



ISSN: 0975-833X

Available online at <http://www.journalcra.com>

INTERNATIONAL JOURNAL
OF CURRENT RESEARCH

International Journal of Current Research
Vol. 12, Issue, 06, pp.11825-11829, June, 2020

DOI: <https://doi.org/10.24941/ijcr.38833.06.2020>

RESEARCH ARTICLE

NATURAL SILENT HEALING PROPERTIES AND PHARMACOLOGICAL ACTIVITY OF MOMORDICA CHARANTIA LINN

Om Prakash^{1*}, Saurabh Nimesh¹, Dakshina Gupta²

¹*,²Department of Pharmacology, Advance Institute of Biotech & Paramedical Sciences, Kanpur-209217 (U.P.), India
¹Department of Pharmacology, Shri Gopichand College of Pharmacy, Ahera, Baghpat-250609 (U.P.), India

ARTICLE INFO

Article History:

Received 10th March, 2020
Received in revised form
19th April, 2020
Accepted 27th May, 2020
Published online 29th June, 2020

Key Words:

Potential, India, Lanceolate, Pneumonia,
Trimester.

ABSTRACT

Momordica charantia Linn. (*M. charantia*) commonly-known as karela, bitter melon, or bitter guard is tropical and subtropical areas around the world, mainly in Asia, India, China, and Brazil, where it is traditionally used as a medicinal plant, and the fruits of some varieties of *M. charantia* are consumed as food. Ancient days to now a day, it possesses many uses as anti-diabetic, carminative, anthelmintic, anti-malarial, anti-microbial, anti-viral, anti-carcinogenic, contraceptives, immunostimulant, laxative, antioxidant, insecticidal and also indicates in skin treatment (eczema, acne, mycoses, scabies, and hemorrhoid). Herbalism has a long tradition of use outside of conventional medicine. It is becoming more main-stream as improvements in analysis and quality control along with advances in clinical research show the value of herbal medicine in the treating and preventing disease. In this paper, we revealed the medicinal potency and pharmacological activity of *M. charantia*.

Copyright © 2020, Om Prakash et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Om Prakash, Saurabh Nimesh and Dakshina Gupta. 2020. "Natural Silent Healing Properties and Pharmacological Activity of Momordica Charantia Linn.", *International Journal of Current Research*, 12, (06), 11825-11829.

INTRODUCTION

Since ancient times, a variety of plants have been used as medicine and vegetable throughout the world. *M. charantia*, a member of the Cucurbitaceae family, is widely distributed in tropical and subtropical regions of the world (Sorifa, 2018). The Latin name *Momordica* means "to bite" (referring to the jagged edges of the leaf, which appear as if they have been bitten). In Ayurveda, the fruit is considered as tonic, stomachic, stimulant, emetic, antibilious, laxative, and alterative. *M. charantia* has been used in various Asian traditional medicine systems for a long time. Like most bitter-tasting foods, bitter melon stimulates digestion. While this can be helpful in people with sluggish digestion, dyspepsia, and constipation, it can sometimes make heartburn and ulcers worse. The fact that *M. charantia* is also a demulcent and at least mild inflammation modulator, however, means that it rarely does have these negative effects, based on clinical experience and traditional reports (Lopes et al., 2018).

Plant Description: Karela, bitter melon, bitter cucumber, or bitter gourd are some of the names given to *M. charantia*. It belongs to the Cucurbitaceae family. *M. charantia* is a vegetable with many culinary uses, especially in Asia and

Africa, and is widely cultivated in the tropical and subtropical regions of the world, such as India, Malaya, China, Thailand, Japan, Singapore, Vietnam, Amazon, Brazil, China, Colombia, Cuba, Ghana, Haiti, Mexico, Malaya, New Zealand, Nicaragua, Panama, Middle East, Central, and South America (Balde et al., 2019). *M. charantia* is a slender and slightly hairy or hairless plant that can be grown at high altitudes. A description of each part of *M. charantia* is shown in Table 1 (Güdr et al., 2016).

