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A COMPREHENSIVE REVIEW ON THE TAXONOMY, PHYTOCONSTITUENTS, AND PHARMACOLOGICAL ASPECTS OF *MOMORDICA DIOICA*

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ABSTRACT: *Momordica dioica*, commonly known as spiny gourd or teasel gourd, is a perennial, dioecious climber belonging to the Cucurbitaceae family. Widely distributed across tropical Asia, especially in India, this underutilized vegetable holds immense medicinal and nutritional significance. The plant is characterized by its small, spiny, green fruits that are rich in dietary fibre, minerals, and bioactive compounds. Ethnobotanical studies reveal its traditional use in managing diabetes, inflammation, fever, and digestive disorders. Phytochemical analyses have identified the presence of flavonoids, alkaloids, tannins, saponins, and phenolic compounds that contribute to its antioxidant, antimicrobial, hepatoprotective, and antidiabetic properties. Its seeds and fruits are used in Ayurvedic formulations, while leaves are sometimes applied for wound healing and skin ailments. Recent pharmacological investigations have supported many of its traditional claims and highlight its potential as a source for novel therapeutic agents. However, despite its proven benefits, *M. dioica* remains under-researched and underutilized. Agronomically, it is a hardy plant suited to diverse climatic conditions, though its cultivation is limited to certain regions due to lack of awareness and propagation challenges.

INTRODUCTION: *Momordica dioica* is a well-known and nutritious vegetable that has been cultivated in India for centuries. In India, it is commonly referred to as "Kantola" or "Kakrol." Although it bears a resemblance to bitter gourd in appearance, its flavor is distinctly different. This vegetable is characterized by its short length and round shape. The botanical classification of spiny gourd is "*Momordica dioica*," and it is a member of the "Cucurbitaceae" family. It thrives in both tropical and subtropical climates, as it is primarily a warm-season crop. *Momordica dioica*, also known as spiny gourd or bristly balsam pear, is a flowering plant species^{1, 2, 3}.



FIG. 1: *MOMORDICA DIOICA*

Cucurbitaceae, commonly referred to as the gourd family, encompasses a variety of crops such as cucumbers, squashes (including pumpkins), luffas, and melons (including watermelons). This family is primarily found in tropical regions, where many of its edible fruit-bearing species were among the first cultivated plants in both the Old and New Worlds. Notable genera within this family include

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Trichosanthes (100 species), Cayaponia (60 species), Momordica (47 species), Gurania (40 species), Sicyos (40 species), and Cucumis (34 species). Cucurbitaceae represents one of the most genetically diverse assemblages of food plants in the botanical realm. Members of this family exhibit sensitivity to frost, possess drought tolerance, and are generally intolerant of wet or poorly drained soils. The cultivation of cucurbits has seen a notable increase over time, driven by consumer demand.

These plants are also recognized for their bitter flavor, attributed to the occurrence of phytochemicals, especially alkaloids, is associated with a broad spectrum of medicinal properties. *Momordica* species, which include approximately 80 varieties, can be classified as either annual or perennial climbers. These species are predominantly distributed across India, Pakistan, and Bangladesh, extending from the Himalayas to Ceylon. They have been documented at elevations reaching up to 1500 meters in regions such as Assam, the Garo Hills of Meghalaya, and the Western Ghats, which is recognized as a hotspot of biodiversity. This genus encompasses several varieties, including *M. charantia* var. *muricata*, *M. charantia* var. *charantia*, *M. dioica*, and *M. sahyadrica*. The renewed interest in natural pharmaceuticals has emerged over the past decade, largely due to the prevailing perception that herbal remedies are more beneficial to health compared to synthetic alternatives.

There has been a significant rise in the industries focused on medicinal plants in recent years. This surge, which is occurring at an annual growth rate of 7-15%, reflects a growing global interest in these natural resources, even in the face of substantial advancements in modern medicine. The exploration of new pharmaceuticals derived from natural products remains a critical area of research. Medicinal plants are increasingly recognized as potential therapeutic agents, prompting extensive scientific inquiry. The *Momordica* species, in particular, have been utilized in traditional medical practices across various regions in Asia and Africa. Indigenous knowledge highlights the essential role of wild plant foods within the intricate cultural frameworks of tribal communities, particularly in addressing a range of health issues. Studies indicate

that numerous edible wild plants are abundant in specific phytochemicals, which may confer health benefits. To date, there has been no comprehensive review in the literature that addresses the multifaceted attributes of *M. dioica*. Its diverse applications as a nutritious vegetable, traditional medicine and functional food ingredient have motivated us to undertake a thorough review of this versatile fruit, focusing on its distribution, nutritional properties, phytochemical profile, and medicinal benefits⁴.

