

# Health Promoting Components of Bitter Gourd (*Momordica charantia*) and its Value added Products

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**Abstract:** Bitter guard (*Momordica charantia*) is used as a medicinal food in different systems of medicine including traditional medicine. It plays vital role in maintaining and providing many basic nutrients and prevention of various ailments. It comprises a variety of bioactive compounds including alkaloids, polypeptides, vitamins, and minerals. A diversity of bioactive compounds present in bitter gourd makes it potential for preventing from different diseases such as cardiovascular disorder etc. The present review shall draw a link of the bioactive compounds to its pharmacological effects like antidiabetic, anticancer, antiviral, anti-inflammatory, analgesic, hypolipidemic, and hypocholesterolemia effects as well insights of different commercial products of bitter gourd. These valued products in addition to being healthy are more palatable than raw fruit thus increasing consumption of this bitter fruit. Further, processing of bitter gourd can generate a source of income among farmers and women making their livelihood better.

**Keywords:** Bitter gourd, bioactive compounds, antioxidant activity, commercialized products

## 1. INTRODUCTION

Bitter gourds (*MomordicaCharantia*) have its place in the family of Cucurbitaceous and recognized as one of the bitterest fruits. It actually belongs to India and eventually carried to China during the 14th century (Aboa et al., 2008). It is tropical and subtropical climber. There are many different names of bitter gourd such as bitter melon for its English name and Goya for its Japanese name. It is recognized with different common names in different Indian languages i.e. Hindi – Karela; Sanskrit – Karavelli; Marathi – Karli; Gujarati – Karelo; Bangali – Baramasiya; Kannada – Karali; Malayalam – Kaypa; Tamil – Pakar; Telugu – Kakar and also known as balsam pear, *Momordica chinensis*. Bitter gourd is one of the nature's most generous gifts and it is one of the most discarded vegetables by consumers because of its harsh taste as it contains a bitter compound called Momordica. It consist of glycosides, saponins, alkaloids, reducing sugars, resins, phenolic constituents and free acids as these components are very beneficial (Raman and Lau, 1996). Bitter gourd has good demand due to mainly its special culinary taste and it is also considered to be a good source of dietary fibers (Gopalan et al., 2000). The immature part of bitter gourd can be fried, deep fried, boiled, pickled, juiced, in the dried form it can be also

used to drink as tea (Myojin et al., 2008). Bitter gourd is considered as a very effective in the disease such as diabetes .it is also known as stimulant, stomachic, laxative, blood purifier and control diabetes. (Sandhya et al., 2000) studied that bitter gourd is antipyretic tonic, appetizing and antibilious). Its leaves are nutritious and have been reported as a source of calcium (1%), magnesium (4%), potassium (7%), phosphorus (5%), and iron (3%); fruits and leaves are great source of B vitamins; Thiamine (4%), Riboflavin (4%), Niacin (2%), Vit.B6 (3%) and Folate (13%). The fruits of bitter gourd are considered as a rich source of vitamins and minerals and contain 88mg vitamin C per 100 g (Akryod, 1963).

## 2. HEALTH PROPERTIES /BENEFITS OF BITTER GOURD

### 2.1. Antioxidant Activity

Bitter gourd consists of carotenoids, flavonoids and phenolic acids. They protect humans from carcinogens and mitigate free radical effects associated with heart disease. Total phenolic compounds like gallic acid, epicatechin, chlorogenic acid, catechin, and gentisic acid are free radical scavenging agents, present in whole fruit, seeds, and leaves, and regulates impaired antioxidant status and suppress fat accumulation. Flavonoids regulate blood cholesterol that provides protection from cardiovascular disorders like atherosclerosis (Gil et al. 2002). Leaf, fruit, seed, and ethanolic extracts have been reported to possess antioxidant and anti-inflammatory activity because of the presence of phenolic compounds (Qader et al. 2011; Chunthorng-Orn et al. 2012; Aljohi et al. 2016).

