



## Pharmacognostic and phytochemical investigation of pulp and seed of *Momordica charantia* L. and *Momordica dioica* Roxb.

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### Abstract

The present paper reports the pharmacognostic and phytochemical evaluation of *Momordica charantia* L. and *Momordica dioica* Roxb. pulp and seed belongs to the families Cucurbitaceae which is a slender, tendril climbing, annual vine. Bitter melon is a common food and widely used as medicinal plants in countries like India, China, Africa etc. Macroscopic characters like color, odor, taste, shape characteristics along with inflorescence characteristics were noted. Microscopical characters show epicarp middle mesocarp, vascular bundles, inner mesocarp. Powder microscopy showed useful diagnostic features like acicular raphides, sclerenchymatous cells. *Momordica charantia* fruit pulp and seed values are as Total ash 7.62 and 5.60, Water soluble ash 2.35 and 1.76, Water insoluble ash 5.48 and 6.39, Acid soluble ash 1.22 and 1.22, Acid insoluble ash 2.47 and 2.47, Loss on drying 6.68 and 2.25, Alcohol soluble extractives 18.25 and 15.47, Ether soluble extractives 15.83 and 11.56, Water soluble extractives 27.24 and 19.76. The percentage of loss on drying for fruit pulp and seed of *Momordica charantia* was found to be 5.2%w/w and 5.76%w/w respectively. Extractive values for pulp and seed of *Momordica charantia* Petroleum ether extract 1.27%w/w and 3.02%w/w, Ethyl acetate extract 4.04%w/w and 2.04%w/w, Methanol extract 13.77%w/w and 11.54%w/w, Aqueous extract 4.52%w/w and 4.58%w/w respectively. *Momordica dioica* fruit pulp and seed values are as Total ash 26 and 06, Water soluble ash 32 and 18, Water insoluble ash 17 and 13, Acid soluble ash 1.4 and 0.22, Acid insoluble ash 2.7 and 0.57, Loss on drying 5.2 and 1.2, Alcohol soluble extractives 12 and 16, Ether soluble extractives 9.25 and 13.78, Water soluble extractives 21.20 and 18.40. The percentage of loss on drying for fruit pulp and seed of *Momordica dioica* was found to be 5.2%w/w and 5.9%w/w respectively. Extractive values for fruit pulp and seed of *Momordica dioica* Petroleum ether extract 1.5%w/w and 12.67%w/w, Ethyl acetate extract 2.6%w/w and 3.5%w/w, Methanol extract 18%w/w and 19.22%w/w, Aqueous extract 26.67%w/w and 27.89%w/w respectively.

**Keywords:** *Momordica charantia*, *Momordica dioica*, pharmacognostic, phytochemical

### Introduction

*Momordica charantia* belongs to the family Cucurbitaceae [1] and under the genus *Momordica*, a genus of annual or perennial herbaceous climbers that contains about 80 species [2]. The plant *Momordica charantia* is also known as bitter gourds, bitter melon, karela, and balsam pear. These species include *M. angustisepala*, *M. balsamina* Linn, *M. cochinchinensis* Spreng, *M. cabrei*, *M. dioica*, *M. elaterium*, *M. foetida*, *M. grosveroni*, *M. tuberosa* or *cymbalaria* [3]. *Momordica charantia* Linn. is a monoecious climber found in tropical and subtropical regions, often under cultivation up to an altitude of 1500 m. It is mainly found in Africa, Asia and Australia [4]. Its many varieties differ substantially in the shape and bitterness of the fruit. Bitter melon originated in India and was introduced into China in the 14th century. It is widely used in the cuisines of East Asia, South Asia, and Southeast Asia. *Momordica charantia* is an important vegetable crop in tropical countries, including China and India. A wide range of genetic diversity exists in India [5]. The fruit morphology varies greatly in colour, size and exocarp characteristics. Indian *Momordica charantia* cultivars bear large fruits, whereas wild, free-living *M. muricata* ecotypes develop small, round fruits [6]. *Momordica charantia* was originated from India and carried to China in the 14th century. It is a tropical and subtropical vine of the family Cucurbitaceae, widely grown in Asia, Africa, and the Caribbean. The fruit juice and/or a leaf tea