Flowering takes place from June to July, while fruiting occurs between September and November. The leaves of the plant are simple, membranous, and broadly ovate in shape, exhibiting a length variation of 3.8 to 10 cm and a width of 3.2 to 8 cm. They are cordate at the base and feature deep lobes, typically divided into three to five triangular segments. The leaves are punctuated, entire, yet exhibit distant denticulation, with petioles measuring 1.3 to 4.5 cm in length, channelled on the upper side, and covered in pubescence and glandular structures. The male flower appears solitary, reaching lengths of up to 2.8 cm and displaying a yellow hue. Its petals are oblong-lanceolate, measuring between 1.3 and 2.5 cm in length. The calyx consists of five linear-lanceolate lobes, while the corolla is five-parted, and there are three stamens present. The female flower is also solitary.

A small bract is located beneath the midpoint of the peduncle, with the calyx and corolla resembling those of the male, lacking staminodes or forming a gland with three united parts. The ovary is covered in long, soft papillae and contains numerous ovules, exhibiting an ellipsoid shape and a yellow hue. The fruit is characterized by a short beak and an obtuse form, featuring an inner red kernel that is densely echinate with soft spines, displaying green and yellow colors upon maturity. The seeds are broadly ellipsoid, slightly compressed, and exhibit irregular corrugation while being encased in red pulp. The stem is slender, branched, furrowed, glabrous, and has a shiny appearance. The tendrils are elongated, simple, striated, and also glabrous. This climbing creeper is commonly found across India, Pakistan, Bangladesh, the Himalayas, and Ceylon, with reports of its presence at altitudes of up to 1500 meters in Assam and the Garo Hills of

Meghalaya. Kakrol is a Cucurbitaceous crop that has its origins in the Indo-Malayan region^{5, 6, 7}.

Biogeography and Botanical Description: Historical literature and contemporary analyses indicate that *Momordica dioica* Roxb is a perennial dioecious climbing plant characterized by tuberous roots. This taxon has been confirmed by the United States Department of Agriculture as belonging to the Cucurbitaceae family, specifically the subfamily Cucurbitoideae. The genus name Momordica may derive from the distinctive sculptured seeds or the irregular appearance of the fruit, which resembles being nibbled. Commonly referred to as ‘Kakora’ in the Gwalior Chambal Division of Madhya Pradesh, this species is believed to have originated in the Indo-Malayan region. In India, it is extensively distributed from the Himalayas to the southern peninsula, as well as in other regions of the Indian subcontinent, including Pakistan, Bangladesh, Myanmar, and Sri Lanka, where it grows both wild and cultivated for its edible fruit. The fruit is oval-shaped and covered with soft spines; the aerial parts of the plant die back at the onset of winter. The species survives through the sprouting of tubers, which can lead to significant production losses. Cultivation is primarily achieved through vegetative propagation from the underground tuberous roots⁴. The origin of *Momordica dioica* can be traced to its classification as a perennial, dioecious climbing plant belonging to the Cucurbitaceae family, commonly referred to as kakrol, spiny gourd, or teasle gourd. This species is indigenous to Asia, with a significant presence in regions such as India and Bangladesh⁸.

Synonyms of *Momordica Dioica*:

TABLE 1: SYNONYMS OF MOMORDICA DIOICA⁵

Bengoli	Kartoli
English	Small bittergourd, spine gourd
Hindi	Kakora, Parora, Golbandra
Malyalam	Venpaval, Erimapasel
Marathi	Kartoli
Tamil	Aegaravalli, Tholoopavai, Paluppakkay
Telagu	Karkotaki, Agakara
Cannad	Madahagala –Kayi
Sanskrit	Vahisi
Panjabi	Dharkarela
Assam	Batkarila

Classification of *Momordica dioica*:

TABLE 2: CLASSIFICATION OF MOMORDICA DIOICA⁵

Kingdom	Plantae
Subkingdom	Tracheobionata
Super division	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Dilleniidae
Order	Violales
Family	Cucurbitaceae
Genus	Momordica
Species	Dioica

The cultivation of *Momordica dioica*, commonly known as spinegourd or kantola, is primarily concentrated in the states of Karnataka and West Bengal, where it is grown on a commercial scale. Additionally, the improved hybrid variety known as Indira Kankoda I is cultivated commercially in several other states, including Chhattisgarh, Odisha, Uttar Pradesh, Maharashtra, and Jharkhand. Furthermore, various regions in Meghalaya also engage in the production of this vegetable⁹.

