

The Study of phytochemicals, Traditional and pharmacological uses of *Momordica dioica* Roxb. ex. willd: A review

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Abstract: The Indian uses wild plants as medicine and food stuffs. One of that is *Momordica dioica* plant. It is highly nutritional. *Momordica dioica* traditionally used as antiseptic, astringent, febrifuge, spermicidal and anthelmintic. Also it is used as medicine for bleeding a piles, urinary infection and as a sedative. The literature shows that it possesses antidiabetic, antioxidant, Antiallergic, anticancer, antimicrobial, nephroprotective, anti-inflammatory, antiulcer, antitumor, antifertility and analgesic properties. This review aims to highlight the traditional study, nutritional value and medicinal value of *Momordica dioica*. According to the view of medicinal plant based treatment including ayurveda along with recent scientific observation.

Key Words: *Momordica dioica*, Antioxidant, analgesic, antifertility.

1. INTRODUCTION:

The *Momordica dioica* plant commonly called spine gourd. It's Also known as kontoli, in the Maharashtra regions of an India. *Momordica dioica* belongs to family cucurbitaceae .it is perennial climbers .It has two different types of varieties male and female well as fruited variety and fruitless variety. This plants (chromosome number 28) dioecious and propagated vegetatively through tuberous root. The green fruit is extensively used as vegetable by cooking or frying by local people. Leaves 1.5-4 inches long, cordate, acute more or less 3-4 lobed, flowers large, dioecious and yellow in color, fruit 1-3 inch long, shortly beaked, densely covered with soft spine. Venkateshwarlu M et al [1] the flowering occurs during months of June, July and fruiting during September, November. The Male flower is oblong and lanceolate. Calyx is five lobed, linear lanceolate. The corolla is five partite and stamen three. Female flower is solitary small bract below the middle of the peduncle, calyx and corolla in male without staminodes or in the form of gland three united, ovary clothed with long soft papillae and many ovulated, ellipsoid. Its seeds are rounded broadly ellipsoid, slightly and irregularly corrugated enclosed in red pulp. Its stem is slender, branched, furrowed, glabrous and shining. Tendrils are elongated, simple and glabrous. (Anjana M et al, 2020)[9]

1.1. TAXONOMICAL CLASSIFICATION OF MOMORDICA DIOICA:

Kingdom- Plantae
Subkingdom- Tracheobionata
Super division- Spermatophyta
Division- Magnoliopsida
Class- Magnoliopsida
Subclass- Dilleniidae
Order- Violales
Family- Cucurbitaceae
Genus- *Momordica*
Species- *dioica*

Synonyms / Vernacular Names of *Momordica dioica* Robx.ex. willd in India :

Marathi-kantoli , Hindi - Kakora, English - Small bitter gourd, Spine gourd, Malayalam - Venpaval, Tamil - Paluppakkay, Telugu - Agakara, Karkotaki, Bengoli -Kartoli, Kannada – Madahagala-Kaya, Sanskrit -Vahisi , Punjabi - Bharkarela, Assam - Batkarila.

1.2. CLIMATE CONDITIONS, SOIL REQUIREMENT, AND HARVESTING PROCEDURE FOR MOMORDICA DIOICA FORMING:

Momordica dioica is a warm and low humid seasonal wild plant. The spine gourd can be grown in both tropical and sub-tropical area. *M. dioica* requires good sunlight for better growth and yield. The optimal temperature of about 27 °C to 32 °C is suitable for its growth.

Momordica dioica can be grown on sandy loam to clay soils with pH values 5.5-7.0. Soils with well drainage and good organic matter best suited for its growth. An average yield of 75-100 quintals/hectare can be obtained with

good management practices. These vegetables will be ready for harvesting for 75-80 days of sowing. In second year, they will become available for picking in 35-40 days. Fruits are picked when they are in tender stage. Alternate days are recommended for harvesting to avoid over mature of vegetables. Hand harvesting can be carried without disturbing the vine. If you are growing these for seed production then leave the fruits on the vine until they ripen fully. Usually, they turn the color from green to orange. One can easily identify matured seeds when the pulp inside the fruit turns into red color. (Anjana M. et al 2020) [9].

