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**Review Article**

“PHYTO-PHARMACOLOGY OF *MOMORDICA DIOICA*: A REVIEW”

DOLI R. DAS, *¹ ANUPAM KR. SACHAN, ¹ MOHD. SHUAIB, ² MOHD. IMTIYAZ³

¹Dayanand Dinanath College, Institute of pharmacy, Ramaipur, Kanpur, India

²Department of Pharmacognosy and Phytochemistry, Jamia Hamdard, New Delhi

³Azad Institute of Pharmacy and Research, Lucknow, India

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ABSTRACT:

Herbal drugs play an important role in health care programs especially in developing countries. Ancient Indian literature incorporates a remarkably broad definition of medicinal plants and considers ‘all’ plant parts to be potential sources of medicinal substances. *Momordica dioica* Roxb. Willd is a perennial, dioecious climbing creeper belonging to family Cucurbitaceae. Its common name is Parora, kakora. It is now found to grow in India, Bangladesh, Srilanka, Myanmar, China, Japan, South East Asia, Polynesia, Tropical Africa, and South America. Its cultivation up to an altitude of 1500 meters in Assam and Garo hills of Meghalaya is reported. Fruit is shortly beaked, obtuse with inner red kernel, densely echinate with soft spines, green and yellow at maturity. Seeds are rounded broadly ellipsoid, slightly compressed, slightly and irregularly corrugated enclosed in red pulp. It mainly contains hederagenin, momordicaursenol, momordicin, momordicafoetid, Cucurbitacins and cucurbitane. Its fruits have diuretic, laxative, hepatoprotective, antivenomous, antihypertensive, anti-inflammatory, antiasthmatic, antipyretic, antileprosy, antidiabetic, and antidepressant properties but also its leaves have antihelminthic, aphrodisiac, antihemorrhoidal, hepatoprotective, antibronchitic, antipyretic, antiasthmatic, and analgesic properties. Oral administration of 50mL of root juice is advised once a day with empty stomach to beat diabetes. The superficial use of root paste over the whole body is believed to act as a sedative in high fever with delirium.

KEYWORDS: *Momordica Dioica*, Antidiabetic Activity, Active Constituents, Pharmacological Activity

INTRODUCTION:

In developing nations, numerous types of edible wild plants are exploited as sources of food hence provide an adequate level of nutrition to the inhabitants. Recent studies on agro pastoral societies in Africa indicate that these, plant resources play a significant role in nutrition; food security and income generation.[1] Furthermore, Food and Agricultural Organization (FAO) report, at least one billion people are thought to use wild foods in their diet.[2]

Herbal drugs play an important role in health care programs especially in developing countries. Ancient Indian literature incorporates a remarkably broad definition of medicinal plants and considers ‘all’ plant parts to be potential sources of medicinal substances. [3]

Momordica dioica Roxb. Willd is a perennial, dioecious climbing creeper belonging to family Cucurbitaceae. Its common name is Parora, kakora.[4] *Momordica* genus contains about 80 species. [5-6] According to the latest revision of Indian *Momordica*, there are six well identified species of which four are dioecious and two are monoecious. [7] Although this genus is originated from Indo- Malayan region, it is now found to grow in India,

Corresponding Author:

Doli R. Das

Dayanand Dinanath College, Institute of pharmacy,
Kanpur, India

Email ID- das.dollydas@gmail.com

Contact No- 7388155959

Bangladesh, Srilanka, Myanmar, China, Japan, South East Asia, Polynesia, Tropical Africa, and South America. [8-9] Its cultivation up to

an altitude of 1500 meters in Assam and Garo hills of Meghalaya is reported. [10]

VERNACULAR NAME:	
English-	Small bittergourd, spine gourd
Bengoli-	Kartoli
Malyalam-	Venpaval, Erima pasel
Tamil-	Aegaravalli, Tholooavai
Cannad	Madahagala –Kayi
Assam	Batkarila
Hindi -	Kakora, Parora
Sanskrit-	Vahisi
Marathi-	Kartoli
Telagu-	Karkotaki, Agakara
Panjabi-	Dharkarela

TAXONOMICAL CLASSIFICATION	
Kingdom-	Plantae
Super division-	Spermatophyta
Class-	Magnoliopsida
Orde-	Violales
Genus-	<i>Momordica</i>
Subkingdom-	Tracheobionata
Division-	Magnoliphyta
Subclass-	Dilleniidae
Family-	Cucurbitaceae
Species-	<i>dioica</i>



Plant of *Momordica dioica*

MACROSCOPIC CHARACTERS OF LEAVES:

Leaves of plant are simple membranous, broadly ovate in outline, variable in length 3.8-10cm by 3.2-8 cm, cordate at the base, deeply lobed in 3-5 triangular lobes, punctated, entire but distantly denticulate, petiole 1.3-4.5 cm. long channelled above, pubescent and glandular. Male flower is solitary, up to 2.8 cm long and yellow coloured. Petals 1.3- 2.5 cm long, oblong lanceolate. Calyx five lobed, linear lanceolate. Corolla five partite, stamen three. Female flower is solitary, small bract below the middle of the peduncle, calyx and corolla as in male without staminodes or in form of gland three united, ovary clothed with long soft papillae and many ovuled, ellipsoid. Yellow