Soil and Climatic Requirements: Spine gourd is adaptable to various soil types; however, it exhibits optimal growth in sandy loam soils with a pH level between 5.5 and 7.0. The most suitable conditions for its cultivation are well-drained soils enriched with organic matter. A hot and humid climate is preferred for spine gourd cultivation, with the plant thriving in temperatures ranging from 25 to 35°C and receiving annual rainfall between 600 and 4500 mm.

Sowing Schedule: The crop reaches maturity during the months of September and October. From the second year onward, there is no requirement for additional planting materials. Typically, the growth cycle of spine gourd spans 115 to 125 days, with sowing commencing at the onset of the monsoon season in June and July. The first marketable fruits can be harvested in the last week of August, and after four harvests, tuber sprouting begins from the second half of May to the first half of June, with the initial harvest occurring in the first half of July¹⁰.

Nutritional Composition of *Momordica dioica*: This fruit is characterized by its content of lectins, proteins, triterpenes, and various vitamins. Notably, it is particularly rich in vitamin C, providing a significant amount of ascorbic acid and iodine.

Additionally, the fruit contains alkaloids, flavonoids, glycosides, and amino acids. *Momordica dioica* also includes an alkaloid, along with extractive matter and ash, which constitutes approximately 3 to 4 percent of its composition.

The ash is noted to contain trace amounts of manganese. The average nutritional profile per 100 grams of the edible portion of the fruit reveals a composition of 84.1% moisture, 7.7 grams of carbohydrates, 3.1 grams of protein, 3.1 grams of fat, 3.0 grams of fiber, and 1.1 grams of minerals. Furthermore, it provides small amounts of essential vitamins, including ascorbic acid, carotene, thiamine, riboflavin, and niacin. The leaves also contain protein, and the dry weight of the aerial parts of the plant is observed to be higher in male plants compared to female defruited and monoecious specimens of *Momordica dioica* ⁴.

TABLE 3: NUTRITIONAL COMPOSITION OF FRUITS OF MOMORDICA DIOICA ¹⁰

Parameter	Nutrient composition
Crude protein (g)	19.38
Crude lipid (g)	4.70
Carbohydrates (g)	47.92
Crude fibre (g)	21.30
Ash (g)	6.70
Calorific value (kcal)	311.50
Calcium (mg)	33.00
Phosphorus (mg)	42.00
Iron (mg)	4.60
Riboflavin (mg)	0.18
Thiamine (mg)	0.05

There is potential for Spine Gourd to aid in improving digestive health. Spine gourd is a highly palatable fruit, characterized by its sweetness and absence of bitterness. It serves as a valuable source of antioxidants and various essential nutrients, including β -carotene, vitamin C, folic acid, magnesium, phosphorus, and potassium. Additionally, it is frequently utilized in traditional medicinal practices. Typically, the fresh fruit contains approximately 84.1% to 87% moisture content ¹¹.

The health advantages associated with *Momordica dioica*, commonly known as Spine Gourd, are numerous and noteworthy. These benefits include the following:

- Spine Gourd has been shown to lower blood glucose levels.

- It possesses properties that may contribute to anti-aging effects.
- The consumption of Spine Gourd is believed to enhance visual acuity.
- It may play a role in decreasing the risk of cancer.
- Spine Gourd is effective in the elimination of kidney stones.
- It serves as a natural remedy for the treatment of piles.
- The vegetable is known to mitigate excessive perspiration.
- Spine Gourd can be utilized in the management of coughs.

