Therapeutic Uses of *Momordica Cymbalaria* – A Review

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**ABSTRACT**

*Momordica cymbalaria* is a medicinal plant species that belongs to the Cucurbitaceae family, which is widely spread in southern parts of India. In ancient days the use of the species *Momordica cymbalaria* plants parts such as root, leaves and fruit were treated for various clinical ailments. In recent times, the uses of this plant species were well documented and it is found to have various significant activities. *Cymbalaria* has possessed numerous therapeutic value and antioxidant properties in it. Treatment with conventional drugs has an increase in side effects. Hence, natural remedy with herbal drugs like *Momordica cymbalaria* gives positive responses in various clinical conditions and it has identified with its known properties such as hypolipidemic, hypoglycaemic, neuroprotective, cardio Protective, nephroprotective and hepatoprotective. Infectious diseases such as hepatitis, malaria, colic pain, measles, flu and also used to treat the sores, wound infections, worms and parasitic infections. Therefore, this present review discusses clearly the traditional and medicinal value ant its active principles in the treatment of various diseases.

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**INTRODUCTION**

The plant *Momordica cymbalaria* species is affiliated to the Cucurbitaceae family, which is commonly called as melons, cucurbits or gourds. *Momordica cymbalaria* is a wild plant species, well known as “Athalakka” in Tamil. This family Cucurbitaceae also includes crops like cucumbers and squashes. *M. cymbalaria* is distributed majorly in and around the southern parts of India. The edible parts of this species are the fruits, which are rich in nutritional value. The fruit of *Momordica cymbalaria* holds a high level of nutrients are calcium, potassium, vitamin C and mainly, this species holds a rich content of fiber. These plant parts were used traditionally by the southern region of people to relieve their skin diseases, rheumatism, ulcer; diarrhea, diabetes and also used a tonic for stomachic (Koneri et al., 2014). In the near future, the herbal medicine use and its safety were accepted worldwide. It provides an opportunity for the Indian pharmaceutical companies to look forward to the therapeutic leads from the traditional Indian system of Ayurveda and Siddha that could be utilized in the development of the herbal drugs (Mathew, 2005).

This species of the plant is a perennial herbaceous climber in nature; either it is permitted to grow on the agricultural fields or to climb on support with
the help of tendrils. It is mainly seen in Southern states of Indian, Andhra Pradesh, Karnataka, Madhya Pradesh, Maharashtra and Tamil Nadu as a weed. The plant is allowed to grow even in the boundary of agricultural lands, fences and in the fields for the sake of fruits. However, this species is not regularly cultivated.

The plant is tuberous in nature; this tuberous root of the plant provides to maintain the perennial habits, which is pubescent in nature or subglabrous. i.e., this particular species is completely dry and disappears at the end of every season. But the tuberous root of this species of the plant remains in the soil and regrowth in the next season. The plant has a single stem, which is very slender in its shape. The cymbalaria leaves are of obicular in its structure or of reinformin shape with an extremely cordate base. The characteristics of the flowers are unisexual. Whereas the male flower has a filiform, puberulous, ebracteate peduncle, the length is roughly about 5-30 mm, with two or more than two flowers in racemes with a pale yellow in colour corolla and the presence of two stamens in each of the flower. On the other side, the female flower of this species is solitary, with a peduncle roughly 28 mm in length.

The length of fruit cymbalaria is 20-25 mm, pyriformin nature with 8 sharp, deep ridges in it, which is 24 × 15mm attenuated at the tip of the apex region and with a base narrowed into the curved peduncle, the peduncle region is fleshy with a dark green and ribbed in nature. The length of seeds for about 4.6 mm, ovoid in shape with a smooth even and shiny surface. Usually, the flowering happens during the month of October and the fruits were harvested from November to January.