MEDICINAL USES

Medicinal properties of *M. Charantia* include anti-microbial, anti-helminthic, anti-cancerous, anti-mutagenic, anti-tumourous, abortifacient, anti-fertility, anti-diabetic (Table 2) (Zeng et al., 2018). *M. charantia* is rich in nutrients like thiamine, beta-carotene, folate, riboflavin, and minerals like calcium, iron, phosphorus, manganese, potassium, magnesium, zinc, and dietary fiber. Regular use of *M. charantia* juice boosts body stamina and prevents chronic fatigue. The beta-carotene content in bitter gourd helps in controlling eye disorders and enhances eyesight (Urasaki et al., 2017).

- *M. charantia* stimulates a sluggish digestive system and treats dyspepsia
- Scientific studies show that fresh juice of *M. charantia* can lower blood sugar values and keep Insulin under check

*Corresponding author: Om Prakash,

Department of Pharmacology, Advance Institute of Biotech & Paramedical Sciences, Kanpur-209217 (U.P.), India

Table 1. Description of *M. charantia*

| Part | Description | Image |
|---------|--|---|
| Stem | Round, well-branched, internodes 5-6 cm, thin, corrugated and has unbranched tendrils in the axillae of the leaf |  |
| Root | It has a primary root that extends to the vertex where the stem is born |  |
| Leaves | Palmately-lobed, alternating, rounded edge with 3-7 lobes deeply separated and with quite small marginal points. They are distributed individually in petioles 1.5-5 cm long and have no stipules. When they are crushed, they give off a rather unpleasant smell (Emre et al., 2017) |  |
| Flowers | Solitary, pubescent, and with 5 yellow petals and 5 central stamens. The male flowers have thinner stems and larger petals than the female flowers and, while the male flower sepals are oval-elliptical, those of the female flowers are narrow and oblong-lanceolate (Poolperm et al., 2017) |  |
| Fruit | Pendular discoid with ovoid shape, 2-10 cm in length, covered with broken or continuous longitudinal ridges and warts. The young fruit is white or emerald green that turns orange when ripe, and its white pulp becomes scarlet during ripening |  |
| Seed | 8-15 mm long, rectangular squares, corrugated on the margin, sculpted on both sides, but covered with a white pulp when green and red when ripe (Bai et al., 2018) |  |

| Property | Active phytochemicals/extract administered | Test system | Mechanism of action/ targeted against an organism |
|-----------------|---|--|---|
| Anti-viral | MAP 30 (Momordica Anti-HIV Protein) in seed and fruit extracts | Viral cell line, H9 | Anti-HIV1 (Human Immunodeficiency Virus) activity |
| | Anti-HIV proteins MAP30 | Human lung fibroblasts | Anti-HSV (Herplex Simplex Virus) activity |
| | Alpha and beta momorcharin(MMC) from seeds, fruits, and leaf extracts | Rabbit reticulocyte lysate | Anti-HIV activity |
| | Methanol extract | Shrimp | White spot syndrome virus |
| Anti-malarial | Leaf extract | Rat | Plasmodium falciparum |
| | Aerial part extract | Rat | Plasmodium vinckepetteri279BY (rodent malarial parasite) |
| Anti-bacterial | Water, ethanol, and methanol extracts from leaves | Shrimp | Broad-spectrum anti-microbial activity (Basavaraj et al., 2017) |
| | Leaf extract | Shrimp | Escherichia coli, Salmonella paratyphi and Shigelladysenterae |
| | Essential oil | Shrimp | Klebsiellapneumoniae, Bacillus megaterium, Bacillus subtilis, Proteus mirabilis, Aspergillusniger, Aspergillusflavus and Escherichia coli |
| Anti-diabetic | Green fruits | Human | Hypoglycemic activity detected |
| | Subcutaneously administered p- insulin | Human | A decrease in blood glucose level in IDDM (Insulin-Dependent Diabetes Mellitus) patients |
| | Fruit powder | Human | Increase in glucose tolerance and fasting glucose levels in NIDDM (Non-Insulin Dependent Diabetes Mellitus) patients |
| | Seed powder | Human | A decrease in postprandial glucose levels |
| | Charantin administered orally or intravenously | Rabbit | Fall in blood glucose level |
| | Chloroform extract Administered intravenously | Alloxan induced rabbit | Fall in blood glucose level |
| | Pulp juice | Rats | Fall in blood glucose level |
| Anti-cancerous | Alcoholic fruit extract | Rat (1 hour after feeding glucose to the normal) | Fall in plasma glucose level (Farooqi et al., 2018) |
| | Fruit and seed extract | Mice | Extract activates natural killer cells in mice |
| Anti-helminthic | The crude plant extract, MAP 30 | Rat | Lymphoid leukemia, lymphoma, squamous carcinoma of tongue, larynx, human bladder carcinoma, Hodgkin's disease |
| | Plant extract | Rat | Free-living nematodes |
| Anti-tumour | Lyophilised plant extract | Rat | Caenorhabditiselegans |
| | Crude extract | Mice | Tumor formation inhibition in CBA/DI tumor cell line |
| Anti-mutagenic | Green fruits containing acyl-glucosylsterols | Mice | 80% reduction in the number of micronucleated polychromatic erythrocytes induced by mitomycin C |
| Abortifacient | Alpha and beta MMC in seeds extract | Mice | Induction of mid-term abortion |
| Anti-fertility | Ether, benzene and ethanol extracts | Male rat | Anti-spermatogenic activity (Jones et al., 2018) |