Bioactive Compounds of *Momordica dioica*: This dioecious climbing herb is a member of the Cucurbitaceae family and is characterized by a diverse array of phytoconstituents. The phytochemical profile of *Momordica dioica* includes various compounds such as alkaloids, steroids, triterpenoids, flavonoids, glycosides, saponins, and triterpenes, along with ursolic acid, a dark brown semidrying oil, and saturated fatty acids. Additionally, it is rich in ascorbic acid, vitamin A, thiamine, riboflavin, niacin, proteins, carbohydrates, lectins, carotenes, bitter principles, oleanoic acid, stearic acid, gypsogenin, α -spirostanosterol, and hederagenin. Notably, the alkaloid known as momordicin is found in the seeds, while another compound, *Momordica foetida*, is present in the roots ⁴.

TABLE 4: PROXIMATE AND MINERAL COMPOSITION OF MOMORDICA DIOICA ¹²

Composition	<i>Momordica dioica</i>
Moisture /%	84.17
Ash /%	6.7
Lipid /%	4.7
Fibre /%	21.3
Protein /%	19.38
Carbohydrate /%	47.92
Energy k cal/100 g	311.50
Calcium mg/100g	33
Sodium mg/100g	1.51
Potassium mg/100g	8.25
Iron mg/100g	4.6
Phosphorus mg/100g	42

TABLE 5: VITAMIN COMPOSITION OF FRUITS OF MOMORDICA DIOICA ⁴

Vitamins (g/100g)	Momordica dioica	Recommended dietary allowances (mg/day)
Vitamin A	2.5	-
VitaminB1 (Thiamine)	1.8	1.7
Vitamin B2 (Riboflavin)	3.5	1.7
Vitamin B3 (Niacin)	1.9	18
Vitamin B5 (Pantothenic Acid)	18	-
Vitamin B6 (Pyridoxine)	4.3	2.0
Vitamin B9 (Folic Acid)	3.6	0.2
VitaminB12 (Cyanocobalamin)	4	0.001
Vitamin C (Ascorbic Acid)	-	40
Vitamin D2 & 3 (Cholecalciferol)	3	-
Vitamin H (Biotin) g/100g	6.5	-

Chemical Composition: The fruit of *Momordica dioica* is characterized by its ash content, which is measured at 9.1%. The crude protein levels include potassium at 4.63 g, sodium at 1.62 g, calcium at 7.37 g, iron at 5.04 g, and zinc at 3.83 g. In a separate study, the nutritional composition of 100 g of the edible fruit was found to consist of 84.1% moisture, 7.7 g of carbohydrates, 3.1 g of protein, 3.1 g of fat, 3.0 g of fiber, and 1.1 g of minerals, along with trace amounts of essential vitamins such as carotene, thiamin, riboflavin, and niacin. Ali and Deokule conducted an evaluation of certain micronutrients and secondary metabolites, yielding the following results: calcium at 0.5 mg/g, sodium at 1.5 mg/g, potassium at 8.3 mg/g, iron at 0.14 mg/g, zinc at 1.34 mg/g, protein at 19.38%, fat at 4.7%, total phenolic compounds at 3.7 mg/g, phytic acid at 2.8 mg/g, and an ash value of 6.7%.

Plant Parts:

Furthermore, the fruit is recognized as a nutritionally valuable source of protein and a good source of lipids, crude fiber, carbohydrates, iron, calcium, and phosphorus. Notably, it contains the highest concentration of carotene (162 mg/100 g of edible portion) among cucurbitaceous vegetables, with an ash content reported to be between 3-4%, which includes trace amounts of manganese ⁴.

TABLE 6: FATTY ACID COMPOSITION OF FRUITS OF MOMORDICA DIOICA

Fatty Acids	Momordica dioica
Myristic acid (%)	3.589
Palmitic acid %	12.157
Stearic acid %	3.547
Oleic acid %	56.253
Linoleic acid %	22.511
Alpha-Linoleic acid %	1.943

TABLE 7: PHYTO-CONSTITUENTS OF DIFFERENT PLANT PARTS OF M. DIOICA AND THEIR EFFECT ⁹

Plant parts	Extracted compound	Effect of each compound
Fruit	Hexane extract	Anti-inflammatory property,Neuro-protective ability protect the liver cells from damages on hepatocytes, anticancer effect
	Methanol extract	
	n-butanol extract Hexane and ethyl acetate extract	Reduction of pancreatic lipase activities provide protection against the anti-feeding activity of cotton leaf worm, Anti-diabetic and antidepressant properties
Leaves	Methanol extract	Hepato-protective, Anti-hepatotoxicity effect Allelopathic activity on seedling growth, seed germination
Root	Alcoholic extraction Ethanol extraction Methanol	Inhibition the formation of free oxygen radical Inhibit the growth, Anti-fertility effect Anticancer effect
Seed	Seed oil	Provide protectant against callosobruchus chinensis, Antiallergic effect

