



BITTER GOURD: HEALTH PROPERTIES AND VALUE ADDITION

AT FARM SCALE

^aMamta Thakur* and ^bR. K. Sharma

^aTeaching Assistant, Department of Food Science, Nutrition and Technology, CSKHPKV, Palampur – 176062 (Himachal Pradesh) India.

^bAssistant Professor, Shramsakti College of Food Technology, Maldad, Sangamner, Ahmednagar - 412201 (Maharashtra) India.

*E-mail: thakurmamtafoodtech@gmail.com

Abstract

Momordica charantia, commonly known as bitter melon has been traditionally used in Ayurvedic and Chinese medicine to treat diabetes and its complications. Several medicinal properties of the bitter melon have been studied such as anti-diabetic, anti-ulcerogenic, anti-mutagenic, antioxidant, anti-tumour, anti lipolytic, analgesic, abortifacient, anti-viral, hypoglycemic and immunomodulatory. *In vitro* studies reveals that the bitter melon proteins (α - and β -monocharin) have inhibitory effect against HIV virus. Medicinal value of bitter melon has been attributed to its high antioxidant properties due in part to phenols, flavonoids, isoflavones, terpenes, anthroquinones, and glucosinolates, all of which confer a bitter taste. Bitter melon is often used in cooking for its bitter flavor, typically in stir-fries, soups, and also as tea. Pakistan, Philippines, Panama and Nepal also use this bitter vegetable for culinary purposes in addition to India. A large number of value added products can be prepared from bitter melon like bitter melon juice, pickle, dried rings, chips, etc. 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 melon can generate a source of income among farmers and women making their livelihood better.

Introduction

Bitter melon (*Momordica charantia* Linn.) belongs to the family of *Cucurbitaceae* and known as one of the bitterest fruits. It actually originated in India and eventually carried to China during the 14th century (Aboa *et al.*, 2008). It is tropical and subtropical climber. Bitter melon received different names such as bitter melon or bitter melon for its English name and Goya for its Japanese name. It is known 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 – Kakara. Bitter melon is one of the nature's most bountiful gifts and is one of the discarded vegetables by people, just because of its bitter taste as it contains a bitter compound called momordicin. Bitter melon fruits consist of glycosides, saponins, alkaloids, reducing sugars, resins, phenolic constituents and free acids (Raman and Lau, 1996). Bitter melon has good demand due to its special culinary taste and it is also considered to be a good source of dietary fibers (Gopalan *et al.*, 2000). The immature fruits of bitter melon can be fried, deep-fried, boiled, pickled, juiced, and dried to drink as tea (Myojin *et al.*, 2008). Bitter melon is anti-diabetic, stimulant, stomachic, laxative, blood purifier and control diabetes. It is

antidotal, antipyretic tonic, appetizing and antibilious (Sandhya *et al.*, 2000). 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 88 mg vitamin C per 100 g (Akryod, 1963).

Health Properties

1. Hypoglycemic Activity

Bitter gourd contains bitter chemicals like charantin, vicine, glycosides and karavilosides along with polypeptide-p, plant insulin, which are hypoglycemic in action and improve blood sugar levels by increasing glucose uptake and glycogen synthesis in the liver, muscles and fat cells (Raman and Lau, 1996 and Harinantenaina *et al.*, 2006). Bitter melon contains another bioactive compound i.e. lectin that has insulin like activity due to its linking together 2 insulin receptors. This lectin lowers blood glucose concentrations by acting on peripheral tissues and, similar to insulin's effects in the brain, suppressing appetite.

2. Antioxidant Activity

The antioxidant properties of carotenoids protect humans from carcinogens and mitigate free radical effects associated with heart disease.

3. Antifertility Effects

Excessive consumption of the fruit and leaves of bitter gourd can reduce sperm production. Bitter gourd ethanol seed extracts have also shown to have potent male antifertility effects when administered to dogs and guinea pigs.

4. Antiviral Activity

In recent years, a number of chemical components have been isolated 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).

