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Role of Bitter gourd (*Momordica charantia* L.) in human health strengthening and regulate different diseases

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Abstract
Bitter gourd (*Momordica charantia* L.) is member of the Cucurbitaceae family and native is India (Indo-Burma region) with chromosome number (2n)= 22. Depending on location is known variously as karela, bitter gourd, bitter melon, balsam pear (India), Kugua (China), Nigeria URI (Japan), Ampalaya (Philippines), Mara (Thailand) and Peria (Malaysia). It is widely grown and consumed vegetable in Asia, East Africa, India as well as South America. Bitter gourd provides health benefits against various ailments for improving the quality of life. It is nutrient dense plant-based food containing versatility of bioactive compounds such as alkaloids, polypeptide, vitamins, and minerals. In view of presence of bioactive compounds, it has the ability to fight against various lifestyle related disorders, e.g. help in weight loss, diabetes mellitus, anti cancer properties, abdominal pain, kidney (stone), fever and liver cleanser. Amongst bioactive moieties, p-insulin is similar to insulin whose subcutaneous injection significantly lower blood glucose levels in diabetic patients. It also contains steroidal saponins called charantin, act similar peptides and certain alkaloids that effectively control sugar level in blood. The therapeutic perspectives have been also highlighted as they are helpful in regulating blood cholesterol thus protecting the body from cardiovascular disorders like atherosclerosis. Whole fruit, seeds and leaves of bitter gourd regulates impaired antioxidant status and suppress fat accumulation. Moreover, curative potential of its bioactive components and their utilization in value added food products are also the limelight of article.

Keywords: Bitter gourd, Health benefits, Anti cancer properties, Diabetes mellitus, Charantin

Introduction
In the field of nutrition, plants and their products have significant importance not only for providing basic nutrients but also for prevention of various maladies [4]. It is estimated that 415 million peoples are living in the world with diabetes, which is estimated to be 1 in 11 of the world's adult population. It is expected to rise to 642 million people living with diabetes worldwide by 2040. Globally, an estimated 422 million adults were living with diabetes in 2014, compared to 108 million in 1980. The global prevalence (age-standardized) of diabetes has nearly doubled since 1980, rising from 4.7% to 8.5% in the adult population (Global Report on Diabetes, WHO) [29]. India is rapidly emerging as the diabetes capital of the world. Currently, there are approximately 63 million diabetics in India, [12] second only to China, and this figure is likely to increase substantially by 2025 [19]. Bitter gourd has received growing attention among all vegetable crops nowadays because it contains an abundance of hydrophilic and lipophilic compounds includes glucosides, saponins, alkaloids, fixed oils, triterpenes, proteins, steroids and polyphenolics that are associated with antioxidants, anti-diabetes, antimicrobial, anti-cancer, hypertensive properties and others. Morphologically, the bitter melon is an herbaceous vine which bears tendrils, and it creeps along supports. Leaves are simple and alternate, and flowers are yellow. Male and female flowers grow on the separate parts of the plants. The fruit has a distinct warty looking exterior and an oblong shape. It is hollow in cross-section, with a relatively thin layer of flesh surrounding a central seed cavity filled with large flat seeds and pith. Seeds and pith appear white in unripe fruits while ripening to red; they are not intensely bitter and can be removed before cooking. The flesh is crunchy and watery in texture, similar to cucumber. The skin is tender and edible. The fruit is most often eaten green. The bitter melon more typical of India has a narrower shape with pointed ends, and a surface covered with jagged, triangular "teeth" and ridges. Bitter gourd is grown for its nutritional value and medicinal properties. The bitterness in bitter gourd is due to the cucurbitacin like alkaloid momordicine and triterpene glycosides (Momordicoside) [17]. The most food preparation, the fruits are blanched, parboiled or soaked in a salt water before cooking to reduce of bitter taste, The potential for bitter gourd to modulate blood glucose has

received the most attention from investigators searching for natural foods or compounds that may be useful in the treatment of diabetes. Insulin is mandatory for type-1 diabetes and is frequently required in type-2 diabetes as the disease progresses. Statistics from developed countries show that more than 30% of all diabetics use insulin either singly or in combination with oral anti-diabetic drugs. These include a mixture of steroidal saponins known as charantin, insulin-like peptides and alkaloids.