Leaves: Leaves of the plant are anthelmintic, aphrodisiac. It is also used to cure tridosha, fever and alters pitta, jaundice, asthma, bronchitis, piles, hepatic damages, mental digestive disorders The leaves of the plant possess anthelmintic and aphrodisiac properties. They are utilized in the treatment of tridosha imbalances, fever, and

conditions that affect pitta, including jaundice, asthma, bronchitis, hemorrhoids, liver damage, mental digestive disorders, bleeding hemorrhoids, bowel issues, and urinary problems. The juice extracted from the leaves can be combined with coconut, pepper, red sandalwood, and other ingredients to create an ointment, which is then

applied to the head to alleviate headaches. Additionally, a paste made from the leaves can be applied externally to the skin or taken orally two to three times daily to address skin diseases. The leaves are simple and membranous, varying in size from 3.8 to 10 cm in length and 3.2 to 8 cm in width. They are broadly ovate in shape, cordate at the base, and deeply lobed with 3 to 5 triangular lobes. The leaves are punctuated, entire but with distant denticulation, and have a petiole measuring between 1.3 and 4.5 cm, which is channeled above and glandular.

The leaves are palmately divided into 5 to 7 lobes, measuring 15 to 25 cm in both length and width. The lobes are triangular in shape, with the central lobe reaching lengths of 8 to 12 cm, characterized by an acute or acuminate apex and a deeply cordate base. The probracts are fleshy and ovate, ranging from 3 to 7 mm in length and 2 to 4 mm in width, featuring 3 to 7 shiny glands on their upper surface. The petioles are stout, measuring 10 to 12 cm in length, and exhibit a scabrous texture. The plants are monoecious in nature⁵.

Fruits: The fruit of the plant is predominantly green and is typically classified as a vegetable. It possesses numerous medicinal attributes, including diuretic, alexiteric, stomachic, laxative, and hepatoprotective properties. This fruit is utilized in the treatment of various conditions such as asthma, leprosy, excessive salivation, and inflammation resulting from lizard and snake bites. Additionally, it is effective in managing fever, mental disorders,

digestive issues, and discharges from mucous membranes. Fresh juice extracted from the fruit is recommended for individuals with hypertension. The fruit is characterized by a short beak and an obtuse shape, containing a red inner kernel and covered with soft spines. Initially green, the spine gourd fruit transitions to yellow upon reaching maturity⁵.



FIG. 2: FRUITS

Chemical Constituents of Fruit: The fruit possesses a significant energy content, measuring 288.25 kcal per 100 grams in its dry form. Additionally, the mineral composition per 100 grams of dry weight includes potassium at 4.63 mg, sodium at 1.62 mg, calcium at 7.37 mg, and iron at 5.04 mg.

Seeds: Seeds are broadly ellipsoid in shape, exhibiting a rounded appearance with slight and irregular corrugations. They are encased in a red pulp and have a slightly compressed structure.

Phytochemical Potential of *Momordica dioica*:

TABLE 8: PHYTOCHEMICAL POTENTIAL OF *MOMORDICA DIOICA*⁸

Sr. no.	Plant part	Class	Compounds	Extract
1.	Seed	Alkaloid	Momordicin	Seed oil
2.	Fruit	Alkaloid	-	Ethyl acetate, methanol
		Flavonoid	-	Methanol, hexane
		Steroids	-	Ethyl acetate, methanol aqueous
		Saponins	-	Methanol, aqueou s
		Triterpenoids	-	Ethyl acetate, methanol and aqueous
3.	Root	Steroid	α -spinasterol-3-o- β -D-glucopyranosides, Olenolic acid, Gypsogenin, Hederagenin	Methanol extract
		Triterpenoid	3 β -O-benzoyl-6-oxo-ursolic acid, 3 β -O-benzoyl-11-oxoursolic acid 3-O- β -D-glucopyranosyl hederagenin, 3-O- β -D-glucopyranosyl gypsogenin, 3-O- β -D-glucurono pyrano pyranosyl gypsogenin.	

