

Review Article

AN UPDATED PHARMACOLOGICAL OVERVIEW ON *MOMORDICA CYMBALARIA* (ATHALAKKAI)

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ABSTRACT

Objective: The review was carried out to discuss in detail about pharmacological activities of *Momordica cymbalaria*. **Methods:** Various literature collection of this plant and collection of its pharmacological actions. **Results:** The phytoconstituents of alkaloids, carbohydrates, flavonoids, sterols, terpenoids, and saponins are present in *Momordica cymbalaria*. In this review evaluate the various pharmacological activities of the *Momordica cymbalaria*. From the literature collections the *Momordica cymbalaria* had the Anti-diabetic Activity, Hypolipidemic activity, Anti-diarrhoeal activity, Antiulcer activity, Neuroprotective Activity, Cardioprotective Effects, Hepatoprotective activity, Nephroprotective, Anti-Cancer Activity, Anticonvulsant activity, Anti-inflammatory activity, antiovolatory, abortifacient activity and Antimicrobial Properties. **Conclusion:** In this review was concluded that *Momordica cymbalaria* plant pharmacological literature used for further studies of this plant.

Keywords: In vivo, Anti-diabetic, Saponins, Flavanoids, Animal model, Phytochemical

INTRODUCTION

Momordica cymbalaria is belongs to the family of Cucurbitaceae. That is having many synonyms and common names. Synonyms of *Momordica cymbalaria* are *Momordica*, Kakrol, Karchikai, Athalakkai and Kaarali Kanda and Common names are *Momordica tuberosa*, *L. tuberosa*, and *Momordica cymbalaria*. *Momordica cymbalaria* is slender, scandent, branched, striate stem. The leaves are orbicular, reniform in outline deeply cordate at the base, sparsely hairy. The root of the plant is woody, tuberous and perennial. The plant is originating in tropical regions of India and South East Asia. It is perennial climber available during the monsoon season and is found in south Indian states of Karnataka, Andhra Pradesh, Madhya Pradesh, Maharashtra and Tamil Nadu.[1] This plant is used for the food vegetables of its fruits and it having rich sources of Vitamin C, Fiber, Beta-carotene and also rich in Iron & Calcium content. Cucurbitaceae family is also widely used in traditional therapeutic systems of some kingdoms, where traditional and tribal medicinal practitioners use some species for the action of diverse illnesses. In this literature review is the purpose of the study of pharmacological medicinal values of *Momordica cymbalaria*.

Phyto-constituents of *Momordica cymbalaria*

The leaves of this plant are having the phytochemicals of alkaloids, carbohydrates, flavonoids, sterols and terpenoids, and tubers of the *Momordica cymbalaria* are showing the positive results of alkaloids, carbohydrates, flavonoids, sterols, terpenoids, and saponins which was confirmed by preliminary phytochemical tests. The GC-MS analysis confirmed the phytoconstituents of cyclopentane acetic acid, myristic acid, margaric acid, a monoterpene isopulegol, thymine and arachidic acid.[2]

Table 1: Pharmacological responsible Phytochemicals

| S.no | Medicinal Activity | Responsible chemical | References |
|------|----------------------------|---|------------|
| 1 | Antidiabetic activity | Saponin (charantin, momordicine, insulin-like steroidal saponin, and triterpenessaponins) | [3,22] |
| 2 | Anti-inflammatory activity | Flavonoids | [4] |

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|----|-----------------------------------|---|---------|
| 3 | Cardioprotective Effects | Saponins | [5] |
| 4 | Anticonvulsant activity | Flavonoids | [6] |
| 5 | Hepatoprotective | Saponin | [7] |
| 6 | Neuro protective | Saponin | [8] |
| 7 | Nephroprotective | Saponins and triterpenoids | [9] |
| 8 | Antiulcer activity | Polyphenols like Quercetin | [10] |
| 9 | Antihypercholesterolemic activity | Saponins | [11,25] |
| 10 | Anti-diarrhoeal activity | Tannins, Flavanoids, Alkaloids, Sterols, Terpenes | [12] |
| 11 | Anti-Cancer Activity | Flavonoids | [13] |

Pharmacological studies of *Momordica cymbalaria*

The various *in vivo*, *in vitro* screening methods are used for the evaluation of pharmacological properties of *Momordica cymbalaria*. This plant is having the pharmacological activities like Anti-diabetic, Hypolipidemic, Anti-diarrhoeal, antiulcer, Protective effect, Anti-Cancer, Anticonvulsant, Anti-inflammatory, antiovolatory, abortifacient, Antimicrobial and antioxidant properties.