Bitter gourd Plant Description

Bitter gourd) (Figure-1) is an annual or perennial climber found throughout the globe and also cultivated up to an altitude of 1500m. It is cultivated during the warm season, i.e., during April to July by sowing seeds in a pit. Seeds are sown at a distance of half a meter and provided with manures. Only one plant is retained, and plant seedlings are watered once or twice a week. Plants begin to flower 30-35 days after sowing and fruits are ready for harvesting after flowering 15-20 days. It is a useful medicinal and vegetable plant for human health and one of the most promising plants for diabetes [1].

Fig 1: Fruit of bitter gourd

Nutritional Value in Bitter gourd

Apart from their bitter, undesirable taste bitter gourd is a good source of nutrients, vitamins as well as minerals. Bitter gourd nutrition facts vary slightly based on which part of the plant is being consumed and whether it's eaten raw or cooked. The following nutrition information is provided by (Gopalan *et al*. 2000 and USDA database).

Table 1: Nutrition value of Bitter gourd (per 100grams fruit)

Principle	Nutrition value (per 100g fruit)
Moisture	83.20
Energy	17 Kcal
Carbohydrates	10.60 g
Protein	2.10 g
Total Fat	0.17 g
Dietary Fiber	1.70 g
Vitamins	
Folates	72 µg
Niacin	0.400 mg
Pantothenic acid	0.212 mg
Pyridoxine	0.043 mg
Riboflavin	0.040 mg
Thiamin	0.040 mg
Vitamin A	471 IU
Vitamin C	84 mg
Electrolytes	
Sodium	2.4 mg
Phosphorus	38 mg
Potassium	171 mg
Minerals	
Calcium	23 mg
Copper	0.19 mg
Iron	2.0 mg
Magnesium	17 mg
Manganese	0.08 mg
Zinc	0.46 mg
Phyto-nutrients minerals	
Carotene-β	126 µg
Carotene-α	185 µg
Lutein-zeaxanthin	170 µg

Amazing Health Benefits of Bitter gourd

1. High nutritive value

Bitter gourd is a rich source of vitamins and minerals. It contains iron, magnesium, potassium and vitamins like A and C. It involves twice the beta-carotene of broccoli and calcium of spinach. Various anti-oxidants and anti-inflammatory compounds are present in bitter gourd. It also helps in lowering the bad cholesterol levels, thus reducing the risk of heart disease and stroke. It strengthens the immune system, improves respiratory health, boosts skin health and contains anti-ageing properties [7, 18].

2. Reducing blood sugar

Bitter gourd is used primarily as an alternative treatment for lowering blood sugar levels in patients [2, 5] with type-2 diabetes mellitus [26]. Considerably it is the most potent and popular fruit in terms of managing diabetes through alternative medicine [23]. In fact, drinking bitter melon decoctions is a common practice of diabetes management in Asian countries. The overall phytochemical composition of the bitter gourd consists of steroidal saponins [15] and charantin alkaloids [21]. Charantin specifically augments glycogen synthesis within liver and muscle cells. Regular consumption of bitter gourd fruit, juice, or dried powder can

provide additive effects when taken with cnventional hypoglycemic medication [25, 11]. Bitter gourd contains polypeptide, an insulin-like compound called and charantin, which has anti-diabetic properties [22]. These components actively help in reducing the blood sugar levels. It also helps to prevent unpredictable spikes and drops in insulin levels by regulating the metabolism and use of sugar the body has consumed [15]. Bitter gourd acts as a hypoglycemic agent. It is rich source of soluble fiber and is low in glycemic index, which helps in lowering the blood sugar level.