Pharmacological Activity:

Antioxidant Activity: Natural source-derived compounds exhibit the ability to protect against free radicals. An alcoholic extract demonstrated the inhibition of oxygen-derived free radicals (ODFR) *in-vitro*, utilizing a concentration of 4000 µg/mL ascorbic acid as a reference. In a separate study, the free radical scavenging capabilities of tuberous roots were evaluated through various *in-vitro* methodologies, including DPPH radical scavenging, ABTS radical scavenging, iron chelation, total antioxidant capacity assessment, and a haemoglobin glycosylation assay. The total antioxidant capacity of the ethanolic extract was determined to be 26 µg/mL, comparable to that of ascorbic acid. Furthermore, the ethanol extract exhibited haemoglobin glycosylation inhibition percentages of 66.63% and 74.14% at concentrations of 500 and 1000 µg/mL, respectively, while the standard DL-tocopherol showed 61.53% and 86.68% inhibition at the same concentrations. The antioxidant properties of both methanol and aqueous extracts from the fruits were investigated, revealing the presence of phenolic compounds, flavonoids, sterols, alkaloids, and amino acids. Notably, the presence of flavonoids in the fruit contributed to its classification as a potent antioxidant.

Nephroprotective Activity: The ethanol extract derived from the seeds was assessed and demonstrated both nephroprotective and therapeutic properties, exhibiting no toxicity associated with nephrotoxins such as gentamicin. Additionally, the nephroprotective and therapeutic effects of the fruit extract were also noted. Gupta *et al.* investigated the renal protective effects of *Momordica dioica* extract in rats induced with streptozotocin diabetes^{15, 11}.

Anticancer Activity: The chloroform extract derived from the roots, along with five isolated compounds, demonstrated anticancer properties in pharmacological evaluations conducted on L1210 cancer cells. Notably, the growth inhibition percentage of α -spinasterol-3-o--D-glucopyranoside was recorded at 50% when administered at a concentration of 4 µg/mL.

Neuroprotective Activity: The impact of methanol and aqueous extracts derived from fruit pulp on the

central nervous system was evaluated through neuropharmacological experimental models in mice. These extracts demonstrated a dose-dependent decrease in both the onset and duration of reduced locomotor activity. It was proposed that the methanol and aqueous extracts of fruit pulp, administered at doses of 100 mg/kg and 200 mg/kg, exhibit neuroprotective properties¹¹.

Antimicrobial Activity: Shrinivas *et al.* undertook a study to assess the antimicrobial properties of methanolic and aqueous extracts obtained from fruit, finding that the methanolic extract demonstrated significantly enhanced antimicrobial activity. In a different investigation, Arekar *et al.* analyzed the antibacterial effects of an ethyl acetate extract, observing that a concentration of 200 µg/disc exhibited greater effectiveness against *E. coli* compared to *S. aureus*, *S. paratyphi*, and *P. mirabilis*. Furthermore, the ethyl acetate extract derived from *in-vitro* shoot culture, which yielded 0.26%, produced the largest inhibition zone against the tested bacterial strains, including *S. paratyphi* and *P. mirabilis*. Conversely, the ethyl acetate extract from *in-vitro* callus culture, with a yield of 21.5%, showed the most significant inhibition zone against *S. aureus*. In contrast, Singh *et al.* reported a lack of promising antimicrobial activity in their findings.

Antiallergic Activities: The antiallergic properties of the extract were assessed in a murine model. The evaluation of the alcoholic extract demonstrated its ability to inhibit passive cutaneous anaphylaxis in both mice and rats.

Antiulcer Activity: The extract of *Momordica dioica* exhibited an antiulcerogenic effect in a rat model of ethanol-induced ulcers. Notable reductions were observed in the levels of H⁺-K⁺ATPase, gastric juice volume, and acid secretion. Conversely, there was a significant increase in gastric wall mucus and catalase enzyme levels, while the antioxidant enzyme superoxide dismutase showed a decrease. Additionally, the extract displayed gastroprotective and ulcer healing properties.