Table 3. Ethnobotanical uses of *M. charantia* in India

| Plant part | Type of extract | Route of administration | Used by a human (male/female) | Ethnobotanical uses |
|-----------------|-------------------|-------------------------|-------------------------------|--|
| Leaf | Leaves | Oral | Child | Purgative in children |
| Leaf | Hot water extract | Oral | Adult | Anthelmintic |
| Leaf | Hot water extract | Oral | Adult | Treatment of leprosy, piles, and jaundice |
| Leaf and flower | Hot water extract | Oral | Female | Used regularly each month to avoid childbirth (Yoshime <i>et al.</i> , 2016) |
| Leaf | Juice | Oral | Adult | Leaf juice rubbed on the affected parts for the treatment of ringworm |
| Leaf | Juice | Oral | Child | 5-6 drops of leaf juice extracted from half fried leaves are administered to infants during breastfeeding for a bowel movement |
| Leaf | Juice | Oral | Child | 1 teaspoon leaf juice with few drops of honey administered thrice a day for cough, congestion and chest pain in children (Tuan <i>et al.</i> , 2017) |
| Root | Hot water extract | Oral | Pregnancy | Used for abortions up to II-trimester (v month) of pregnancy |
| Root | Paste | oral | Adult | Root paste administered with milk to reduce the scars in smallpox |
| Fruit | Decoction | Oral | Adult | Treat diabetes |
| Seeds | Hot water extract | Oral | Adult | Seeds are boiled and the extremely bitter effusion is said to produce instantaneous vomiting |
| Shoots | Shoots | Oral | Adult | Used to treat pneumonia and leucorrhoea (Sung <i>et al.</i> , 2018) |

- *M. charantia* juice can also prevent jaundice by detoxifying, nourishing and strengthening the liver and may be beneficial in the treatment of a hangover
- *M. charantia* is an Immuno-modulator. It might improve immune cell function in people with cancer
- Piles: A popular folk remedy is to mix 3 teaspoonfuls of juice from *M. charantia* leaves with a glassful of buttermilk to be taken every morning for about a month on an empty stomach
- Cholera: Fresh juice of leaves of *M. charantia* is also a useful medicine in the early stages of Cholera and other types of diarrhea (Soo May *et al.*, 2018).

Ethnobotanical Uses: *M. charantia* is very important so far as ethnomedical practices are concerned. Ethnobotanical uses of *M. charantia* in India are enumerated in Table 3 (Mohan *et al.*, 2017).

Pharmacological activity: As *M. charantia* has been used for the treatment of various kinds of diseases since ancient times, it is still widely applied for therapy in Latin America and Asian countries as mentioned above. The following is an overview of its common pharmacological activities (Massimo *et al.*, 2019).