3. Good for digestion

It is an excellent source of dietary fiber. Regular consumption of bitter gourd contributes to relieving constipation and indigestion. It supports healthy gut bacteria, which favours digestion and nutrient absorption [4, 27].

4. Liver cleanser

Bitter gourd is liver friendly and detoxifies. A tonic aids in digestion, improves gallbladder function, and lowers fluid retention. Cirrhosis of the liver, hepatitis, and constipation may be relieved with a bitter gourd liver tonic. It boosts the liver enzymes and is a good cure for a hangover as it reduces alcohol deposits on the liver. Bladder and the gut also benefit from consuming it [4].

5. Therapy of Herpes disease

According to the World Health Organization (WHO), around 67 percent of people, globally, have an HSV-1 infection, and 11 percent have an HSV-2 infection. Bitter melon has antiviral properties, treat patients with herpes simplex virus-1 (HSV-1), and prevent the spread of herpetic plaques to other persons [24].

6. Heals Ulcer

Various studies reveal that bitter gourd is quite beneficial in treating various digestive and stomach disorders including constipation, intestinal worms and ulcers. Being a great source of dietary fiber, adding this in your daily diet improves soothes tummy, bowel movements and prevent the formation of stomach ulcers [6].

7. Immunity enhancer

Drink bitter gourd juice to get rid of skin disorders like blemishes and acne. It is an excellent remedy for disorders like itching, scabies, ringworm, boils and other fungal infections. Adding bitter melon fruit or juice to your diet helps you recover from common illnesses much quicker and decreases your susceptibility to infections. Bitter melon is abundant in antioxidants that constitute an impregnable line of defense against viruses. The fruit is rich in vitamin C, a powerful antioxidant. A hundred-gram serving of bitter melon provides over 80mg of vitamin C. Antioxidants attack free radicals within the body and eliminate other harmful compounds that may cause a number of ailments [21].

8. Anti cancer properties

Free radicals seek out and destroy healthy cells, which accelerate aging and lead to numerous complications including cancer. Bitter melon is abundant in antioxidants that combat free radical effects as well as creating a strong defense against common diseases. Along with its abundance of antioxidant are its anti-tumor and anti-carcinogenic attributes. Recent clinical trials and pharmacologic studies show a link between eating bitter melon and the reduction of tumors in individuals with breast, cervical, and prostate cancer. There has been a significant body of studies conducted for its role on cancer prevention, [10, 28] which is promising as an alternative to potent chemotherapy agents.

9. Beneficial for eyes

It is rich source of vitamin A and prevent cataract and strengthens vision. It even lightens dark circles. Also, read 10 foods that are good for eye health [4].

10. Good for skin & hair problems

Ayurvedic and traditional Chinese medicine has been using bitter gourd as treatment for skin conditions for centuries. The antifungal and antibacterial compounds present in the bitter gourd fight off numerous skin infections including ringworm, scabies, and even the auto-immune condition psoriasis. It stops guanylate cyclase activity that is responsible for worsening psoriasis. Apply extracted juice or salve to the affected areas to reduce swelling and irritation. Its juice adds lustre to the hair and combats hair loss, dandruff and split-ends [27].

11. Resourceful and delicious

Bitter gourd has a sharp flavor that works well in many dishes. To prepare it, start by washing the fruit and cutting it lengthwise. Then use a utensil to scoop out the seeds from the center, and cut the fruit into thin slices. It can be enjoyed raw or cooked in various recipes. In fact, it can be pan-fried, steamed, baked, or even hollowed out and stuffed with your choice of fillings. Here are a few interesting ways to add bitter gourd to your diet:

- Bitter gourd along with a few other fruits and vegetables for a nutrient-packed beverage
- Mix bitter melon into your next stir-fry to bump up the several health benefits
- Combine seedless bitter gourd with your choice of dressing and garnish for a savory salad
- Stuff with ground meat and vegetables and serve with a black bean sauce.

