are susceptible to light frost and are provided with partial protection if grown during winter months. Temperature range of 24o- 27oC is considered as optimum for the growth of the vines. The seed germinates best when temperatures are higher than 18oC. High humidity at the time of vegetative growth renders the crop susceptible to various fungal diseases

2.Soil

Bitter gourd can be grown on well drained sandy to sandy loam; medium black soils rich in organic matter. Alluvial soil along the river beds is also good for production of bitter gourds. A pH range of 6.0- 7.0 is considered as optimum.[16]

3.Choosing a variety

Numerous hybrids and open-pollinated varieties are available. Hybrids usually produce higher yields, but their seeds are relatively expensive and must be purchased for every planting. Open-pollinated varieties have the advantage that their seeds maybe saved and used for future plantings. The choice of variety depends on market preference in a certain region, and is based on fruit shape and colour. Generally, there are three types:1) small, 10–20 cm long, 100–300 g, usually dark green, very bitter; 2) long, 30–60 cm long, 200–600 g, light green in colour with medium size protuberances, and only slightly bitter; and 3) triangular fruit type, cone-shaped, 9–12 cm long, 300-600 g light to dark green with prominent tubercles, moderately to strongly bitter. Select a variety that is well adapted to your growing conditions and preferred by consumers. Growers are encouraged to compare the performances of different varieties during different seasons to identify superior types

4.Preparing the field

Thorough land preparation and a well-prepared bed is required. Plow, harrow and rototill the field. Form 20-cm-high beds during the dry season and 30 cm or higher during the wet sea-son using a plow or me-chanical bed shaper. The distance between centers of adjacent furrows is about 150 cm with a 90cm bed top

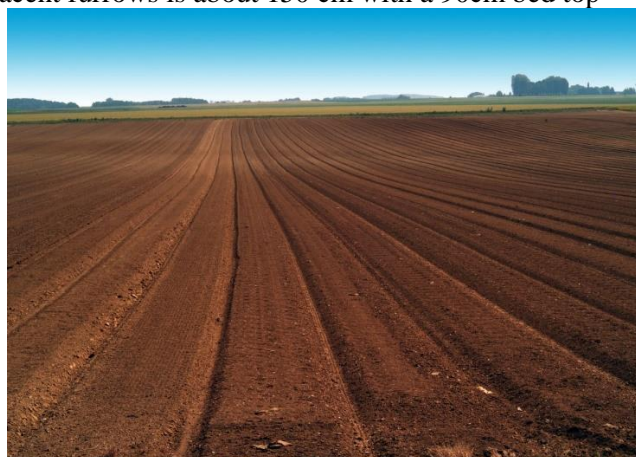


Image.2 Forming raised beds [17]

5.Planting

Land Preparation:

The land is ploughed and brought to a fine tilth by 1-2 crosswise ploughing and levelled. Furrows are opened at a distance of 1.5-2.5 m depending on the support system to be adopted.

Method of Planting:

In the plains, the summer season crop is sown from January to February, whereas the rainy season crop is sown in the month of May. For planting one-hectare area 4-5 kg of seed is required. Before planting the seed is treated with Thiram (3 g/kg of seed).

Plant Support:

Bitter gourd being a weak climber needs support for its growth. The plants trailed on the support (bower) continues to give yield for 6-7 months as against 3-4 months when trailed on the ground without support. Such vines are less susceptible to pest and diseases as they do not come in direct contact with the soil. In bower system, planting is done at a spacing of 2.5 x 1m. Furrows are opened up at 2.5 m and irrigation channels are laid out at 5-6 m distance. Wooden poles (3 m in height) are pitched on both the ends of alternate furrows at a distance of 5 m. these poles are connected with wires. . The wires along the furrows are further connected with cross wires fastened at 45cm distance so as to form a network of wires. Seeds are dibbled at distance of 1 m along the furrow and covered lightly with soil. The vines take about 1.5-2 months to reach the bower height, hence the vines during the initial stages of growth are trailed on ropes till they reach the bower. Once the vines reach the bower height, the new tendrils are then trailed on the bower.[18]

6.Purning.