Anti-diabetic Activity

Firdous M *et al.* evaluated the Type 2 anti-diabetic activity of *Momordica cymbalaria* in Streptozotocin-Nicotinamide Induced Type 2 diabetic mice. Single intraperitoneal injection of Streptozotocin (100 mg/ kg, i.p) and Nicotinamide (240 mg/ kg, i.p) was used for the induction of Type 2 diabetes in BALB/c mice. The treatment of the ethanolic extract of *Momordica cymbalaria* (175mg/kg,p.o) and Metformin (350mg/kg,p.o) was administered orally for 30 days to the Type 2 diabetic mice.[18] The serum glucose, cholesterol, triglycerides, and insulin levels are analyzed at the end of the treatment. Treatment of Type 2 diabetic mice with *Momordica cymbalaria* and Metformin produced a significant fall in

blood glucose, cholesterol, triglycerides. In these results confirms of the *Momordica cymbalaria* having the anti-diabetic effect. [16,20]

Hypolipidemic activity

Yeddula Ezra *et al.* investigated the hypolipidemic activity of *Momordica cymbalaria* Fenzl. Against high cholesterol diet-induced hyperlipidemia in rats were fed with ethanolic extract of *Momordica cymbalaria* (250mg/kg and 250mg/kg p.o) and atorvastatin (30 mg/kg, p.o) along with hyperlipidemic diet for 30 days. [21] *Momordica cymbalaria* and atorvastatin was found to lower the serum cholesterol, triglyceride, VLDL, LDL, and atherogenic index, but were found to increase the HDL as compared to the corresponding high fed cholesterol diet group (control). The hypolipidemic activity of *Momordica cymbalaria* is ascribed to its inhibitory effect on the liver HMG CoA reductase activity. Thus, the study demonstrates that *Momordica cymbalaria* possesses a hypolipidemic effect. [19,25]

Anti-diarrhoeal activity

Vrushabendra Swamy *et al.* evaluated the anti-diarrheal activity of fruit extract of *Momordica cymbalaria* in castor oil induced experimental rat model and gastrointestinal motility in the charcoal meal test in rats. The extract showed a significant reduction in gastrointestinal motility which confirms the plant extract has the significant anti-diarrheal activity. [15]

Antiulcer activity

Dhasan PB *et al.* investigated the antiulcer activity of fruits extracts of *Momordica cymbalaria* in ethanol-induced ulcer model. In this animal model, 80% ethanol was used for induction of ulcer in rats. The treatment test group was administrated with aqueous extract of fruits of *Momordica cymbalaria* (500 mg/kg) and the standard group treated with lansoprazole (30 mg/kg). The various parameters such as the area of the gastric lesion, nonprotein sulfhydryls (NPSH) concentration, gastric wall mucus concentration, total acidity and volume of gastric content and histopathological parameters were evaluated. The test group showed significant ($P < 0.05$) decrease in the total acidity and ulcer index which also showed a significant decrease in gastric lesion and NPSH and gastric wall mucus concentrations. In these results show that aqueous extract of *Momordica cymbalaria* fruits had antiulcer property in rats. [10]

PROTECTIVE ACTIVITY

Neuroprotective Activity

Dhasan PB *et al.* investigated the neuroprotective action of an oleanane type triterpenoid saponin isolated from the *Momordica cymbalaria* in diabetic peripheral neuropathy (DPN) in streptozotocin-induced diabetic rats. In this study male wistar rats were administrated with streptozotocin for the induction of diabetes. The neuropathy was induced after six weeks of induction of diabetes in rats. The treatment groups were administrated with saponin and epalrestat. Various parameters of neuropathy like muscular grip strength and pain sensation tests using a hot plate and tail-flick methods and nerve conduction velocity (NCV) measurements were evaluated end of treatment. The significant results of improvement of muscular grip strength, reaction time to pain sensation and nerve conduction velocity was shown the *Momordica cymbalaria* produces the significant neuroprotective activity. [27]

Cardioprotective Effects

Raju Koneri *et al.* was evaluated cardioprotective effects of isolated saponin from *Momordica cymbalaria* (SMC) in ischemia-induced myocardial damage in male Wistar rats. In this study test group was pretreated with SMC at different doses. The ischemia-reperfusion injury was produced severe myocardial damage and reduction of antioxidant enzymes level. The SMC treated animals showing enhanced the antioxidant protection system and reduced the oxidative stress induced by ischemia-reperfusion. In these results shows the *Momordica cymbalaria* having good cardioprotection activity. [5]

Hepatoprotective activity

Kumar P *et al.* evaluated the hepatoprotective activity of plant extract of *Momordica tuberosa* tubers in experimentally induced liver damage by paracetamol (2 g/kg, po.) in albino rats. The hepatoprotective effect was determined by estimating the levels of biochemical markers like SGPT, SGOT, bilirubin, ALP, and triglycerides. In this study, the treatment group of test and the standard group were administrated with ethanol extract of *Momordica tuberosa* tubers and drug silymarin (100 mg/kg). The test treatment group produced significant protection effect through decreasing the activity of serum enzymes, bilirubin, cholesterol, triglycerides and tissue lipid peroxidation. The effects of the extract were compared with the standard treatment group of drug silymarin. In these results the extract of *Momordica tuberosa* having the significant hepatoprotective activity. [14]