12. Help in weight loss

Bitter gourd is low in calories, fat and carbohydrates. The properties together help to manage the body weight. It keeps you full for longer, so you avoid over-eating. It stimulates the liver to secrete bile acids that are essential for metabolizing fat in the body. Moreover, bitter gourd contains 80-85% water, which is a universal suppressant of hunger. It also improves metabolism and it can be a natural agent for treating obesity [3].

13. Asthma sustenance

It can help to reduce symptoms brought on by certain respiratory conditions such as asthma, bronchitis and hay fever. It has anti-inflammatory, anti-histaminic and anti-viral properties, which makes it an ideal supplementary food in maintaining good respiratory health [8].

14. Reduce cholesterol levels

It reduces the risk of heart attack by lowering the levels of bad cholesterol in the blood. It is also widely consumed to help lower bad cholesterol levels, which in turn prevents atherosclerotic plaque buildup in arterial walls. Decongested arteries reduce the risk of heart attack, heart disease, and stroke [9].

Challenges for prevalent diseases of Bitter gourd

Bitter gourd (*Momordica charantia* L.) is a vegetable known for its anti-diabetic properties and has the potential to be a viable food-based solution in diabetes management. Diabetes, obesity, and metabolic syndrome are becoming epidemic both in developed and developing countries in recent years. 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 [10, 22] However, bitter gourd varieties are diverse in fruit type, shape, size, color and bitterness and phytochemical profiles and concentrations are affected by specific variety, growing conditions, postharvest handling and food preparation methods. Well-designed review is needed to assess germplasm diversity, bitter gourd production and postharvest practices to optimize the content of anti-diabetic compounds, determine appropriate food processing methods and dosages as well as develop food-based interventions.

Conclusion

Nowadays various diseases such as diabetes, cancer, asthma and so on have been spread worldwide. It is confirm that antioxidant could contribute to prevent many diseases. Bitter gourd could be used as different sources of phytochemicals those are worthy of human being. However processing methods and consumption way the influences of contain of phytochemicals in human body. Hence, it can be considered that from this review Bitter gourd could be used as health promising phytochemicals those are beneficial for human health. It has antibiotic, anti-allergenic, anti-inflammatory, anti-fungal, anti-viral and anti-parasitic properties. It is most notable health benefit is its ability in managing type-2 diabetes. Studies have identified specific phenolic and flavonoid compounds within bitter melon that are responsible for many of its anti-diabetic and anti-cancer effects. Towards the conclusion, it is anticipated that functional and health supportive potential of bitter gourd needs to be explored for the curb various maladies. It has a great potential to fight against various lifestyle related disorders. Apart of the health promoting functions, it may be deemed as efficient choice in value added food products.