1.3. Phytochemicals:

Sattya Narayan Talukdar and Mohammad Nazir Hossain(2014),and Venkateshwarlu M. et al (2017) worked on phytochemical analysis of *Momordica dioica* Fruits. Phytoconstituents of *Momordica dioica* are traces of alkaloids, steroids, triterpenoids, flavonoids, glycosides, saponins, triterpenes of urisolic acid dark brown seed drying oil and saturated fatty acids, ascorbic acids, vitamin A, thiamine, riboflavin's, niacin, protein carbohydrates, lectins, ascorbic acids, carotenes, bitter principles, oleanolic acid, stearic acid, gypsogenin, alpha-spiranosterol hederagenin, momordicaursenol. The alkaloid present in this plants seed called momordicin. Other alkaloid present in root called momordica foetida. The fruit of *Momordica dioica* contains carbohydrate: 59.31%, ashes: 9.1%, crude protein: 5.44%, crude lipid: 3.25% and crude fiber: 22.9%. These fruit has high energy value (288.25 kcal/100 g) in dry weight. These fruit mineral ranges (mg/100 g dry weight,) are: calcium (7.37), iron (5.04), potassium (4.63), zinc (3.83) and sodium (1.62). Its nutritional value of *Momordica dioica* per 100 g edible fruit is reported to contain 84.1% moisture, 7.7 g carbohydrate, 3.1 g protein, 3.1 g fat, 3.0 g fiber and 1.1 g minerals and small quantities of essential vitamins like carotene, thiamin, riboflavin and niacin. [1-9].

2. TRADITIONAL USES:



Figure 1: *Momordica dioica* fruit



Figure. 2: *Momordica dioica* leaves

2.1. Fruits:

The Fruit of *Momordica dioica* plant are green and generally used as vegetable by local people. It is shown in photoimage no.1. This fruit also used as medicine on health problem. Fruit are diuretic increased production of urine, salexiteric, hepatoprotective, and used to treat certain venomous bites. It is also used to cure asthma, leprosy, excessive salivation, prevent the inflammation caused by lizard, snake bite, elephantiasis, fever, mental disorders, digestive disorders and troubles of heart and to treat discharge from mucous membrane. Fresh fruit juice is prescribed for hypertension. The fruit is cooked in a small amount of oil and consumed for treating diabetic patient; juice of the young fruits can be applied on skin for pimples and acne to keep the skin healthy. Seeds are roasted and taken for eczema and other skin problems. This fruit is considered as a low-calorie, so add it to your monsoon diet for reduce extra fat.

2.2. Leaves:

The leaves of *Momordica dioica* plant are used in India as a folk remedy for diabetic patient. It is shown in photoimage no.2. Juice of leaves worked as pain relief, the juice of the leaves mixed with coconut, pepper, red sandalwood in order to form an ointment and applied to the head to relieve pain in the head. In skin disease leaf paste of this plant more effective. Leaf paste is used both orally and external application.

2.3. Roots:

Roots of the *Momordica dioica* are full of medicinal value. Spine guard tubers are styptic in nature and toasted roots or its powder is used in bleeding piles. The local people its tuber are used with honey in headache problem. The root juices of *Momordica dioica* plant are also used to relieve inflammation caused by lizard excretion. They are also

used in mental disorder and digestive ailments. The most important use of *Momordica dioica* root is treat diabetes, root juice in the dose of 50ml once a day in empty stomach is given to treat diabetes. In diabetes, tuber powder along with Vanga bhasma is given. It causes vomiting in excess dose. The root powder applied externally softens skin and reduces excess sweating. In snake bite and scorpion stings root paste of spine guard is applied externally or nasal instillation is done. In any difficulty in urination, root along with milk is given to drink.

Table 1: Plant parts and Traditional uses of *Momordica dioica* plant.

Plant parts	Traditional uses
Leaves	Pain in head, skin disease, diabetic. Fever, eyes disease.
Fruits	Pimples treatment, remedy for diabetic, hypertension, eyes disease.
Roots	Treat bleeding piles, headache, relieves inflammation, used in mental disorder and digestive ailments, skin treatment and reduce excess sweating, snake bite and scorpion stings. Difficulty in urination.