Generally, the plant yields 1.25 - 1.5kg each. The tender fruits of this plant closely resemble the shape and size of a small variety of bitter gourd. Athalakkai is most preferred as a cooking vegetable by the rural populations of the Southside of Tamil Nadu and Northern Karnataka, India (Parvathi and Kumar, 2002). The phytochemical screening of this plant athalakkai is reported with tannins, alkaloids, phenols, proteins, amino acids 4, Vitamin C, carbohydrate and β-Carotene (Parvathi and Kumar, 2002).

The fruits of this plant were possessed anti-diabetic and antihyperlipidemic activities. The tuber parts of the plant were reported as antiovulatory activity (Kameswararao et al., 2003; Koneri et al., 2006). Furthermore, the literature of M. cymbalaria revealed the rational use of this plant parts products were, leaves juice is used for whooping cough, tubers used for abortion, a paste of tubers root are used for applying boils, ulcers, and snakebite (Togu-nashi et al., 1977). Not much review has been yet reported the detailed therapeutic activities of the species M. cymbalaria.

**Nutritional Composition**

The nutritional content of plant M. cymbalaria is reported by author (Gopalan, 1993). The moisture content of this species is about 84.30. The energy value is about 3.00kcal/100g. The carbohydrate and protein constitute about 12.60 mg/100gm and 2.15 mg/100gm, respectively. Accordingly, the author also reported the calcium (72.00), Potassium (500.00), Sodium (40.00), iron (1.70), Copper (0.18), Manganese (0.32), Zinc (2.82), Phosphorus (0.46) and Vitamin C (290.00). Therapeutic uses of this species are mainly of its rich content of calcium, potassium and vitamin C, which elevates most of the pathological conditions.

**Phytochemical Screening**

The Phytochemical properties of M. cymbalaria are reported in the presence of tannins, vitamin C, alkaloids, proteins, amino acids, phenols, carbohydrate and β-Carotene.

**Tubers**

Phytochemical screening of Momordica cymbalaria species tubers shows the presence of sterols, triterpenes, saponins, carbohydrates and cardiac glycosides (Kumar et al., 2010b).

**Leaves**

Whereas the leaves of cymbalaria species show the presence of flavonoids along with other phytoconstituents (Fernandes et al., 2007).

**Fruits**

The plant fruit contains flavonore ids, tannins, alkaloids, carbohydrates, glycosides, Vitamin C, β-carotene, polyphenols and amino acids. The amino acids present in M. cymbalaria are Momordicin, Ascorbigen and Pipelicolic acid. The unripe fruits contain the amino acid Luteolin (Parvathi and Kumar, 2002).

**Therapeutic Uses**

Momordica cymbalaria species is widely used in ancient days. Rationally the extracts and decoctions of fruits, tuberous roots and leaves of in M.cymbalaria have been pre-owned in many Research to prove the positive effects for the various clinical conditions. Clinically the activities of the fruit extract are proven with antidiabetic, antimicrobial and antihyperlipidemic properties. The antiovulatory activity is possessed by the plant tubers extract.
Traditionally, the leaves juice of *M. cymbalaria* is positively used for whooping cough; tubers extract were used for abortion, the paste of tubers used in applying boils, ulcers, and in snake bite6. The fruit juice drink and leaf decoction of *M. cymbalaria* is treated for the clinical conditions like diabetes, hepatitis, malaria, colic pain, measles, flu and also used to treat the infections like sores and wound infections, worms and parasitic infections. The pulp of the fruit, leaf juice and the extract of the seeds possess anti-helmintic activity.

**Hepatoprotective Activity**

The ethanolic extraction of the tubers parts of *Momordica tuberosa* Possesses antioxidant property by preventing the formation of trichloromethyl per- oxy radical, by inhibiting this radical leads to reducing tissue damage *(Kumar et al., 2008)*. CCl4 is metabolized by the liver enzyme Cyp 450. In the liver, the CCl4 is changed into a trichloromethyl radical (CCl2).