Fruits of *Momordica dioica*

coloured. Fruit is shortly beaked, obtuse with inner red kernel, densely echinate with soft spines, green and yellow at maturity. Seeds are rounded broadly ellipsoid, slightly compressed, slightly and irregularly corrugated enclosed in red pulp. Stem slender, branched, furrowed, glabrous and shining. Tendrils are elongated, simple, striate and glabrous. [12-17]

ACTIVE CONSTITUENTS:

Momordica dioica is as dioeciously climbing herb belonging to family Cucurbitaceae. Phytoconstituents of *Momordica dioica* are traces of alkaloids, steroids, triterpenoids, [18] flavonoids, glycosides, saponins, [19] triterpenes of urisolic acid dark brown semidrying oil and saturated fatty acids

,ascorbic acids , vitamin A , thiamine, riboflavins, niacin, protein carbohydrates, lectins, [20] ascorbic acids, carotenes, bitter principles, oleanolic acid, stearic acid, gypsogenin, alpha-spiranosterol hederagenin, momordicaursenol.[21]The alkaloid present in seed called momordicin and present in root called momordicafoetid. Cucurbitacins and cucurbitane glycosides: structures. [22] Sadyojatha et al examined the chemical constituents of the rhizome of *Momordica dioica* revealed the presence of β -sitosterol saponin glycosides and alkaloids. The isolated principles of rhizome was tested against bacteria & concluded that the compound exhibits a moderate antibacterial activity. [23] The fruit of *Momordica dioica* contains ashes: 9.1%, crude protein: 5.44%, crude lipid: 3.25%, crude fiber: 22.9%, and carbohydrate: 59.31%. Its fruit has high energy value (288.25 kcal/100 g) in dry weight. Its mineral ranges (mg/100 g dry weight,) are: potassium (4.63), sodium (1.62), calcium (7.37), iron (5.04), and zinc (3.83). [24]In another investigation, its nutritional value of 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. [25]

ETHNOBOTANICAL AND PHYTOTHERAPEUTICAL STUDY:

According to Ayurveda not only its fruits have diuretic, laxative, hepatoprotective, antivenomous, antihypertensive, anti-inflammatory, antiasthmatic, antipyretic, antileprosy, antidiabetic, and antidepressant properties but also its leaves have antihelminthic, aphrodisiac, antihemorrhoidal, hepatoprotective, antibronchitic, antipyretic, antiasthmatic, and analgesic properties. [26-27] Fresh fruit juice and cooked fruit in small amount of oil are prescribed for hypertension and diabetes, respectively. Oral administration of 50mL of root juice is advised once a day with empty stomach to beat diabetes. The juice of root is a domestic remedy for the inflammation caused by contact with the urine of the house lizard. The juice of the leaves are mixed with coconut, pepper, red sandalwood,

and so forth in order to form an ointment and applied to the head to relieve pain. Dried fruit powder applied into the nostrils produces a powerful errhine effect and provokes a copious discharge from the schneiderian mucous membrane.[28] Root juice has stimulant, astringent, antiseptic, antidiabetic, anti-inflammatory, and antiulcerant effect. Themucilaginous tubers act as antihelminthic, spermicidal, and antifertility abortifacient agent.[29] The root of the male plant is used in snake bites and scorpion sting.[30] The superficial use of root paste over the whole body is believed to act as a sedative in high fever with delirium.[31-32] Beside the superficial and oral administration of leaf paste for skin disease, tender fruits are rubbed on skin for pimples and acne and roasted seeds are used for eczema and other skin problems.[33] Root powder is also applied for softening skin and reducing perspiration. The protective role of the leaves against chronic skin diseases is also reported. A preparation called “Panchatikta ghrita” is made by boiling 800 g each of neem bark, leaves of *Momordica dioica*, *Solanum surattense*, *Tinospora cordifolia*, and bark of *Adhatoda vasica*, in 5-6 liters of water up to its reduction to quarter and then adding of 3.5 liters of butter and about 3 kg myrobalans and is recommended as one tablespoonful with little hot milk internally twice daily in chronic skin diseases.[34]

PHARMACOLOGICAL ACTIVITY:

Antidiabetic Activity:

Antidiabetic specifically oral hypoglycemic effects of *Momordica dioica* in rat model was screened by Fernandopulle et al. [35] Reddy et al. and Singh et al. showed aqueous, chloroform, ethyl acetate and ethanolic extract of fruit mediated antidiabetic activity in alloxan induced experimental rats. Moreover, Sharma and Arya reported ethyl acetate and ethanol extract containing steroids, triterpenoids had potential role in alloxaninduced diabetic rats and broadly type 2-diabetes.[36]

Antioxidant Activity:

Compounds derived from natural sources are capable of providing protection against free radicals. The alcoholic extract inhibited the formation of oxygen derived free radicals (ODFR) in vitro with 4000 $\mu\text{g/mL}$ ascorbic system. In another work, the free radical scavenging potential of the tuberous roots was studied by different in vitro methods, namely, DPPH radical scavenging, ABTS radical scavenging, iron chelating activity, total antioxidant capacity, and haemoglobin glycosylation assay.[37]

Antiallergic Activities:

The antiallergic activity of its extract in mice was observed. The alcoholic extract was evaluated and its efficacy to inhibit passive cutaneous anaphylaxis was found in mouse and rat.[38]

Anticancer Activity:

Luo et al. showed that the CHCl_3 extract of roots and five isolated constituents had anticancer activity during pharmacological testing on cancer cell (L1210). The growth inhibitory index (%) of α -spinasterol-3- α - β -D-glucopyranoside was shown to be 50%, at the dose of 4 $\mu\text{g/mL}$. [39]

Analgesic Activity:

Ilango et al. and Vaidya and Shreedhara reported that both hexane extract and soluble portion of methanolic extract of *Momordica dioica* fruit pulp exhibited analgesic activity when compared to standard drug. Petroleum ether, ethyl acetate, and methanol extracts exhibited significant analgesic activity in acetic acid induced writhing syndrome when compared to the vehicle treated control group. But among them petroleum ether and methanol extract gave more significant analgesic activity than ethyl acetate extract.[40]

Neuroprotective Activity:

The effect of methanol and aqueous extract of fruit pulp was observed on the central nervous system by using neuropharmacological experimental models in mice. These extracts were used for a dose dependent reduction of

the onset and duration of a reduction in locomotor activity.[41]

Antimicrobial Activity:

Shrinivas et al. studied methanolic extract and aqueous extract of fruit and found that methanolic extract had more promising antimicrobial activity. Arekar et al. screened antibacterial activities of ethyl acetate extract. The concentration of 200 $\mu\text{g/disc}$ was more active against *E. coli* compared to *S. aureus*, *S. paratyphi*, and *P. mirabilis* bacteria. Ethyl Acetate extract of in vitro shoot culture (yield: 0.26%) showed maximum inhibition zone against *S. paratyphi* and *P. mirabilis* while ethyl acetate extract of in vitro callus culture (yield: 21.5%) showed maximum inhibition zone against *S. aureus*.

Anti-inflammatory activity:

The anti-inflammatory effect of the alcoholic extract of roots was evaluated during CCl_4 induced hepatotoxicity. Ilango et al. evaluated both hexane extract and methanolic extract of fruit pulp mediated anti-inflammatory activities [42].

Antifertility Activity:

Shreedhar et al. reported the antifertility activity of ethanolic and aqueous extract of *Momordica dioica* root. The extracts showed moderate estrogenic activity and caused significant increase in uterine weight. Moreover, at a dose of 200mg/kg, aqueous extract showed 83% and ethanolic extract showed 100% abortifacient activity [74]. Kudaravalli evaluated the ethanolic extract of fruit mediated antifertility activities of female rats but found no male antifertility activity at the dose of 250mg/kg. [43]

TRADITIONAL USES:**Fruits**

Fruit of plant are green and generally used as vegetable. It possesses many medicinal properties. Fruit are diuretic, alexiteric stomachic laxative, hepatoprotective, and have antivenum property. 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 [44] Fresh fruit juice is prescribed for hypertension. The fruit is cooked in a small amount of oil and consumed for treating diabetes. Tender fruits are rubbed on skin for pimples and acne. Seeds are roasted and taken for eczema and other skin problems. The powder or infusion of the dried fruits, when introduced into the nostrils produces a powerful errhine effect and provokes a copious discharge from the schneiderian mucous membrane [45].

Leaves

Leaves of the plant are antihelminthic, aphrodisiac. It is also used to cure tridosha, fever and alters pitta, jaundice, asthma, bronchitis, piles, hepatic damages, mental digestive disorders, bleeding piles bowel affection and urinary complaints. The juice of the leaves mixed with coconut, pepper, red sandalwood etc in order to form an ointment and applied to the head to relieve pain in the head. Leaf paste applied externally to skin and orally two or three times daily for skin disease [46].

Roots

Roots of the *Momordica dioica* is full of medicinal values. Juice of root is stimulant, astringent, antiseptic. The mucilaginous tubers are antihelminthic, spermicidal, antifertility abortifacient, used in case of bleeding piles, similar bowel afflictions and urinary complaints [47]. Powder of root is applied to skin to make it soft and to reduce perspiration. Mucilaginous tubers of female plants used in bleeding piles & bowel infections; the dose is two drachmas or more twice daily. Tuberous root is ground in hot water and 50ml of juice is taken orally once a day on empty stomach for two days to beat diabetes. The toasted root is used to stop bleeding from piles and also in bowel complaints. In the Konkan region, the juice of the root is a domestic remedy for the inflammation caused by contact with the urine of the house lizard. The root of the male creeper is used in ulcers, especially those caused by snake –bites. The roots of the plant are also recommended for scorpion sting. The root ground into a paste and smeared over the

whole body is believed to act as a sedative in high fever with delirium [48-49].

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