3. PHARMACOLOGICAL USE OF *MOMORDICA DIOICA*:

3.1. ANTIDIABETIC ACTIVITY:

Firdous et al [10] reported that saponin of many plants possess antidiabetic activity. one of the main constituent of spine gourd is a steroidal, saponins, charantin and is responsible for the antidiabetic effects. R. Gupta et al 2011[11] worked on Anti diabetic and renoprotective activity of *Momordica dioica* in diabetic rat. They concluded diabetic rat may reflect susceptibility to increased oxidant stress. Antidiabetic specifically oral hypoglycemic effects of *Momordica dioica* in rat model was screened by Fernandopulle et al.[12], Reddy et al.[13] and Singh et al.[14] showed aqueous, chloroform, ethyl acetate and ethanolic extract of *Momordica dioica* fruit mediated antidiabetic activity in alloxan induced experimental rats. Other work, Sharma and Arya [15] reported ethyl acetate and ethanol extract of *Momordica dioica* containing steroids, triterpenoids had potential role in alloxan-induced diabetic rats and broadly type 2-diabetes. Poonam Sharma and Rambir Singh[16] worked on Effect of *Momordica dioica* fruit extract on Antioxidant status in liver, kidney, pancreas and serum of diabetic rats and their study demonstrated that aqueous extract of *M. dioica* possess potent antioxidant activity. Protection and pancreatic β -cell function and enhancement in insulin secretion may be one of the reasons for its anti-diabetic activity.

3.2. ANTIOXIDANT ACTIVITY:

G. vijaykumar et al [17] also worked on antioxidant properties of extract of *Momordica dioica* roots by using (DPPH) to determine the Free radical scavenging activity and resulted spine gourd root extract has shown IC_{50} value of 76.55 μ g/ml of male plant, and 290.28 μ g/ml for female plants respectively. C. s. shreedhara et al [18] also worked on the free radical scavenging potential of the tuberous roots of *Momordica dioica* was studied by different in vitro methods namely DPPH radical scavenging, ABT radical scavenging, iron chelating activity, total antioxidant capacity, and hemoglobin glycosylation assay. Total antioxidant capacity of ethanolic extract of *M. dioica* was found to be 26 μ g/ml which is equivalent to ascorbic acid.

3.3. ANTIALLERGIC ACTIVITIES:

Maharudra S Rakh et al [19] worked on antiallergic activity of *Momordica dioica* seed extract. They concluded methanol extract of *M. dioica* seed shows more significant antiallergic activity as compare to other extract in three models of milk induced eosinophilia, milk induced leucocytosis and differential leukocytes count in mice. They also conclude the antiallergic activity may be due to phytochemicals constituents such as flavonoids and polar constituents.

3.4. ANTICANCER ACTIVITY:

Luo et al. [20] showed that the $CHCl_3$ extract of *Momordica dioica* roots and five isolated constituents had anticancer activity during pharmacological testing on cancer cell (L1210). The growth inhibitory index (%) of - spinasterol-3- β -D-glucopyranoside was shown to be 50%, at the dose of 4 g/ml.

Rajesh A Ahirrao[21] worked on anticancer activity of fruit of *Momordica dioica* by using MTT assay. Their study indicates the aqueous fruit extract of *Momordica dioica* showed anticancer activity by causing 50% inhibition of PA-1 cell at IC_{50} value of 4 μ g/ml.

S. rupachandra and Sarada [22] worked on methanolic seed extract of *M. dioica* the results showed that inhibited the growth of human lung carcinoma (A549) cell at the IC_{50} value of 12.5 μ g/ml and breast carcinoma (MCF-7) cell at the IC_{50} value of 3.125 μ g/ml.

3.5. ANALGESIC ACTIVITY:

Maharudra s rakh et al [23] worked on Analgesic activity of *Momordica dioica* seed by acetic acid induced writhing-reflex method in mice. It was observed that petroleum ether and ethyl acetate more significant analgesic activity, when compare to methanol. The effects of *Momordica dioica* seed extract resulted dose dependent reduction in the no. of writhing as compared to control drug which highly significant.

3.6. NEPHROPROTECTIVE ACTIVITY:

A. Jain and A. K. Singhai [24] worked on nephroprotective activity of *Momordica dioica* Roxb. in cisplatin-induced nephrotoxicity. They check antioxidant status of fruit extract, also observed that pre-treatment and post-treatment with the ethanol extract of *M. dioica* fruits (200mg kg⁻¹) reduced the raised levels of serum creatinine and blood urea in wistar rats.