- **Anti-diabetic activity:** *M. charantia* contains bitter chemicals like, charantin, vicine, glycosides, and karavilosides along with polypeptide-p plant insulin, which is hypoglycemic in action and improves blood sugar levels by increasing glucose uptake and glycogen synthesis in the liver, muscles and fat cells. Reports indicate that they also improve insulin release from pancreatic beta cells, and repair or promote new growth of insulin-secreting beta cells.

- P-Insulin, a polypeptide from the fruits and seeds rapidly decreased and normalized the blood sugar level in rats. Bitter melon contains another bioactive compound i.e. lectin that has insulin-like activity. This lectin is a major contributor to the hypoglycemic effect that develops after eating Karela. Charantin extracted by alcohol is a potent hypoglycemic agent composed of mixed steroids which are sometimes used in the treatment of diabetes to lower the blood sugar levels (Deng *et al.*, 2019).
- **Antioxidant activity:** Antioxidant activity of extracted phenolic compounds from *M. charantia* has been reported. Antioxidant properties of *M. charantia* Seeds on Streptozotocin induced-diabetic rats have been studied and results suggest that seeds of *M. charantia* may effectively normalize the impaired antioxidant status in streptozotocin induced-diabetes (Yue *et al.*, 2019).
- **Anti-cancer activity:** The clinical trials have not been conducted using *M. charantia* extracts in cancer patients, in vitro studies indicate bitter melon fruit and seed extracts inhibit the growth of some cancer cell lines, including prostate adenocarcinoma, human colon cancer (Caco-2 cells), and the very much metastatic breast cancer cell line MDA-MB-231 (Svobodova *et al.*, 2017).
- **Immunomodulatory activity:** Immunomodulatory activity of *M. charantia* showed that it has a variable effect on the immune system in some conditions, like allograft rejection, someplace it was shown to have an immunosuppressive effect and in some other cases immunostimulant.

- The immunomodulatory activity has been attributed to an increase in interferon production and natural killer cell activity (Raish *et al.*, 2018).
- **Anti-malarial activity:** *M. charantia* is traditionally regarded by Asians, as well as Panamanians and Colombians, as a useful plant for preventing against used treating malaria. Laboratory studies have confirmed that various species of *M. charantia* have antimalarial activity. Leaves brewed in hot water to create a tea to treat malaria (He *et al.*, 2018.).
- **Anti-genotoxic activity:** *M. charantia* decreases the genotoxic activity of methyl nitrosamine, methanesulfonate, and tetracycline, as shown by the decrease in chromosome breakage (Jia *et al.*, 2017).
- **Anthelmintic activity:** *M. charantia* was found more effective in the treatment of *Ascaridiagalli*. Ethanol (95%) extract of fruit juice, was found active on *Ascaridiagalli*, whereas, hot water extract of seed at a concentration of 1:50 was active on *Haemonchus contortus* (Rao *et al.*, 2018).
- **Hypocholesterolemic activity:** Experiments carried out in normal, as well as diabetic animals, have shown hypocholesterolemic effects by *M. charantia*. In a study, sunflower fed rats were fed with conjugated octadecatrienoic fatty acid isolated from *M. charantia* seeds for 4 weeks. After 4 weeks, these rats showed a significant lowering of the plasma lipid peroxidation and erythrocyte membrane lipid peroxidation as well as non-enzymatic liver tissue lipid peroxidation (Peter *et al.*, 2019).
- **Hypolipidemic activity:** In an in vivo study the elevated cholesterol and triglyceride levels in diabetic rats were returned to normal value after 21 days of administration of bitter gourd fruit and seeds. Evaluated the effects of bitter gourd oil on the blood and liver lipids of rats (Pahlavani *et al.*, 2019).
- **Anti-inflammatory activity:** The anti-inflammatory activity of dried leaves was comparable to 10 mg/kg of indomethacin. Further, the wound healing capacity of fruit powder was comparable to those of povidone-iodine ointment in excision, incision, and dead space wound model in rats (Saad *et al.*, 2017).