Other solvent extracts are endorsed to the existence of higher amounts of flavonoids and phenolics. The levels of TBARS, hydroperoxides, ALT, AST, and GPx (responsible for liver damage and lipid peroxidation) are normalized on oral administration of bitter gourd (Thenmozhi and Subramanian 2012; Sagor et al. 2015). The highest value based on DPPH radicals-scavenging activity and ferric-reducing power was observed for leaf extract, while the green fruit extract showed the highest antioxidant activity based on hydroxyl radical-scavenging activity, b-carotene-linoleate bleaching assay, and total antioxidant capacity (Yadav et al. 2016) Aqueous and ethanolic extract possess significant DPPH radical-scavenging

activity and iron chelating as compared to Vit. E (Kamal et al. 2011)

## 2.2. Antifertility Effects

It can be used as anti-fertility drug .Excessive consumption of the fruit and leaves of bitter gourd can reduce sperm production. Bitter gourd seed extracted from ethanol have also shown to have potent male antifertility effects when administered to dogs and guinea pigs.

## 2.3. Hypoglycemic Activity

Charantin, vicine, glycosides and karavilosides along with polypeptide-p, plant insulin are the compounds that are present in the bitter gourd, which are known for hypoglycemic in action and blood glucose levels are maintained by increasing glucose uptake and glycogen synthesis in the liver, also in muscles and fat cells (Raman and Lau, 1996 and Harinantenaina et al., 2006).Some other bioactive compound are present i.e. lectin that links the insulin receptors together. Due the presence of this lectin blood glucose concentrations decreases by performing on peripheral tissues. It also maintains effects of diabetes on brain and as well as, suppressing appetite.

## 2.4. Antiviral Activity

Many chemical components have been sequestered from bitter gourd, such as c-momorcharin, which inactivates ribosome function and stimulates MAP30 (Momordica anti-HIV protein) production, which, in turn, simultaneously suppresses HIV (human immunodeficiency virus) activity. (Lee-Huang et al., 1995)So it can be used to decrease the viral infections.

## 2.5. Antimicrobial Activity

Bitter melon/bitter gourd is also known for its antimicrobial activity .The leaf extracts of bitter gourd have antimicrobial activity principally contrary to Escherichia coli, Staphylococcus, Pseudomonas, Salmonella, Streptobacillus, and Streptococcus. Mainly specifically, fruit extracts of *M. charantia* L. have demonstrated activity against tuberculosis and the stomach ulcer—causing bacteria *Helicobacter pylori*.

## 2.6. Anti-cancerous and Anti-tumorous Activity

Due to the presence of novel phytochemical in bitter gourd it has clinically demonstrated the ability to inhibit an enzyme named guanylate cyclase. This enzyme is thought to be linked to the pathogenesis and replication of not only psoriasis, but leukemia and cancer as well.

## 2.7. Respiratory Problems

Combination of paste of leaves of the bitter melon is properly combined with the same quantities of the paste of tulsi leaves. This is used with honey every morning for the treatment and

prevention of many problems such as respiratory problems e.g asthma, bronchitis, common colds and pharyngitis.

## 2.8. Skin Infections

In case of scabies, ringworm and psoriasis, etc. every morning full one glass of bitter melon juice should be consumed on an empty stomach. Thakur and Sharma (2016) suggested that this juice can be prepared more potent by adding a teaspoonful quantity of the juice of the lime in it. It is also used in inhibition of leprosy in vulnerable regions of the world.

## 2.9. Blood Impurities

Many studies proved that bitter gourd is utilized as a blood purifier owing to its bitter tonic properties. Boils are also treated by the use of bitter gourd and other blood related problems that show up on the skin. For treatment of the scars and pimples, a cupful of the juice of the bitter melon with the addition of juice of citrus lemon must be taken each day in the morning.

## 3. COMMERCIALIZED PRODUCTS OF BITTER GOURD

### 3.1. Bitter Gourd Juice

Fresh bitter gourds are washed thoroughly and cut off from the top in which peeling is not done. Juicer extractor/pulper/blender/filter press is used to extract the bitter gourd pulp and then strained. The juice is pasteurized at 83°C for 3 min and citric acid @ 0.15% is added, followed by chemical preservatives, 0.2-0.3% KMS. The pre-sterilized glass bottles are filled with the hot juice and corked. These processed juices can be kept for storage at room temperature for six months. Bitter gourd juice has been utilized as nutraceutical on the basis of presence of certain bioactive components. Fruits like lemon, amla etc juices can be additionally used to bitter gourd juice to enhance the nutritional value as well as palatability.