This CCL2 acts with the molecular oxygen species and then it gets converted to a free radical, trichloromethyl p eroxy. This free radicals form covalently bond with the sulfhydryl group of numerous membrane molecules like reduced glutathione, which leads to the depletion and promote lipid peroxidation. The lipid peroxidation induces a chain of reactions and eventually leads to tissue necrosis. Thus the Root extraction hinders tissue damage and oxidative stress by preventing the formation of the trichloromethyl peroxy radical. The same author; *(Kumar et al., 2011)* reported the study hepatoprotective activity by using 70% of ethanolic extractions of the tubers Momordica, which is active against the drug thioacetamid (100 mg/kg of body weight) induced hepatotoxicity in Wistar albino rats.

**Antihyperglycemic Activity**

The antihyperglycemic action was reported from aqueous extraction of *M. Cymbalaria* fruits. The diabetic rat blood samples showed a reduction in blood glucose level at a dose range of 0.5 g/kg of body weight *(Rajasekhar et al., 2009)*. *(Koneri et al., 2008)* reported that Diabetic induced rats STZ (65mg/kg) treated with the Phytochemical saponins present in *M. Cymbalaria* exhibit a significant decrease in serum glucose level whereas it shows a marked increase in serum insulin and liver glycogen level, proves that increased insulin secretion, increases hepatic glycogen level and attenuates Hyperinsulinemian. Whereas antidiabetic action was manifested in the aqueous extraction of fruits of *M.Cymbalaria* proved by the presence of 17 kDa a protein with an isoelectric point of 5.0. Latter, the protein was specified as M. Cy protein and it is found to be a novel protein by comparing its N-terminal amino acid sequence. The ‘M. Cy protein,’ available in the fruits of *M.Cymbalaria* is showed a potent antihyperglycemic active principle in STZ induced diabetic rats at a dose range of 2.5 mg/kg of body weight *(Rajasekhar et al., 2010)*.

The results were confirmed by the differentiation between two proteins of antihyperglycemic, N-terminal sequence of *M.Cymbalaria* plant protein and human insulin α chain.

![Human Insulin α chain](image)

![M.Cy plant protein](image)

Insulin mimetic peptide was confirmed in *M. Cymbalaria* and in another plant species related co, namely Canavaliaensiformis, Vigna unguiculata and Bauhinia variegata *(Xavier-Filho et al., 2003)* is compared with bovine insulin.

**Hypoglycaemic and Antidiabetic Activity**

The hypoglycaemic and antidiabetic properties of the fruit powder of plant *M. cymbalaria* were assessed in comparison with normal rats and the drug alloxan-induced diabetic rats. The plant *M. cymbalaria* fruit powder is treated with a dose range of 0.25 g/kg of body weight in rats for a period of over 15 days. This experiment clearly exhibits a significantly decreased level in the blood glucose and loss of weight in alloxan influenced diabetic treated rats.

There is no difference and the rats were showed a considerable development in their body weight effect was observed both in normal and *M. cymbalaria* fruit powder treated rats. The natural ability of the fruit powder treatment is to enhance the rate of glycosgenesis and the ability to protect the weight loss is due to antidiabetic activity *(Rao et al., 1999)*. *M. cymbalaria* plant fruit extracts stimulate the secretion of insulin from the residue α cells by lowering the level of blood glucose 41.8% by using a dosage 0.5g/kg of body weight showed that antihyperglycemic activity. Further, proved the antihyperglycemic action of the aqueous extraction of the fruit in diabetic rats is 26% higher after 3 hr of drug administration when compared with the oral hypoglycaemic drug, glibenclamide. Administration of herbal drug *M. Cymbalaria* fruit alcoholic extract in streptozotocin (STZ)/nicotinamide induced type II diabetic rats showed that the significantly decreased level of serum glucose. Oral administration of alcoholic extraction of fruit *M. cymbalaria* at a dose of 175 mg/kg for a period of 31 days showed a
remarkable regression in diabetic state and replaces the level of serum glucose, cholesterol, TG, serum insulin and HDL parameters in STZ-induced type II diabetes rats. The serum insulin levels were tremendously increased after the treatment with fruit extract *M. cymbalaria* both at lower and higher dosage level, the same fruit extract of the plant might be the propound mechanism of action for reduction in blood glucose level in normal glycemic Wistar rats. Therefore based on experimental results, the alcoholic extract of *M. cymbalaria* may be effective in type-II diabetes conditions (Kumar et al., 2010a).