are employed for diabetes, malaria, colic, sores and wounds, infections, measles, hepatitis, and fevers. Leaves are used for treating catarrh, constipation, dermatitis, diabetes, diarrhoea, eczema, fever, leprosy, malaria, rheumatism, breast cancer, snake bite, anaemia, dysentery, gonorrhoea, measles, rheumatoid arthritis. It is used for the treatment of cancer, diabetes, a potent hypoglycemic agent and many ailments [7-12]. *Momordica charantia* used in diabetes, dyslipidemia, microbial infections, cytotoxic agent for certain types of cancer [13-16]. Fruits of *Momordica charantia* are used in asthma, burning sensation, colic, constipation, cough, diabetes, fever (malaria), gout, helminthiasis, inflammation, leprosy, skin diseases, ulcer and wound. It has also been shown to have hypoglycaemic properties in animal as well as human studies. Juice of the plant leaves used to treat piles completely. It is used as a blood purifier due to its bitter tonic properties. It can heal boils and other blood related problems that show up on the skin. Juice of karela is also beneficial in treating and preventing the liver damage [17, 18]. In India, *Momordica charantia* is used by tribal people for abortions, birth control, increasing milk flow, menstrual disorders, vaginal discharge, constipation, food, diabetes, hyperglycemia, jaundice, stones, kidney, liver, fever, gout, eczema, fat loss, hemorrhoids, hydrophobia, intestinal parasites, skin, leprosy, pneumonia, psoriasis, rheumatism, scabies, snakebite, vegetables, piles, tonic, anthelmintic, purgative. However, it is commonly

consumed as vegetable [19]. In the present study by using the pharmacognostic and phytochemical evaluation confirmed the various determination parameters of concern crude drug, macroscopic characters, powder characteristics, ash values, moisture content, extractive values and preliminary screening of extracts.

*Momordica dioica* climber plant commonly known as Teasle Gourd, Kakrol, Kankro, Kartoli, Kantoli, Kantola, Kantroli, Ban karola or Small bitter-gourd is a relatively small oval to ovoid vegetable. It is also called as janglee karela [20]. This genus is essentially a native of tropical regions on Asia with extensive distribution in China, Japan, South East Asia, Polynesia besides tropical Africa and South America. As many of the species of this genus have been found to grow wild in India, Bangladesh, Srilanka, Myanmar, Malay, etc [21]. It indicated that this region might be the origin of *Momordica dioica*. The plant is sometimes found growing wild and is common in hedges. It is often cultivated for its fruits, which are used as vegetable [22]. Teasle gourd is a cucurbitaceous popular summer vegetable. The fruits, young twigs and leaves of this crop are used as vegetable or cooked as a vegetables [23]. It is available in the forest of dry and moist deciduous in feeding months August to February [24]. Teasle gourd is an important summer vegetable in Bangladesh and the Indian subcontinent. It has many advantages, like high market price, good nutritional value and keeps quality longer [25]. It has two different types of varieties male & female as well as fruited variety & fruitless variety. *Momordica dioica*. (chromosome number 28) dioecious and propagated vegetatively through tuberous root [26]. It has two different types of varieties male & female as well as fruited variety & fruitless variety [27-28]. Female plants tubers are larger than those of the male plants [29]. 120 genera in Cucurbitaceae [30]. In *Momordica* species total 60 species are reported worldwide and out of them 7 are available in India. *Momordica dioica* (kartoli or spine gourd) is also found in cultivated or semi wild form. For cultivation require lowland for annual. It is dioecious, perennial in nature having tuberous roots. The green fruit is extensively used as vegetable by cooking or frying. Leaves 1.5-4 inches long, cordate, acute more or less 3-5 lobed; Flowers large, dioecious and yellow in colour; Fruit 1-3 inches long, shortly beaked, densely covered with soft spines [31]. Cure vata, biliousness, asthma, leprosy, bronchitis, fever, tumors, tridosha, urinary discharges, excessive salivation, troubles of the heart, inflammation, errhine effect [32]. Inflammation caused by urine of house-lizard, errhine effect [33]. Errhine effect & provokes a copious discharge from the schneiderian mucous membrane [34]. Anti-allergic, bronchial asthma, antimalarial [35], Spermatorrhoea, leucorrhoea [36] Contraceptive [37]. Spermicidal activity and anthelmintic activity [38] piles, jaundice, worms, leprosy, dysmenorrhoea & externally intractable ulcers, skin affections, burning in feet, night blindness, liver complaints of children, headache & inflammation caused by contact with the urine of the house-lizard [39]. For Diabetes and Hair lengthening [40]. Seed paste applied on the lower abdomen in dysuria and also to cure constipation [41]. To dandruff control tender paste applied on head 1 hour before bath [42]. Eye diseases, poisoning and fever [43].