### 3.2. Fried Bitter Gourd Chips

After washing is over the bitter gourds are trimmed at the ends off. Then Slicing is done in half lengthways, remove the seeds and then slice them lengthways into long strips, 0.5cm (1/4-inch) wide and 3.75cm (1 1/2 inches) long, approximately. Place the bitter melon pieces in a bowl, add 2% salt and 1% turmeric powder and sprinkle it evenly. Keep it for 30 min to reduce the bitterness of bitter gourd. Excessive water is removed from the bitter gourd pieces by keeping them kept under running water. Drying of the bitter gourd slices are allowed to dry either in solar dryer or other mechanical dryer for suitable time. Followed by drying the corn flour is spreaded on the chips and then fried at 1600oC for 3 min. After frying chips are removed and then red chili powder and chat masala may be added for increasing palatability. Packing is done into

the LDPE bags and sealed with the help of sealing machine and well labeled. Packed bitter gourd chips are stored in the cool or dry place. (Thakur and Sharma)

### 3.3. Dehydrated Bitter Gourd Rings.

Dehydrated bitter gourd rings are also used in many forms like cooked, stuffed and fried forms. After properly washing, bitter gourd fruits are cut into 1.5 cm thick rings which are then blanched in boiling water for 3 minutes and soaked in 0.2 per cent potassium meta-bisulphite solution for 15 minutes to inactivate the peroxidase enzymes. The pre-treated bitter gourd rings are spread on an aluminum tray and then solar drying and cabinet drying is used for the process of drying (Singh and Sagar, 2013). Mainly Dried product is chosen for the reason that of benefits like reduced mass and lowers packaging requirements and also increased shelf life.

### 3.4 Bitter Gourd Pickle

Washed bitter gourds are kept in a strainer to drain out remaining water. Cut the bitter gourds into thin round pieces. Add 1 tsp salt to the pieces of bitter gourds and keep aside for 1 hour in a utensil. This is done to release the bitter water from them, these salt coated bitter gourds are kept in boiling water and cover for 5 minutes. Keep the bitter gourd pieces in a strainer and remove excess water, keep the pieces on a washed cloth for 2-3 hours for drying in the open/sun to dry the water on them. Roast the species like Heeng, Jeera, Methi and Saunff until they become light brown. Grind these roasted spices to a coarse powder. Now keep the bitter gourd pieces in a dry utensil, also sprinkle the roasted spices and salt, and mix all these ingredients properly. Lemon juice is squeezed on the pieces of bitter gourd and then mix by a spoon. Plastic containers are used for filling of the pickle of bitter gourds mixed in spices. We can also keep this container in the sun. Stir the pickle everyday for the next 4 days with a clean and dry spoon. This pickle can be eaten for 15-20 days. Oil is used to increase its shelf life, and also by keeping the pickle in the refrigerator.

## 4. CONCLUSION

Bitter gourd is a very delightful vegetable not only on condition that it is good in nutrition but also offering several components which show medicinal properties against a wide number of diseases, thus it can be used as nutraceutical. Most of its chemical and organic constituents have reconnoitered for treating the diseases like diabetes, stomach disorders, pain, viral and bacterial infections as well as it can be also used for the prevention life threatening diseases like cancer and HIV infections too. Different commercialized healthy products can be developed from this bitter vegetable. Many products like Bitter gourd juice blended with citrus juice, chips, dehydrated rings, pickle etc. are some of the nutritious products which people can make at the household level. Thus value addition of

bitter gourd not only improves the economic status of people especially women and farmers but also aids in fighting against several chronic diseases. But People should avoid bitter melon if they have a known allergy to bitter melon or any member of the Cucurbitaceae (gourd or melon) plant families and it should be also avoided and cannot be recommended during pregnancy or breast-feeding because of the risk of birth defects or spontaneous abortion.

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