Anti Hyperlipidemic and Cardioprotective Activity

Hypertriglyceridemic patients are clinically at risk for cardiovascular disease, and the patients often developed a lipoprotein profile characterized by elevation of all lipids such as triglyceride, LDL, and low HDL cholesterol which causes the myocardial membrane damage. The plant *M. cymbala ria* extract, at a dosage range of 500 mg/kg body weight, prevents the variation in marker enzymes of myocardial infarction and prevents the free radical formation along with uric acid. When differentiating the cardiac sections of isoproterenol treated animals and the rats pretreated with M. Cymbalaria extract, the herbal treated rats showed the normal structures of myofibrillar with striations and exhibited marked protection by the extract against myocardial necrotic damage. Whereas Isoproterenol treated rats revealed a marked raised in LDL, Total Cholesterol and a decreased level in HDL cholesterol, this will leads to a risk of cardiac arrest and cardiovascular damage. In contrast with *M. cymbalaria*, pre-treated rats show elevated HDL Cholesterol levels and decreased the LDL cholesterol level (Raju and Balaraman, 2008).

This experiment manifests the evidence from epidemiologic, clinical, and laboratory data recommended that elevated triglyceride levels itself cause a high-risk factor for cardiovascular disease. The promising effect of the plant extract *M. Cymbalaria* shows Cardioprotective, Anti hyperlipidemic, Antidiabetic and antioxidant effect. It paves the way for the therapeutic use of *M. Cymbalaria* plant clinically in the near future.

**Antiucler Activity**

The anti-ulcer effect was experimentally proved by the aqueous extraction of Momordica tuberose, which paves a notable reduction in nonprotein sulfhydryls concentration, gastric content, hemorrhage and ulceration in the ulcer induced Wistar albino rats. This research study proves the anti-ulcer activity of the herb Momordica tuberose aqueous extract is due to the existence of polyphenolic constituents (BharathiDhasan et al., 2010).

**Antidiarrhoeal Activity**

Many of the patients with a quick onset of diarrhea have cured by self-limited; it doesn’t require treatment. However, in some severe harmful cases, dehydration and electrolyte imbalance in the body are the primary risk factor, especially in case of infants, children and elderly patients, thus need a adjuvant non-pharmacological treatments, such as oral rehydration therapy (ORT) to restore the water and electrolyte and zinc supplements, and pharmacological treatments (Fuente et al., 2008).

The use of naturally available compounds in those cases is needful. The *Momordica cymbalaria* fruit extract had possessed a similar function as that of anti-diarrhoeal drug diphenoxylate when examination with the dose range of 200, 400 & 600 mg/kg and shows a statistically significant decreased in the frequency of diarrhea and the moisture of the fecal droppings when differentiating to untreated control rats. For this experiment, castor oil is used to induce diarrhea in rats. *M. Cymbalaria* fruit ethanolic extract inhibits the pathway prostaglandin E2 (PGE2 is responsible for diarrhea in both animals and humans), thereby preventing fluid accumulation in the intestine (Srinivas et al., 2008).

**Antimicrobial Activity**

The different extracts of Petroleum ether, chloroform, ethanol, and aqueous of the species *M. cymbalaria* has shown a hindering effect against the organisms, Staphylococcus, Klebsiella, Escherichia coli, Pseudomonas aeruginosa, and Aspergillus niger when its contrast to the standard known antibiotics. The standard known antibiotics zone of inhibition was lesser than the extracts of *M. cymbalaria* specify that this plant effective against these organisms (Sajjan et al., 2010). (Swamy and Jayaveera, 2007) also reported the properties of *M. cymbalaria* fruit extracts; it may be used as a broad-spectrum antimicrobial agent, and also useful in the treatment of fever, wound infections, and intestinal disorders because of its prominent inhibitory potential.