Nephroprotective activity

Kumar P *et al.* evaluated the nephroprotective effect of *Momordica tuberosa* in gentamicin, cisplatin and paracetamol-induced renal damage in wistar rats. The renal-protective effect of the extract was determined by measuring the levels of body weight, blood urea, serum creatinine, glutathione and lipid peroxidation levels. In this study, the treatment group of test and the standard group were administrated with plant extract of *Momordica tuberosa* and drug sodium metabisulphite. The test group of extract showed significant free radical scavenging activity than standard group of sodium metabisulphite.

Anti-Cancer Activity

Nagarathana PKM *et al.* evaluated the anti-cancer effect of *Momordica cymbalaria* in N-nitrosodiethylamine (DEN) induced hepatocellular carcinoma rats. The Hepatocellular carcinoma was induced by treating rat with a single dose of 200mg/kg of DEN. The anticancer effect was determined by various serum biochemical and histopathological studies. The antioxidant enzymes levels like GSH, SOD, LPO, and CAT were measured in the hemolysate and liver of experimental animals. The effect of DEN was decreased by the administration of the extract. These results show that the *Momordica cymbalaria* having significant anticancer effect. [7]

Anticonvulsant activity

Maniyar YA *et al.* evaluated the anticonvulsant effect of ethanolic extract of *Momordica tuberosa* leaves in maximal electric shock induced seizure (MES) model in rats. The standard and test treatment groups were administrated with phenytoin sodium (25 mg/kg body weight) and leaf extract of *Momordica tuberosa*. The induction of convulsions in all groups by giving maximal electric shock of 150 mA for 0.2 second. The Tonic-clonic seizures were produced by giving an electric shock. The recovery time, period of tonus, clonus, and stupor were measured. In MES model, test treated group significantly ($p < 0.0001$) decreased the duration of tonic-clonic seizures and recovery time. In these results, *Momordica tuberosa* leaves were displayed anticonvulsant property. [6]

Anti-inflammatory activity

Jeevanantham *et al.* evaluated anti-inflammatory activity of methanol extract of *Momordica cymbalaria* Hook F in carrageenan-induced paw edema method in Albino rats. In this study the test treatment group was administrated with methanolic extract of the aerial part of *Momordica cymbalaria* and standard treated group was administrated with Indomethacin. In this method of carrageenan-induced paw edema model, the test treated a group of *Momordica cymbalaria* significant inhibition of paw edema. In these results the methanol extract of *Momordica cymbalaria* produces the significant anti-inflammatory activity. [13]

Antiovolatory and Abortifacient activity

Koneri *et al.* studied the antiovolatory and abortifacient activity of the ethanolic extract of roots of *Momordica cymbalaria*. Female Wistar albino rats (150 to 200 g) with at minimum three regular estrous cycles were treated with ethanolic extracts of roots of *Momordica cymbalaria* orally for 15 days. At the 16th day animals

were sacrificed, and one ovary was subjected to histopathological studies and the other for biochemical studies. The abortifacient study was done in another group of animals. The extracts were administered orally from the day 6 to day 15 of pregnancy. The animals were laparotomies on the day 19th of pregnancy. The horns of the uterus were observed for the number of implantation sites, resorptions, dead and alive foetus. The extract treated significant group decrease the duration of estrous cycle and meta estrous phase and increased in proestrous phase. Ethanolic extract showed a significant abortifacient effect in pregnant rats during organogenesis period. In these results showed that the ethanolic extract of *Momordica cymbalaria* having both antiovolatory and abortifacient activity. [23]

Antimicrobial Properties

Vrushabendra Swamy BM *et al.* evaluated the antimicrobial activity of the fruits of *Momordica cymbalaria* by cup plate diffusion method. In this study, the plant was tested against different bacteria (including *Escherichia coli*, *Staphylococcus aureus*, *Bacillus subtilis*, *Shigella sonnei*, *Klebsiella pneumoniae*, *Salmonella typhi*, *Proteus vulgaris*, and *Pseudomonas aeruginosa*) and fungi (such as *Candida albicans* and *Aspergillus niger*). The Minimal Inhibitory Concentration (MIC) was determined the antimicrobial activity. The results achieved indicated the strong activity of the methanolic extract of the fruits of the plant. [15,17]

CONCLUSION

Momordica cymbalaria is the one of the traditional plant which had the various medicinal properties in this review, concluded that the various pharmacological activity literature is useful for the quick search of pharmacological activities of the *Momordica cymbalaria*.

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