PHCOG MAG.: Plant Review
Momordica charantia L.

[From Latin *mordēre* = *bite*]

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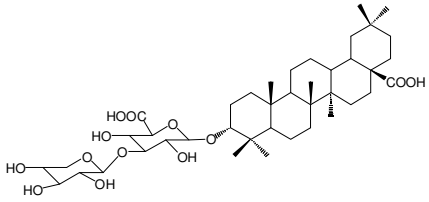
***Momordica charantia* L. or** *Momordica balsamina sensu*

Blanco or wild basalm apple, bitter gourd, carilla fruit; *kyethenka* (Burma); *mreas* (Cambodian); *koo kwa kan* (Chinese); *pandipane* (French); *periah* (Malay); *pepino de Saõ Gregorio* (Portuguese); *karaka*; *patu* (Sanskrit); *pakal* (Tamil); *kho qua* (Vietnamese); is a long and thin, annual and monoecious climber tropical in cultivation for its edible berries. The stems are hairy and 1 mm - 2 mm diameter. Leaves: simple, alternate and without stipules, the petiole is thin, 1 cm - 2 cm long and hairy, the tendrils are opposite the leaves, and 1 cm - 6 cm long, the blade is very thin, mottled with very small blackish spots below, hairy, 3.4 cm x 3.5 cm - 2.9 cm x 3.7 cm and deeply 5 - 7 - lobed. The nerves are sunken above, flat below and hairy. The margin is laxly toothed. The flowers are axillary, solitary, yellow, attached to 4 cm - 10 cm long pedicels, and 7 mm diameter, and small bracts are found at or below the middle of the pedicel. The calyx is campanulate 5 - lobed, hairy and 8 mm - 10 mm long. The calyx lobes are 5 mm - 6 mm long, elliptic and acute. The corolla is irregular and yellowish and consists of 5 free, 1.6 cm - 3 cm long petals which are veined, hairy and rotate. The androecium comprises 3 stamens which are conduplicate. The ovary is fusiform and muricate and develops upwards a 3 - fid stigma. The fruits are edible, fusiform, muricate, bright orange, 5 cm - 15 cm long, and cucumber - shaped berries containing several 8 mm - 13 mm long seeds, compressed, corrugated on the margin, sculptured on both surfaces and embedded into a crimson aril (see figure above).

In China, the fruit of *Momordica charantia* L. is used to reduce body temperature, to invigorate, to relieve the bowels from costiveness and stops flatulence. In Cambodia, the leaves are used to reduce fever and stop delirium. In Indonesia, a decoction of the leaves is used to relieve the bowels from costiveness, to treat liver diseases and to expel intestinal worms. In India, the fruit is bitter, relieves bowels from costiveness, and expels intestinal worms. In Malaysia, the fruit is used to treat diabetes, a poultice of the powdered leaves is applied to burn, decoction of *Momordica charantia* L. is used to abort. In the Philippines, the juice expressed from the green fruit is used to stop chronic colitis and dysentery. In Cambodia, Laos, Vietnam, the cooked fruit is used to stop catarrh, flux and cough.

The antidiabetic property of *Momordica charantia* L. is confirmed experimentally. An extract of fruit given for 10 weeks lowers the glycaemia of streptozocin - induced type I diabetic rats (Ahmed I. *et al.*, 2001). The juice expressed from the fruit improves significantly the glucose tolerance of 73% of diabetic patients while the other 27% fails to respond (Welihinda J. *et al.*, 1986). The hypoglycaemic property of *Momordica charantia* L., would not result from an insulin - mediated mechanism (Sarkar S. *et al.*, 1996; Madsuda H. *et al.*, 1997) but from a glucocorticoid - mediated mechanism on account of oleanolic acid glycosides. Being structurally close to our glucocorticoids, the triterpenes of *Momordica charantia* L. would occupy the glucocorticoid receptors and act thereby as glucocorticoid antagonist: hypoglycaemia and abortion. An example of glucocorticoid antagonist used in therapeutic is RU486 which causes abortion and is known to eliminate carbohydrate intolerance in many subjects (Mantero F. *et al.*,1989). Another hypothesis is that, given *per os*, the triterpenes of *Momordica charantia* L. would suppress the transfer of glucose from the stomach to the small intestine by inhibiting glucose transport at the brush border of the small intestine, as demonstrated with momordin Ic (Matsuda H. *et al.*, 1998a).

***Other steroidal properties*:** Oleanolic acid 3 - *O* - monodesmoside characterized from *Momordica cochinchinensis* Spreng. has antipruritic properties in mice (Matsuda H. *et al.*, 1998). Petroleum ether, benzenic and alcohol extracts of the seeds of *Momordica charantia* L. given to rats (25 mg/100 g/ day, 35 days) reduces the number of spermatocytes, spermatids and spermatozoa. Increase in cholesterolaemia and sudanophilic lipid production indicate inhibition in the steroidogenesis. At the same time the weight of epididymis, prostate gland and seminal vesicle was increased showing an androgen property. Out of the 3 extracts, the alcohol extract is more potent in its antispermatogen, antisteroidogen and androgen property (Naseem, M.Z. *et al.*, 1998).



Momordin I

***Cytotoxic properties*:** *Momordica charantia* L. displays anticarcinogenic effect in rodent through the enzymes of the biotransformation and detoxification (Ganguly C. *et al.*, 2000). Oleanolic acid momordin I, Id and Ie reduce *in vitro* the Jun/Fos - DNA interaction which is a crucial factor in transmitting tumour - promoting signals from the extracellular environment to nuclear transmission machinery (Lee D.K. *et al.*, 1998). Topical application of an extract of peels of the fruits of *Momordica charantia* L. (100 µg/animal/day) reduces the proliferation of 7, 12 - dimethylbenz - [a] - anthracene - induced skin papilloma in mice (Singh A. *et al.*, 1998). An aqueous extract of *Momordica charantia* L. causes a statistical significant genotoxic effect in the plate incorporation assay using *Aspergillus ridulans* (Ramos Ruz A. *et al.*, 1996). Antimutagen principles characterized from the green fruit are identified as 3 - *O* - [6' - *O* - palmitoyl - α - D - glucosyl - stigmasta - 5, 25(27) - dien and its stearyl derivative. At a dosage range in mice of 50-5 µg extract/g - 12.5 µg extract/g, the mixture reduces by about 80% the number of micronucleated polychromatic erythrocytes caused by the well - known mutagen mitomycin C. Structure - activity correlation studies suggest that the antimutagen property may reside in the peculiar lipid - like structure of the acylglucosylsterols. Ingestion of these compounds may result in their absorption in the plasma membrane lipid bilayer which would adversely affect the membrane permeability towards mitomycin C and disrupt the cellular property of the latter (Guevara A. P. *et al.*, 1990).

Antimicrobial properties: An extract of *Momordica charantia* L. annihilates *Mycobacterium tuberculosis* cultured *in vitro* (France A. P. *et al.*, 1998). The fruit of *Momordica charantia* L. contains a protein which inhibits HIV - 1 reverse transcriptase *in vitro* (Jiratchariyakul W. *et al.*, 2001).

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Warning: The seeds of *Momordica charantia* L. must not be consumed during early pregnancy because they contain some proteins called momorcharins, which are teratogenic to the cultured mouse embryos at the early organogenesis stage (Chan W.Y. et al., 1986)