**Antidepressant**

Depression is a common, mental, or behavioral disorder; sometimes, the state of depression leads to serious life-threatening illnesses with an increased incidence of morbidity and mortality. In spite of using antidepressant drugs, utilize of natural plant products will minimize the adverse action and paves a positive response. Hydro-alcoholic extraction of the fruit *Momordica cymbalaria* and the antidepress-
sant drug imipramine were employed for the experiment to identify the action of *M. cymbalaria*.

To examine the potency of Hydro-alcoholic extraction of the fruit Momordica cymbalaria, the dose range of 200mg/kg, 400mg/kg, 600mg/kg, was examined by using the behavioral models like involuntary swimming test experiment and tail suspension test experiment in mice. Both the drug imipramine and the extraction of fruit *Momordica cymbalaria* showed a significant reduction in the period of immobility in both the behavioral models.

The antidepressant action of Hydro-alcoholic extraction of the fruit was comparable to that of known standard drugs, indicate that the potential for the need of *Momordica cymbalaria* as an adjuvant in the clinical treatment for neuro depression (Daripelli et al., 2011).

**Anticarcinogenic Activity**

*M. cymbalaria* Hook f species, methanol extract at a dosage of 200 mg/kg of body weight has possessed the significant anticancer property in compared to standard known drug cyclophosphamide against the Ehrlich ascites carcinoma induced cancer in mice models (Jeevanantham et al., 2011). The cytotoxic effects of saponins derived from *M. cymbalaria* observed on Ehrlich ascites cells and the IC50 value by MTT assay were find to be 180μg. The results indicate that the saponin of *M. cymbalaria* has to exhibit anticancer action in mice (Koneri et al., 2014).

**NephroprotectiveActivity**

Tubers extract of *Momordica tuberosa* possesses tremendous nephroprotective effect and counteract the toxicity induced by nephrotoxins, so it could be clinically effective in the treatment of acute renal injury (Koneri et al., 2014).

**Antimplantation and AntiovulatoryActivity**

The root of *M. Cymbalaria* was treated for the mensusual irregularities, antifertility, antiovulatory and abortifacient activities. (Koneri et al., 2007) identify that the antimplattainy property of the root extract *Momordica tuberosa* species in female rats is not due to its action of estrogen and progesterone. Another experimental study by the same author reported the antiovulatory and abortifacient action of the root extraction of *M. cymbalaria* on female rats.

The rats were administered with root extract *Momordica tuberosa*, a dosage of 250 and 500mg/kg during the estrous cycle, which shows the decrease in estrous, metestrus phase and prolongation of the proestrus phase. Nonavailability of matured graffian follicle and in the preovulatory phase delay was indicated that the depletion in estrous, metestrus phase and the extension of the proestrus phase respectively. So it shows the antiovulatory activity and 500mg extract shows 100% abortifacient activity (Koneri et al., 2006). This extract might be helpful in a post-coital and unwanted pregnancy.

**CONCLUSION**

The traditional use of herbal drug formulations is more widely accepted than the allopathic preparations. The use of naturally available herbal formulations all over the world will exceed that of the conventional drugs by two to three times higher. The ever-increasing use of natural herbal preparations has some very important implications for the geriatric population and for those heading towards their senior years. The geriatric patient has a greater incidence of illness and chronic conditions and generates a higher per capita number of different prescription medications. This renders them to be more cautious when adding herbal medications to their health regime. Nowadays, diabetes is common in all populations, misuse and indiscriminate treatment with synthetic products have allowed the rapid selection of herbs against resistant diabetic populations. In the future, the utilization of natural herbal products, especially *M. Cymbalaria*, would enable them to easily overcome much compliance such as diabetic, antihyperlipidemic, anovulatory, whooping cough and so on.

The Additional use of natural herbal plant products like *M. Cymbalaria* will increase the therapeutic value and possibly minimize the adverse reactions due to allopathic drugs. Thus, the progress of herbal formulations has become necessary to develop experimental research studies aimed at searching complementary alternatives to traditional methods.

**REFERENCES**