5. Antimicrobial Activity

The leaf extracts of bitter gourd possess antimicrobial activity principally against *Escherichia coli*, *Staphylococcus*, *Pseudomonas*, *Salmonella*, *Streptobacillus*, and *Streptococcus*. More specifically, fruit extracts of *M. charantia* L. have demonstrated activity against tuberculosis and the stomach ulcer—causing bacteria *Helicobacter pylori*.

6. Anticancerous and Antitumorous Activity

A novel phytochemical in karela 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.

7. Respiratory Problems

The paste of the leaves of the bitter melon is mixed with equal amounts of the paste of tulsi leaves. This is taken with honey each morning as a treatment and prevention for respiratory problems such as asthma, bronchitis, common colds and pharyngitis.

8. Skin Infections

In case of scabies, ringworm and psoriasis, etc. one cup of bitter melon juice must be had each morning on an empty stomach. This juice can be made more potent by adding a

teaspoonful quantity of the juice of the lime in it. It is also used in prevention of leprosy in vulnerable regions of the world.

9. Blood Impurities

Bitter gourd is used as a blood purifier due to its bitter tonic properties. It can heal boils and other blood related problems that show up on the skin. For treatment, a cupful of the juice of the bitter melon must be taken each day in the morning, with a teaspoon of the juice of the citrus lemon in it.

Post-Harvest Losses and Value Addition

The post-harvest loss of bitter gourd is about 25%. Main reason for this much loss is ripening and mechanical damage during transport. Due to warty nature of the fruit the transport damage is very high. Further, polysacks bags being used to pack them cause severe damage to the fruit. If fruits are carefully transported, post-harvest loss can be minimized to a greater extent. Bitter gourd can be stored at ambient temperature for 4-6 days if they are harvested in a slightly immature stage. However this storage life can further be extended by storing them at 13°C.

Value addition of bitter gourd can be done by a number of ways. Thin slices can be dehydrated and this technology is adopted in a small scale for domestic purposes. A better quality product can be prepared if driers are used for dehydration. In addition, fruits can be canned (Krawinkel and Keding, 2006). They are usually blanched or soaked in salt water before cooking to reduce the bitter taste. Incorporating bitter foods in commonly consumed food dishes can mask the bitter taste of bitter gourd (Snee *et al.*, 2011). The seeds of ripe fruits are used as condiment. Further, bitter gourd is used for juice preparations especially for diabetic patients and may be mixed with other fruit/vegetable juices to improve its palatability for the general consumer.

Bitter Gourd Juice Preparation and Storage

Fresh bitter gourds are washed thoroughly and cut off from the top and are not peeled. The bitter gourd pulp is extracted in a juicer extractor/pulper/blender/filter press and then strained. Based on quality and yield of pulp, it is advisable to use blender or pulper than others. 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 recognized as nutraceutical on the basis of presence of certain bioactive components. The other fruit like lemon, amla etc juices can be added to bitter gourd juice to enhance the nutritional value as well as palatability.

Fried Bitter Gourd Chips

The bitter gourds are washed and trimmed the ends off. Slice them 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, sprinkle liberally with 2% salt and 1% turmeric powder. Keep it for 30 min to reduce the bitterness of bitter gourd. The bitter gourd pieces are kept under running water and drain excess water from them. Bitter gourd slices are allowed to dry either in solar dryer or other mechanical

dryer for suitable time. After drying the corn flour is sprinkled on the chips and then fried into deep fat fryer at 1600°C for 3 min. After frying chips are removed and then red chili powder and chat masala may be added for increasing palatability. Bitter gourd chips should be packed 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.

Dehydrated Bitter Gourd Rings

Dried product is preferred because of advantages like reduced mass and lowers packaging requirements. Dehydrated bitter gourd rings are also used in cooked, stuffed and fried forms. Properly washed 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 metabisulphite solution for 15 minutes to inactivate the peroxidase enzymes. The pre-treated bitter gourd rings are spread on an aluminium tray for solar drying and cabinet drying (Singh and Sagar, 2013).