## Material and Methods

The healthy *Momordica charantia* and *Momordica dioica* fruit plant material was collected from the Beed district, Maharashtra. These plants material (fruits) were subjected to phytochemical analysis (qualitative) for the presence of important secondary metabolite compounds.

### Preparation of plant extract

The fruits of the collected plant material was washed thoroughly in tap water, shade dried in open air separately. Powder of the fruit is obtained by grinding them mechanically. About 100 gm of each dried powder of the plant were soaked separately in 1000 ml of different solvents like petroleum ether, methanol, and water in conical flasks and then subjected to agitation on a rotary magnetic shaker for about 72 hours. After three days the plant extracts were subjected to filtration, filtered with No 42 whatman filter paper separately. Concentrated extracts was preserved in sterilized air tight labeled bottles and preserved in refrigerator at 4°C until required for further use. The extract was filtered under reduced pressure using rotary flash evaporator and subjected for further preliminary phytochemical tests. Different tests conducted for the identification of phytochemicals is adopted by using the methods described [44].

### Standardization of plant material

The quality control of herbal crude drug and bio-constituents is of paramount important for their acceptability in modern system of medicine. One of the major problems faced by user in industry is non availability of rigid quality control profile for herbal raw material and their formulation with advanced of analytical technique and sophisticated instrument technology; it is possible to suggest a practicable quality assurance profile for a crude drug or its bioactive constituents. The action of the herb may be from a number of constituents and not from just one or two ingredients. Thus, the standardized preparation may omit some of the ingredients and to minimize the complex combination of the constituents.

### Determination of Extractive values

Various physicochemical parameters such as water soluble extractive value, alcohol soluble extractive value, total ash, acid insoluble ash, water soluble ash were determined as per Indian Pharmacopoeia.

### Determination of water-soluble extractive value

5 gm of coarsely powdered, air-dried drug was macerated with 100 ml of Chloroform water of the single strength in a closed flask for 24 hours, shaking frequently during the first 6 hours and allowed to stand for 18 hours. Thereafter, filtered rapidly taking precautions against loss of water, 25 ml of the filtrate was evaporated to dryness in a tared flat-bottomed shallow dish, dried at 105 °C and weighed. The percentage of water-soluble extractive with reference to the air-dried drug was calculated.

### Determination of alcohol-soluble extractive value

5 gm of coarsely powdered, air-dried drug was macerated with 100 ml of ethanol of the specified strength in a closed flask for 24 hours, shaking frequently during the first 6 hours and allowed to stand for 18 hours. Thereafter, filtered rapidly taking precautions against loss of ethanol, 25 ml of

the filtrate was evaporated to dryness in a tared flat-bottomed shallow dish, dried at 105 °C and weighed. The percentage of ethanol-soluble extractive with reference to the air-dried drug was calculated.

The volatile ether soluble extractive value, chloroform soluble extractive value, ether soluble extractive values are the other parameters for extractive values.

#### Determination of ash value

2 gm of the air - dried crude drug was weighed accurately in a tared silica dish and incinerated at a temperature not exceeding 450°C until free from carbon, cool and weigh. The percentage of ash with reference to the air - dried drug was calculated.

#### Determination of water - soluble ash

Boiled the ash, for 5 minutes with 25 ml of water; collected the insoluble matter in a Gouch crucible, wash with hot water and ignited for 15 minutes at a temperature not exceeding 450°C. Subtract the weight of the insoluble matter from the weight of the ash; the difference in weight represents the water-soluble ash. The percentage of water soluble ash with reference to the air -dried drug was calculated.

#### Determination of acid soluble and acid - insoluble ash

Boiled the ash with 25 ml of 2M hydrochloric acid for 5 minutes, collected the insoluble matter on an ashless filter paper, washed with hot water, ignited, cooled in a desiccator and weighed. The percentage of acid soluble and acid - insoluble ash with reference to the air - dried drug was calculated.

#### Determination of Loss on drying

Weight a glass-stopper, shallow weight bottle that dried under the same conditions to be employed in the determination. Transfer 2 gm of sample to the bottle. Cover it and accurately weight the bottle. Distribute the sample as evenly as practicable by gentle sidewise shaking to a depth not exceeding 10 mm. Place the loaded bottle in the oven. Removed the stopper and leaved it also in the chamber. Dried the sample to constant weight or for the specified time. After dry completed, opened the drying chamber, closed the bottle promptly and allowed it to cool to room temperature in a desiccator before weight. Weight the bottle and the contents. Calculated Loss on Drying in terms of percent w/w.