Conclusion

The use of the medicinal herbal plant for curing disease has been documented in the history of all civilizations. We concluded that *M. charantia* is a potential herbal plant which is used as vegetable and medicine in the world. Thus, numerous medicinal and ethnobotanical uses of nearly all parts of the plant indicate a long association of the plant with people, especially in India. *M. charantia* is a good source of various medicinally important biochemicals (triterpene, protein, steroid, alkaloid, and phenolic) which are responsible for its biological and pharmacological activities including anti-diabetic, antioxidant, anti-carcinogenic, anti-tumorous, anti-microbial, anti-fertility, anti-viral, anthelmintic, anti-malarial, anti-ulcerative and immunomodulatory. Further studies are required to find many more activities of this plant.

Acknowledgement

We would like to thank anonymous reviewers and editors of this review article for their perceptive comments and positive criticism in this review article.

Conflict of interest: The authors declare no conflict of interest.

Financial support and sponsorship: Nil.

REFERENCES

- Bai, J., Zhu, Y. and Dong, Y. 2018. Obese rats supplemented with bitter melon display marked shifts in the expression of genes controlling inflammatory response and lipid metabolism by RNA-Seq analysis of colonic mucosa. *Genes Genomics*, 40, 561-567.
- Basavaraj, S.A. and Siva, R.E. 2017. *Momordica charantia* of Phytochemical Study: A Review. *International Journal of Homoeopathic Sciences*, 1, 1-4.
- Balde, S., Ayessou, N.C. and Gueye, M. 2019. Investigations Ethnobotaniques de *Momordica charantia* Linn (Cucurbitaceae) au Sénégal. *International Journal of Biology and Chemical Sciences*, 13, 466-474.
- Deng, Z., Yuan, C. and Yang, J. 2019. Behavioral defects induced by chronic social defeat stress are protected by *Momordica charantia* polysaccharides via attenuation of the JNK3/PI3K/AKT neuroinflammatory pathway. *Annals of Translational Medicine*, 7, 1-6.
- Emre, B., Korkmaz, Ö. and Temamoğullari, F. 2017. Effect of intrauterine infusion of *Momordica charantia* L. on oxidative stress and pregnancy rate in infertile cows. *Journal of Veterinary Research*, 61, 489-496.
- Farooqi, A.A., Khalid, S. and Tahir, F. 2018. Bitter gourd (*Momordica charantia*) as a rich source of bioactive components to combat cancer naturally: are we on the right track to fully unlock its potential as an inhibitor of deregulated signaling pathways. *Food and Chemical Toxicology*, 119, 98-105.
- Güdr, A. 2016. Influence of total anthocyanins from bitter melon (*Momordica charantia* Linn.) as antidiabetic and radical scavenging agents. *Iranian Journal of Pharmaceutical Research*, 15, 301-309.
- He, Q., Li, Y. and Li, H. 2018. Hypolipidemic and antioxidant potential of bitter gourd (*Momordica charantia* L.) leaf in mice fed on a high-fat diet. *Pakistan Journal of Pharmaceutical Sciences*, 31, 1837-1843.
- Jones, L.D., Pangloli, P. and Krishnan, H.B. 2018. BG-4, a novel bioactive peptide from *Momordica charantia*, inhibits lipopolysaccharide-induced inflammation in THP-1 human macrophages. *Phytomedicine*, 42, 226-232.
- Jia, S., Shen, M. and Zhang, F.J. 2017. Recent advances in *Momordica charantia*: Functional components and biological activities. *International Journal of Molecular Sciences*, 18(12), 1-25.
- Lopes A.P., Petenuci, M.E. and Galuch, M.B. 2018. Evaluation of the effect of different solvent mixtures on the phenolic compound extraction and antioxidant capacity of bitter melon (*Momordica charantia*). *Chemical Papers*, 72, 2945-2953.
- Massimo, B., Daniele, M. and Letizia, P. 2019. *Momordica charantia*, a Nutraceutical Approach for Inflammatory Related Diseases. *Frontiers in Pharmacology*, 10, 48-54.
- Peter, E.L., Kasali, F.M. and Deyno, S. 2019. *Momordica charantia* L. lowers elevated glycemia in type 2 diabetes mellitus patients: a systematic review and meta-analysis. *Journal of Ethnopharmacology*, 231, 311-324.