Bitter Gourd Pickle

Washed bitter gourds are placed in a strainer to drain out remaining water. Cut the bitter gourds into thin round pieces. Put 1 tsp salt to the pieces of bitter gourds and keep aside for 1 hour in a utensil. This releases the bitter water from them, put these salt coated bitter gourds 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 in the open/sun to dry the water on them. Roast Heeng, Jeera, Methi and Saunff till they turn light brown. Grind these roasted spices with yellow mustard to a coarse powder. Now keep the bitter gourd pieces in a dry utensil, also put the roasted spices and salt, mix all these ingredients properly. Squeeze the juice from the lemons on the bitter gourd pieces and mix with a spoon. Fill a glass or plastic container with the 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. Sour bitter gourd pickle with a mouth watering smell is ready. This pickle can be eaten for 15-20 days. To increase its shelf life, keep the pickle in the fridge or add mustard oil enough to submerge the pickle completely.

Potential Dangers

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 bitter melon cannot be recommended during pregnancy or breast-feeding because of the risk of birth defects or spontaneous abortion.

Conclusion

Bitter gourd is a very wonderful vegetable not only providing nutrition but also offering several components which show medicinal properties against a wide number of diseases. Most of its chemical constituents have explored for treating conditions like diabetes, stomach disorders, pain, viral and bacterial infections as well as life threatening cancer and HIV infections too. This bitter fruit can be used for preparing many mouth watering healthy products. 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 economical status of people especially women and farmers but also aids in fighting against several chronic diseases.

References

- Aboa, K., A. Fred-Jaiyesimi, and A. Jaiyesimi. (2008). Ethnobotanical studies of medicinal plants used in the management of diabetes mellitus in South Western Nigeria. *J. Ethnopharm*, **115**: 6771.
- Akroyd, D. (1983). Characteristics of bitter gourd. *Prog. Hort.*, **15**: 50.
- Gopalan, C., B.V. Rama Sastri, and Balasubramanian. (2000). Nutritive value of Indian foods. National Institute of Nutrition, ICMR, Hyderabad, pp. 204.
- Harinantenaina, L., M. Tanaka, S. Takaoka, M. Oda, O. Mogami, M. Uchida, and Y. Asakawa. (2006). *Momordica charantia* constituents and antidiabetic screening of the isolated major compounds. *Chemical and Pharmaceutical Bulletin*, **54**: 1017-1021.
- Krawinkel, M.B., and G.B. Keding. (2014). Bitter Gourd (*Momordica charantia*): A dietary approach to hyperglycemia. *Nutrition reviews*, **64**(7): 331-337.
- Lee-Huang, S., P.L. Huang, H.C. Chen, A. Bourinbaiar, H.I. Huang, and H.F. Kuang. (1995). Anti-HIV and anti-tumor activities of recombinant MAP30 from bitter melon. *Gene*, **161**: 151–156.
- Myojin, C., N. Enami, A. Nagata, T. Yamaguchi, H. Takamura, and T. Matoba. (2008). Changes in the radical-scavenging activity of bitter gourd (*Momordica charantia* L.) during freezing and frozen storage with or without blanching. *Journal of Food Science*, **73**(7): 546-550.
- Raman, A., and C. Lau. (1996). Anti-diabetic properties and phytochemistry of *Momordica charantia* L. *Phytomedicine*, **2**: 349–362.
- Sandhya, L.S., S. Yogita, and B. Ramesh. (2000). Role of bitter gourd fruit juice in stz-induced diabetic state in vivo and in vitro. *J. Ethnopharmacology*, **73**(1-2): 71-79.
- Singh, U. and V.R. Sagar. (2013). Effect of drying methods on nutritional composition of dehydrated bitter gourd (*Momordica charantia* L.) rings. *Agriculture for Sustainable Development*, **1**(1): 83-86.
- Snee, L.S., V.R. Nerukar, D.A. Doolay, J.T. Efirt, A.C. Shovic, and P.V. Nerukar. (2011). Strategies to improve palatability and increase consumption intension for *Momocordia charantia* (bitter melon): A vegetable commonly used for diabetic management. *Nutri J.*, **10**: 71-78.