#### Microscopy of *Momordica charantia* Fruit pulp

The fruit pulp shows epicarp, hypodermis, middle mesocarp, vascular bundles, prismatic calcium oxalate crystals, inner mesocarp and the seed shows testa, endosperm, cotyledon, perisperm.

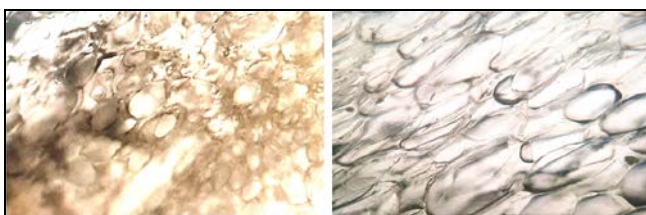


Fig 1: TS of *Momordica charantia* pulp

#### Powder characteristic of *Momordica charantia*

In powder characteristic of fruit pulp, whitish-brown, free flowing, characterized by the presence of calcium oxalate crystals observed in the form of small acicular raphides, sclerenchymatous cells, showing radial pit canals and narrow lumen; starch grains are also present.



Fig 2: Powder characteristic of *Momordica charantia* pulp under microscope

#### Microscopy of *Momordica dioica* Fruit pulp

The fruit pulp shows epicarp, hypodermis, middle mesocarp, vascular bundles, prismatic calcium oxalate crystals, inner mesocarp and the seed shows testa, endosperm, cotyledon, perisperm.

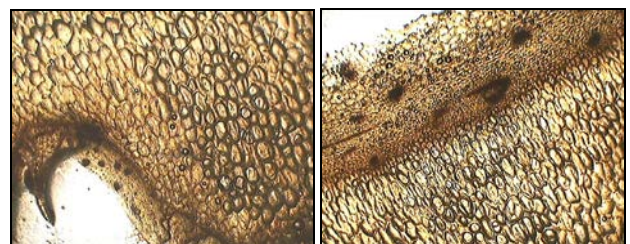


Fig 3: TS of *Momordica dioica* pulp

#### Powder characteristic of *Momordica dioica*

In powder characteristic of fruit pulp, whitish-brown, free flowing, characterized by the presence of calcium oxalate crystals observed in the form of small acicular raphides, sclerenchymatous cells, showing radial pit canals and narrow lumen; starch grains are also present.

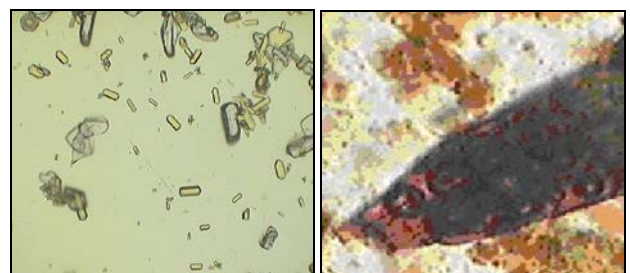


Fig 4: Powder characteristic of *Momordica dioica* pulp under microscope

#### Pharmacognostic Investigation

In Pharmacognostic study of fruit pulp and seed of *Momordica charantia* and *Momordica dioica* macroscopy, microscopy, powder characteristic and physicochemical parameters were studied.

#### Macroscopy

**Table 1:** Morphological and Organoleptic Characters for fruit pulp and seed of *Momordica charantia* and *Momordica dioica*

Sr. No.	Parameters	<i>M. charantia</i> Fruit pulp	<i>M. charantia</i> seed	<i>M. dioica</i> Fruit pulp	<i>M. dioica</i> seed
1	Color	Outer surface – rough and green turning orange on maturity	Outer and inner surface – whitish	Outer surface – rough and green turning orange on maturity	Outer and inner surface – whitish
2	Odor	characteristic	characteristic	odorless	odorless
3	Taste	bitter	bitter	slightly bitter	slightly bitter
4	Size	3-6 inches long	6-10 x 4-7 mm	1-3 inches long	6-7 x 5-6 mm
5	Shape	Long ovoid, ellipsoid	squarish rectangular	rounded ovoid, ellipsoid	Irregular corrugate

**Table 2:** Powder characteristics chemical tests for fruit pulp and seed of *Momordica charantia* and *Momordica dioica*

Sr. No.	Part of Plant	Reagents	Observation	Characteristics
1	<i>M. charantia</i> pulp	Alcoholic picric acid	Yellow	Small acicular raphides calcium oxalate crystals
2	<i>M. charantia</i> pulp	Pholorog. + Con. HCl (1:1)	Pink	Lignified reticulate parenchymas of mesocarp & vascular bundles.
3	<i>M. dioica</i> pulp	Alcoholic picric acid	Yellow	Small acicular raphides calcium oxalate crystals
4	<i>M. dioica</i> pulp	Pholorog. + Con. HCl (1:1)	Pink	Lignified reticulate parenchymas of mesocarp & vascular bundles.