References

1. Akroyd D. Characteristics of bitter gourd. Prog. Hort. 1983; 15:50.
2. Abascal K, Yarnell E. Using bitter melon to treat diabetes. J Altern Complement Med. 2005; 1:179-184.
3. Alam MA, Uddin R, Subhan N, Rahman MM, Jain P, Reza HM. Beneficial Role of Bitter Melon Supplementation in Obesity and Related Complications in Metabolic Syndrome. Journal of Lipids. 2015, 1-18.
4. Basch E, Gabardi S, Ulbricht C. Bitter melon (Momordica Charantia): a review of efficacy and safety. American Journal of Health-System Pharmacy. 2003; 60:199-204.
5. Chauhan A, Sharma PK, Srivastava P, Kumar N, Dudhe R. Plants having potential anti-diabetic activity: A review. Der Pharmacia Lettre. 2010; 2(3):369-387.
6. Dandawate PR, Subramaniam D, Padhye SB, Anant S. Bitter melon: a panacea for inflammation and cancer. Chin J Nat Med. 2016; 14:81-100.
7. Gopalan C, Rama Sastri BV, Balasubramanian. Nutritive value of Indian foods. National Institute of Nutrition, ICMR, Hyderabad, 2000, 204.
8. Global Initiative for Asthma. Global stargery for asthma management and prevention, 2017.
9. In Institute of Medicine (Eds.), Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids (macronutrients) Washington, DC, USA: National Academy Press, 265-334.
10. Fang EF, Zhang CZ, Wong JH, Shen JY, Ng TB. The MAP30 protein from bitter gourd (Momordica charantia) seeds promotes apoptosis in liver cancer cells in vitro and in vivo. Cancer Letters. 2012; 324(1):66-74.
11. Harinantenaina L, Tanaka M, Takaoka S, Oda M, Mogami O, Uchida M, Asakawa Y. Momordica charantia constituents and antidiabetic screening of the isolated major compounds. Chemical and Pharmaceutical Bulletin. 2006; 54:1017-1021.
12. International Diabetes Federation. IDF diabetes atlas: 5 th ed. 2012.
13. Indian Horticulture database, 2015-16.
14. Kumar DS, Sharathnath VK, Yogeswaran P, Harani A, Sudhakar K, Sudha P *et al*. A medicinal potency of *Momordica charantia*. Int J Pharm Sci Rev Res. 2010; 1(2):95-99.
15. Keller AC, Ma J, Kavalier A, He K, Brillantes AM, Kennelly EJ. Saponins from the traditional medicinal plant *Momordica charantia* stimulate insulin secretion *in vitro*. Phytomedicine. 2010; 19:32-37.
16. Kim H, Mok S, Kwon S, Lee D, Cho E, Lee S. Phytochemical constituents of bitter melon (*Momordica charantia*) Nat Prod Sci. 2013; 19:286-9.
17. Lee SY, Eom SH, Kim YK, Park NI, Park SU. Cucurbitane-type triterpenoids in *Momordica charantia* Linn. J Med Plants Res. 2009; 3(13):1264-1269.
18. Kandangath RA, Garlapati PK, Nallamuthu I. Nutritional, pharmacological and medicinal properties of Momordica charantia. International Journal of Nutrition and Food Sciences. 2015; 4:75-83.
19. Mohan V, Sandeep S, Deepa R, Shah B, Varghese C. Epidemiology of type 2 diabetes: Indian scenario. Indian J Med Res. 2007; 125:217-30.
20. Pharmacological actions and potential uses of Momordica charantia: a review 9 jEthnopharmacol. 2004; 93(1):123-32.
21. Pitipanapong J, Chitprasert S, Goto M, Jiratchaiyakul W, Sasaki M, Shotipruk A. New approach for extraction of charantin from *Momordica charantia* with pressurized liquid extraction. Sep Purif Technol. 2007; 52:416-33.
22. Patel DK, Prasad SK, Kumar R, Hemelatha S. An overview on antidiabetic medicinal plants having insulin mimetic property. Asian Pac J Trop Biomed. 2012; 2:320-330.
23. Raman A, Lau C. Anti-diabetic properties and phytochemistry of Momordica charantia L. Phytomedicine. 1996; 2:349-362.
24. Sathish Kumar D, Vamshi Sharathnath K, Yogeswaran P, Harani A, Sudhakar K, Sudha P *et al*. A medicinal potency of *Momordica charantia*. Int J Pharm Sci Rev Res. 2010; 1:95-100.
25. Sharma AK, Aggarwal A, Singhal VK. Treatment of diabetes mellitus with Indian herbal Drugs. IJARPB 2012; 1(2):145-153.
26. Tayyab F, Lal SS, Mishra M, Kumar U. A review: Medicinal plants and its impact on diabetes. World J Pharm Res. 2012; 1(4):1019-1046.

27. Tan, Kha, Parks *et al*. Bitter melon (*Momordica charantia* L.) bioactive composition and health benefits: A review. Food Review International. 2016; 2:181-202.
28. USDA National Nutrient Database for Standard.
29. World Health Organization. Global Report on Diabetes; World Health Organization: Geneva, Switzerland, 2016.