Antidiabetic Activity: The antidiabetic effects, particularly the oral hypoglycemic properties of *Momordica dioica*, were investigated in a rat model

by Fernandopulle *et al.* Research by Reddy *et al.* and Singh *et al.* indicated that the aqueous, chloroform, ethyl acetate, and ethanolic extracts of the fruit exhibited antidiabetic activity in alloxan-induced rats. Furthermore, Sharma and Arya noted that the ethyl acetate and ethanol extracts, which contained steroids and triterpenoids, played a significant role in managing alloxan-induced diabetes and type 2 diabetes. Gupta *et al.* explored the antidiabetic and renal protective effects of a methanolic extract of *Momordica dioica* (MDMtE) in streptozotocin-treated diabetic rats, revealing degenerative changes in the glomeruli and renal tubules of the diabetic subjects.

Antimalarial Activity: The alcoholic extract was tested both *in-vivo* and *in-vitro* for its antimalarial properties against the NK65 strain of *Plasmodium berghei*, as well as *Jurineama crocephala* and *Aegle marmelos*, demonstrating significant schizontocidal activity.

Anti-Inflammatory Activity: The anti-inflammatory properties of the alcoholic extract derived from roots were assessed in the context of hepatotoxicity induced by carbon tetrachloride (CCl). Ilango *et al.* investigated the anti-inflammatory activities mediated by both hexane and methanolic extracts of fruit pulp²⁵.

TABLE 9: PHARMACOLOGICAL EVALUATION OF *M. DIOICA*

Pharmacological Activity	Part of plant	Extract/preparation	Detail effect
Neuroprotective activity	Fruit	Methanol extract	Methanol extract of fruit pulp (100mg/kg and 200mg/kg had neuroprotective activities ²⁶
Antiallergic activities	Seed	Alcoholic extract	The antiallergic activity of extract in mice was observed. found its efficacy to inhibit passive cutaneous anaphylaxis in mouse and rat ^{27, 28}
Anticancer activity	Root	Methanol extract	The growth inhibitory index (%) of α - spinasterol-3-o- β -D-glucopyranoside was shown to be 50%, at the dose of 4 μ g/ml while testing on cancer cell ²⁹
Antimicrobial activity	Fruit	Ethanol, aqueous extract	Found methanolic extract had more promising antimicrobial activity ³⁰
	Root, Leaf	Ethyl acetate extract	The concentration of 200 μ g/disc was more active against <i>E. coli</i> compared to, <i>S. paratyphi</i> , and <i>P. Mirabilis bacreria</i> ³¹
Antimalarial activity	Not specified	Alcoholic extract	Screened extract <i>in-vivo</i> and <i>in-vitro</i> against NK65 strain of <i>Plasmodium berghei</i> , <i>Jurinea mrocephala</i> , <i>Aegle marmelos</i> and found to possess schizontocidal activity ³²
Anti-inflammatory activity	Root	Alcoholic extract	Significantly reduced carrageenan –induced paw edema when administered orally (200mg/kg) and the activity was comparable with ibuprofen (200mg/kg) ³³
	Fruit	ne, methanol extract.	Both extract exhibited anti-inflammatory activities when compared to standard drug ³⁴
Antifertility activity	Root	anol, aqueous extract	Found moderate estrogenic activity including significant increase in uterine weight and abortifacient activity ³⁵
	Fruit	Ethanolic extract	Found antifertility activities of female rats but no male antifertility activity at the dose of 250mg/kg

CONCLUSION: *Momordica dioica*, commonly known as spine gourd or teasle gourd, has emerged as a promising medicinal and nutritional plant with wide-ranging ethnopharmacological applications. The plant is rich in bioactive compounds including flavonoids, saponins, alkaloids, glycosides, and triterpenoids, which contribute to its diverse pharmacological actions such as antioxidant, antidiabetic, anti-inflammatory, antimicrobial, analgesic, hepatoprotective, and antiallergic activities.

Recent advances in extraction, phytochemical profiling, and *in-vivo* pharmacological studies provide a solid scientific foundation for its traditional uses. Despite these advancements, further studies are warranted to isolate pure active compounds, explore their mechanisms of action, and validate therapeutic efficacy through clinical trials. Integrating modern pharmacological techniques with traditional knowledge could help position *M. dioica* as a sustainable and effective source for future drug development.

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