**Extra feature**

Finely chopped pieces show outer surface rough and grayish, central portion white to cream, starchy, fibrous; characteristic and slightly bitter.

Finely chopped pieces shows outer surface rough and grayish to yellowish, central portion white to cream, starchy,

fibrous; odourless and slightly bitter to sweet taste.

**Ash values**

Standardization of plant was done with the help of total ash values, water soluble ash values, acid insoluble ash values and loss on drying. They were found to be.

**Table 3:** Ash values for fruit pulp and seed of *Momordica charantia* and *Momordica dioica*

Sr. No.	Evaluation parameter	Yield of <i>M. charantia</i> Pulp (% w / w)	Yield of <i>M. charantia</i> Seed (% w / w)	Yield of <i>M. dioica</i> Pulp (% w / w)	Yield of <i>M. dioica</i> Seed (% w / w)
1	Total ash	7.62	5.60	26	06
2	Water soluble ash	2.35	1.76	32	18
3	Water insoluble ash	5.48	6.39	17	13
4	Acid soluble ash	1.22	1.22	1.4	0.22
5	Acid insoluble ash	2.47	2.47	2.7	0.57
6	Loss on drying	6.68	2.25	5.2	1.2
7	Alcohol soluble extractives	18.25	15.47	12	16
8	Ether soluble extractives	15.83	11.56	9.25	13.78
9	Water soluble extractives	27.24	19.76	21.20	18.40

Standardization of plant was done with the help of extractive values, total ash values, water soluble ash values and acid insoluble ash values. Water soluble extractive value was found to be greater than alcohol soluble extractive

value in the experiment. There are more polar compounds present in pulp and seed part.

**Moisture content for fruit pulp and seed of *Momordica charantia* and *Momordica dioica*****Table 4:** Determination of Moisture Content or LOD for fruit pulp and seed of *Momordica charantia* and *Momordica dioica*

Time (Min)	0	10	30	60	90	120	150	180	210	240	270
<i>M. charantia</i> pulp	0.0	1.2	1.9	3.1	3.4	4.7	4.8	5.0	5.1	5.2	5.2
<i>M. charantia</i> seed	0.0	2.7	3.04	3.39	3.73	4.06	4.4	4.74	5.07	5.42	5.76
<i>M. dioica</i> pulp	0.0	1.4	2.3	3.6	3.9	4.1	4.4	4.9	5.1	5.2	5.2
<i>M. dioica</i> seed	0.0	2.1	2.4	3.0	3.7	4.02	4.5	4.8	5.3	5.6	5.9

The percentage of loss on drying of *Momordica charantia* was found to be 5.2%w/w and 5.76%w/w respectively. The percentage of loss on drying of *Momordica dioica* was found to be 5.2%w/w and 5.9%w/w respectively

**Extractive values of fruit pulp and seed of *Momordica charantia* and *Momordica dioica*****Table 5:** Extractive values for fruit pulp and seed of *Momordica charantia* and *Momordica dioica*

Sr. No.	Extracts	Yield of Pulp (%w/w)	Yield of Seed (%w/w)	Yield of Pulp (%w/w)	Yield of Seed (%w/w)
1	Petroleum ether extract	1.27	3.02	1.5	12.67
2	Ethyl acetate extract	4.04	2.04	2.6	3.5
3	Methanol extract	13.77	11.54	18	19.22
4	Aqueous extract	4.52	4.58	26.67	27.89