Image 3. Horizontal trellis on top of structure. Image 4. Lean to trellis structure.



Bitter gourd develops many side branches that are not productive. To improve yield, remove lateral branches until the runner reaches the top of the trellis. Leave 4–6 laterals and cut the tip of the main runner to induce early cropping. Removal of lateral branches in the first 10 nodes has a positive effect on total yield. Without pruning, most of the female flowers occur between the 10th and 40th nodes, or at a height of 0.5–2.0 m. [19]

Image.3.Horizontal Trellis on top of structure Image.4. Lean to trellis structure.

7.Manufacturing and fertilization

The fertilizer doses to be applied depend on variety, fertility of soil, climate and season of planting. Generally, well decomposed FYM (15-20 t/ha) is mixed with the soil during ploughing. The recommended dose of fertilizer to be applied per hectare is 50-100 kg N, 40- 60 kg P₂O₅ and 30-60 kg 25 K₂O. Half the N and entire P & K should be applied before planting. The balance N is given at the time of flowering. The fertilizer is applied in a ring at 6-7 cm from the base of the stem. It is better to complete all the fertilizer applications just before the fruit set .[20]

8.Harvesting and handling

Bitter gourd requires close attention at harvest time. The fruits develop rapidly and must be harvested frequently to keep them from becoming too large or too bitter. Normally it takes 15–20 days after fruit set or 90 days from planting for fruit to reach marketable age, however, bitter gourd can be harvested at earlier stages depending on the purpose for

which it will be used. Fruits should be light green, thick and juicy, and the seeds should be soft and white. Harvest every 2–3 days using a pair of scissors or a sharp knife to cut the fruit stalk. If a fruit remains too long on the vine, it will turn spongy, sour, yellow or orange, and split open. Bitter melon yield can vary depending on variety and crop management. Average marketable yields are 8–10 t/ha. A yield of 20–30 t/ha is excellent and some F1 hybrids yield up to 40 t/ha. Fruits of bitter melon do not keep long and should be sold in the market immediately. Remove damaged and deformed fruits. Carefully arrange fruits in bamboo baskets or boxes (Fig. 12) and store in cool place at 12–13°C with 85–90% relative humidity. Under this condition, fruit storage life can be extended 2–3 weeks. Bitter melon is chilling sensitive and damage may occur if kept below 10°C. Do not store fruits at temperatures above 13°C, as this will result in fruits turning yellow and splitting open. Keep harvested fruits away from other fruits (such as banana, pineapple and apple) that release large amounts of ethylene, a ripening [21]

Conclusion

Bitter melon is a beautiful food that not only provides nutrition but also contains various components with therapeutic potential against a variety of diseases. Bitter melon contains a high concentration of vital health-promoting substances, making it a commercially valuable crop species for plant improvement. *Momordica charantia* Linn (karela) is a potential herbal plant that is used as both a vegetable and a medicinal. It contains a variety of medicinally essential biochemicals such as triterpene, protein, steroid, alkaloid, and phenolic compounds, which are responsible for its biological and pharmacological action such as antidiabetic, antioxidant, and anticancer properties. Many traditional medicine plants have been studied for their anthelmintic properties; however, the efficacy and safety of numerous plants have yet to be established. Several researchers suggested that *M. charantia* could.

REFERENCES:

1. APA Rani, K. R. (2014). Performance of bitter melon genotypes for yield and earliness. *Annals of Plant and Soil Research*, 16(4), 330-333.
2. APA Resmi, J., & Sreelathakumary, I. (2012). Studies on genetic divergence in bitter melon (*Momordica charantia* L.). *Journal of Horticultural Sciences*, 7(2), 152-155.
3. APA Chen, F., & Huang, G. (2019). Extraction, derivatization and antioxidant activity of bitter melon polysaccharide. *International Journal of Biological Macromolecules*, 141, 14-20.
4. APA Thakur, M., & Sharma, R. K. (2016). Bitter melon: health properties and value addition at farm scale. *Marumegh*, 1(2), 17-21.
5. APA Islam, M. R., Hossain, M. S., Bhuiyan, M. S. R., Husna, A., & Syed, M. A. (2009). Genetic variability and path-coefficient analysis of bitter melon (*Momordica charantia* L.). *Int. J. Sustainable Agric*, 1(3), 53-57.
6. APA Shetty, A. K., Kumar, G. S., Sambaiiah, K., & Salimath, P. V. (2005). Effect of bitter melon (*Momordica charantia*) on glycaemic status in streptozotocin induced diabetic rats. *Plant Foods for Human Nutrition*, 60, 109-112.
7. APA Dey, S. S., Singh, A. K., Chandel, D., & Behera, T. K. (2006). Genetic diversity of bitter melon (*Momordica charantia* L.) genotypes revealed by RAPD markers and agronomic traits. *Scientia Horticulturae*, 109(1), 21-28.
8. APA Dey, S. S., Singh, A. K., Chandel, D., & Behera, T. K. (2006). Genetic diversity of bitter melon (*Momordica charantia* L.) genotypes revealed by RAPD markers and agronomic traits. *Scientia Horticulturae*, 109(1), 21-28.
9. APA Krawinkel, M. B., & Keding, G. B. (2006). Bitter melon (*Momordica charantia*): a dietary approach to hyperglycemia. *Nutrition reviews*, 64(7), 331-337.
10 <https://images.app.goo.gl/T6BkbeMkHmpBjxfX6>
- 11 <https://www.google.com/imgres?imgurl=https%3A%2F%2Fimage.slidesharecdn.com%2Fkarela-200120162226%2F85%2Fkarela-momordica-charantia-7-320.jpg%3Fcb%3D1668266705&tbnid=g0Wza4SWDgO7uM&vet=1&imgrefurl=https%3A%2F%2Fwww.slideshare.net%2Fdeepakshukla128%2Fkarela-US&source=sh%2Ffx%2Fim%2Fm1%2F4&kgs=4c0bc66446c00dcd>
- 12 <https://images.app.goo.gl/BJZqDHmq6CgifUnp8>
- 13 https://www.google.com/search?sca_esv=f1fc6411aede3e&hl=en_US&sxsrf=ACQVn0_tJm5ze0EWNsaPY4kq9OMxbijgXA:1709108554703&q=taxonomical+classification+of+bitter+melon&tbm=isch&source=lnms&prmd=ivsnbmtz&sa=X&ved=2ahUKEwjajaTCzc2EAXUnwTgGHXIUAcUQ0pQJegQIDhAB&biw=360&bih=668&dpr=2#imgrc=UINIHgqUyLrZYM
14. APA Poolperm, S., & Jiraungkoorskul, W. (2017). An update review on the anthelmintic activity of bitter melon, *Momordica charantia*. *Pharmacognosy reviews*, 11(21), 31.
15. APA Thakur, M., & Sharma, R. K. (2016). Bitter melon: health properties and value addition at farm scale. *Marumegh*, 1(2), 17-21.
- 16 <https://vikaspedia.in/agriculture/crop-production/package-of-practices/vegetables-1/bitter-melon>
17. APA Thakur, M., & Sharma, R. K. (2016). Bitter melon: health properties and value addition at farm scale. *Marumegh*, 1(2), 17-21.

- 18 <https://vikaspedia.in/agriculture/crop-production/package-of-practices/vegetables-1/bitter-gourd>
- 19 APA Palada, M. C., & Chang, L. C. (2003). Suggested cultural practices for bitter gourd. Bangkok: The World Vegetable Centre (AVRDC). Available online at: <http://avrdc.org/LC/cucurbits/bittergourd>. Pdf.
- 20 <https://vikaspedia.in/agriculture/crop-production/package-of-practices/vegetables-1/bitter-gourd>
- 21 APA Palada, M. C., & Chang, L. C. (2003). Suggested cultural practices for bitter gourd. Bangkok: The World Vegetable Centre (AVRDC). Available online at: <http://avrdc.org/LC/cucurbits/bittergourd.pdf>.