3.7. ANTIMICROBIAL ACTIVITY:

Arekar et al. [25] investigated antibacterial activities of *in vivo* and *in vitro* ethyl acetate extract of *Momordica dioica*. The concentration of 200 g/disc was showed maximum inhibition; this extraction was more active against *E. coli* as compared to *S. aureus*, *S. paratyphi*, and *P. mirabilis* bacteria. Ethyl acetate extract of this plant in vitro callus culture (yield: 21.5%) showed maximum inhibition zone against *S. aureus*. while Ethyl Acetate extract of in vitro shoot culture (yield: 0.26%) showed maximum inhibition zone against *S. paratyphi* and *P. mirabilis*. Shrinivas et al. [26] studied methanolic extract and aqueous extract of *Momordica dioica* fruit and found that methanolic extract had more promising antimicrobial activity as compare to other solvent extract.

3.8. ANTI-INFLAMMATORY ACTIVITY:

The anti-inflammatory effect of the alcoholic extract of *Momordica dioica* roots was evaluated during CCl₄ induced hepatotoxicity. Ilango et al. [27] evaluated both hexane extract and methanolic extract of *Momordica dioica* fruit pulp mediated anti-inflammatory activities.

3.9. ANTIFERTILITY ACTIVITY:

Shreedhar et al. (2001) [28] reported the antifertility activity of ethanolic and aqueous extract of *Momordica dioica* root. They studied postcoital antifertility activity in female rats. These extract caused increase in uterine weight and show mild estrogenic activity because of that causing the reabsorption of the implants by the uterus. Rajesh pusuloori et al [29] word done on the evaluation of effect of *Momordica dioica* Extract on reproduction system of male and female albino rats. The administration of ethanolic extract in male and female rats for 30days, they observed decrease the sperm count, mortality and a substantial reduction in sex hormones and fertility capacity in male rat. In female rat's estrogen and porgestron hormone level decreased when compared with control. Kudaravalli [30] worked on screening of antifertility activity of *Momordica dioica* roxb, in male and female rats. she conclude that *M. dioica* fruit extract at the dose of 500 mg/kg showed a significant increase in the serum testosterone level, increased ALP and cholesterol level. Its promising antifertility activity and it is shown to have blastocystotoxic, anti zygotic, antiovolatory activities.

3.10. ANTI TUMOR ACTIVITY:

Krishna et al [31] worked on anti-tumor activity of fruit extracts of *Momordica dioica* roxb, these a study was to examine the antitumor effect of chloroform and methanolic extracts of *M. dioica* fruits on DLA induced tumor model in mice. They conclude in DLA model Chloroform extract of *M. dioica* at dose of 400 mg/kg decreased the growth of solid tumor as evidenced by the reduction of solid tumor weight and volume.

3.11. ANTIULCER ACTIVITY:

M.vijaykumar et al (2011). [32] The study was carried out to evaluate antiulcer activity of hydroalcohol extract of *M. dioica* fruit. The gastro protective role of *M. dioica* in ethanol induced ulcer might be the resultant of decreased gastric lesions, proton pump activity and increased gastric wall mucus. The fruit extract possess antiulcerogenic effect that attributable to augmentation of gastric defense mechanisms. This study clarifies at doses of 100, 200, and 400mg/kg twice a day for 5 days prevented the acute gastric ulcer in a dose-related manner.

4. CONCLUSION:

In nature many medicinal plant are available, they are highly beneficial. The traditional use of medicinal plant from local or an ancestor person has long history. But in the world same plant identify different name because of language. The researches help to people for identifying plant and provide basic knowledge about traditional and pharmacological use of plant. A natural drug has fewer side effects as compared to synthetic drugs. Medicinal plant is

an alternative way of synthetic drugs and it's free of cost. The paper has mainly focused on the traditional and pharmacological activity of *Momordica dioica* Roxb. It contains significant amount of minerals, nutrients, vitamin, secondary metabolites, and other important ingredients, these may be helpful to fight against several diseases including diabetes, ulcer, tumor, pills, cancer, and neurodegenerative diseases, skin disease.

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