**Preliminary screening of extracts for fruit pulp and seed of *Momordica charantia* and *Momordica dioica***

**Table 6:** Preliminary screening of extracts for fruit pulp and seed of *Momordica charantia* and *Momordica dioica*

Sr. No.	Extracts	Part	Color ( <i>M. charantia</i> )	Consistency ( <i>M. charantia</i> )	Color ( <i>M. dioica</i> )	Consistency ( <i>M. dioica</i> )
1	Petroleum ether	Pulp	Grayish-brown	Semisolid	Grayish-brown	Semisolid
		Seed	Yellowish	Liquid	Yellowish	Liquid
2	Ethyl acetate	Pulp	Grayish-brown	Semisolid	Grayish-brown	Semisolid
		Seed	Yellowish	Liquid	Yellowish	Liquid
3	Methanol	Pulp	Grayish-brown	Semisolid	Grayish-brown	Semisolid
		Seed	Yellowish	Liquid	Yellowish	Liquid
4	Aqueous	Pulp	Dark brown	Solid	Dark brown	Solid
		Seed	Dark brown	Solid	Dark brown	Solid

## Results and discussion

In the present study by using the pharmacognostic and phytochemical evaluation confirmed the various determination parameters of *Momordica charantia* and *Momordica dioica* crude drug, macroscopic characters, powder characteristics, ash values, moisture content, extractive values and preliminary screening of extracts. Macroscopic characters like color, odor, taste, shape characteristics along with inflorescence characteristics were noted. Microscopical characters show epicarp middle mesocarp, vascular bundles, inner mesocarp. Powder microscopy showed useful diagnostic features like acicular raphides, sclerenchymatous cells. Ash values, moisture content, extractive values and preliminary screening of extracts. *Momordica charantia* fruit pulp and seed values are as Total ash 7.62 and 5.60, Water soluble ash 2.35 and 1.76, Water insoluble ash 5.48 and 6.39, Acid soluble ash 1.22 and 1.22, Acid insoluble ash 2.47 and 2.47, Loss on drying 6.68 and 2.25, Alcohol soluble extractives 18.25 and 15.47, Ether soluble extractives 15.83 and 11.56, Water soluble extractives 27.24 and 19.76. The percentage of loss on drying for fruit pulp and seed of *Momordica charantia* was found to be 5.2%w/w and 5.76%w/w respectively. Extractive values for fruit pulp and seed of *Momordica charantia* Petroleum ether extract 1.27%w/w and 3.02%w/w, Ethyl acetate extract 4.04%w/w and 2.04%w/w, Methanol extract 13.77%w/w and 11.54%w/w, Aqueous extract 4.52%w/w and 4.58%w/w respectively. *Momordica dioica* fruit pulp and seed values are as Total ash 26 and 06, Water soluble ash 32 and 18, Water insoluble ash 17 and 13, Acid soluble ash 1.4 and 0.22, Acid insoluble ash 2.7 and 0.57, Loss on drying 5.2 and 1.2, Alcohol soluble extractives 12 and 16, Ether soluble extractives 9.25 and 13.78, Water soluble extractives 21.20 and 18.40. The percentage of loss on drying for fruit pulp and seed of *Momordica dioica* was found to be 5.2%w/w and 5.9%w/w respectively. Extractive values for fruit pulp and seed of *Momordica dioica* Petroleum ether extract 1.5%w/w and 12.67%w/w, Ethyl acetate extract 2.6%w/w and 3.5%w/w, Methanol extract 18%w/w and 19.22%w/w, Aqueous extract 26.67%w/w and 27.89%w/w respectively. Preliminary screening for Color and Consistency of *Momordica charantia* and *Momordica dioica* fruit pulp and seed extracts shows similar outcome respectively are as Petroleum ether is grayish-brown and semisolid, yellowish and liquid; Ethyl acetate is grayish-brown and semisolid, yellowish and liquid; Methanol is grayish-brown and semisolid, yellowish and liquid; Aqueous is dark brown and solid, dark brown and solid.

## Conclusion

It is concluded that *Momordica charantia* and *Momordica dioica* are the plants with a various medicinal uses. The

pharmacognostic and phytochemical evaluation confirmed the various determination parameters of *Momordica charantia* and *Momordica dioica* crude drug, macroscopic characters, powder characteristics, ash values, moisture content, extractive values and preliminary screening of extracts. The present study confirmed the precise values for *Momordica charantia* and *Momordica dioica* pulp and seed crude drug which can be further explored to the comparative biological activity for further confirmation. This help for isolation of constituents from each extracts. These valuable information data may provide a base to start the search related to phytochemistry, pharmacology, pharmacognosy and general investigations to researchers, as well as practitioners related to this plant. Therefore, attention should also be made on proper exploitation and utilization of this medicinal plant.

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## Conflicts of Interest

Nil

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