- Poolperm, S., Jiraungkoorskul, W. 2017. An updated review on the antihelminthic activity of bitter gourd, *Momordica charantia*. *Pharmacognosy Reviews*, 11(21), 31-34.
- Pahlavani, N., Roudi, F. and Zakerian, M. 2019. Possible molecular mechanisms of glucose-lowering activities of *Momordica charantia* (karela) in diabetes. *Journal of Cellular Biochemistry*, 120(7), 10921-10929.
- Mohan, G.K. and Rao, P.S. 2017. In vitro alpha-amylase inhibition and in vivo antioxidant potential of *Momordica dioica* seeds in streptozotocin-induced oxidative stress in diabetic rats. *Saudi Journal of Biological Sciences*, 24(6), 1262-1267.
- Rao G.P., Behera, T.K. and Gaikwad, A.B. 2018. Mapping and QTL analysis of gynocelia and earliness in bitter gourd (*Momordica charantia* L.) using Genotyping-by-Sequencing (GBS) technology. *Frontiers in Plant Science*, 9, 1555-1562.
- Raish, M., Ahmad, A. and Ansari, M.A. 2018. *Momordica charantia* polysaccharides ameliorate oxidative stress, inflammation, and apoptosis in ethanol-induced gastritis in mucosa through NF- κ B signaling pathway inhibition. *International Journal of Biological Macromolecules*, 111, 193-199.
- Saad, D.Y., Soliman, M.M. and Baiomy, A.A. 2017. Effects of Karela (Bitter Melon; *Momordica charantia*) on genes of lipids and carbohydrates metabolism in experimental hypercholesterolemia: biochemical, molecular and histopathological study. *BMC Complementary and Alternative Medicine*, 17, 319-327.
- Soo May, L., Sanip, Z. and Ahmed Shokri, A. 2018. The effects of *Momordica charantia* (bitter melon) supplementation in patients with primary knee osteoarthritis: a single-blinded, randomized controlled trial. *Complementary Therapies in Clinical Practice*, 32, 181-186.
- Sung, H.C., Liu, C.W. and Hsiao, C.Y. 2018. The effects of wild bitter gourd fruit extract on ICAM-1 expression in pulmonary epithelial cells of C57BL/6J mice and microRNA-221/222 knockout mice: involvement of the miR-221/-222/PI3K/AKT/NF- κ B pathway. *Phytomedicine*, 42, 90-99.
- Svobodova, B., Barros, L. and Calhella, R.C. 2017. Bioactive properties and phenolic profile of *Momordica charantia* L. medicinal plant growing wild in Trinidad and Tobago. *Industrial Crops and Products*, 98, 365-373.
- Sorifa, A.M. 2018. Nutritional Compositions, Health Promoting Phytochemicals, and Value Added Products of Bitter Gourd: A Review. *International Food Research Journal*, 25, 1763-1772.
- Tuan, N.Q., Lee, D.H., and Oh, J. 2017. Inhibition of proliferation of vascular smooth muscle cells by cucurbitanes from *Momordica charantia*. *Journal of Natural Products*, 80, 2018-2025.
- Urasaki, N., Takagi, H. and Natsume, S. 2017. Draft genome sequence of bitter gourd (*Momordica charantia*), a vegetable and medicinal plant in tropical and subtropical regions. *DNA Research*, 24(1), 51-58.
- Yue, J., Sun, Y. and Xu, J. 2019. Cucurbitanetriterpenoids from the fruit of *Momordica charantia* L. and their anti-hepatic fibrosis and anti-hepatoma activities. *Phytochemistry*, 157, 21-27.
- Yoshime, L.T. 2016. Bitter gourd (*Momordica charantia* L.) seed oil as a naturally rich source of bioactive compounds for nutraceutical purposes. *Nutrire*, 41(1), 12-20.
- Zeng, Y., Guan, M. and Li, C. 2018. Bitter melon (*Momordica charantia*) attenuates atherosclerosis in apo-E knock-out mice possibly through reducing triglyceride and anti-inflammation. *Lipids in Health and Diseases*, 17, 251-260.
