

# Phytochemical analysis of *Momordica cymbalaria* Fenzl., a medicinally important Cucurbit

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## Abstract

Present investigation was carried out the preliminary phytochemical screening of the *Momordica cymbalaria* Fenzl. The phytochemical analysis is done in plant by using five different solvent systems (methanol, hexane, ethanol, chloroform and distilled water). A standard procedure was used to identify the constituents present in the extract. Preliminary phytochemical screening of *Momordica cymbalaria* leaves, stem and tuberous roots revealed the presence of different phytochemicals such as alkaloids, flavonoids, glycosides, phenols, tannins and saponins by cold maceration technique.

*Momordica cymbalaria* methanolic extract of leaf, stem and roots was found to have high intensity of all tested phytochemicals compared with hexane, ethanol, chloroform and distilled water. Glycosides were absent in all the solvent extracts of roots. Thus the plant *Momordica cymbalaria* possesses medicinally important phytochemicals which are useful in pharmaceutical industries.

**Keywords:** Phytochemicals, *Momordica cymbalaria*, Aqueous extract, Alkaloids, Flavonoids, Glycosides, Tannins, Saponins and Phenols.

## Introduction

Plants are used medicinally all over the world and they are source of many potent and powerful drugs. Medicinal plants are having the global importance in the traditional medicine. They have played an important role in the lives of rural people, particularly in remote parts of developing countries with few health facilities. Medicinal plants have many phytochemicals; few of them are considered as the small source of curing human ailments. Phytochemicals are non nutritive chemical constituents of plants which occur naturally in it.<sup>1</sup>

Cucurbitaceae family confirms the presence of various phytochemicals like tannins, alkaloids, glycosides, terpenoids, carbohydrates, resins, saponins, carotenoids and phytosterols.<sup>2</sup> The current study is therefore carried out to provide requisite phytochemical and pharmacological detail about the *Momordica cymbalaria*, a medicinally important cucurbit.

*Momordica cymbalaria* Fenzl. is one of the species of Cucurbitaceae family, arising from a small perennial tuber, it is a herbaceous climber and it climbs on supports with the

aid of tendrils or allowed to grow on the ground. The plants originate in the tropical regions of India and South East Asia. The plant has synonyms named *Momordica tuberosa* Roxb or *Luffa tuberosa* Roxb. It is commonly known as Athalakkai in Tamil, Kasarakaya in Telugu.

The fruits of this plant are having only 3-4 seeds and they remain dormant and have low germination.<sup>3</sup> The fruit contains vitamin- C, citric acid, maleic acid and high amount of crude fiber content.<sup>4</sup> The plant is recognized in traditional medicine used for the treatment of various diseases.<sup>5</sup>

The medicinal values of *Momordica cymbalaria* lies in the bioactive phytochemical constituents that protect human body from various diseases. A phytochemical is a natural bioactive compound found in plants foods that works with nutrients and dietary fiber to protect against diseases. Previous studies of phytochemical plant part extracts show anti-diabetic<sup>6</sup>, neuroprotective and anti-ulcer<sup>7</sup>, anti-ovulatory, abortifacient and cardioprotective<sup>8</sup>, antioxidant<sup>9</sup>, hypolipidemic<sup>10</sup>, anti-diarrheal and anti-microbial<sup>11</sup> and anti-cancer<sup>12</sup> activities.

The main aim of this study is qualitative analysis of total phytochemicals of *Momordica cymbalaria* by using different solvents.

## Material and Methods

**Plant material:** *Momordica cymbalaria* plants were collected from Jammikunta crop fields, Telangana State during monsoon season. The plants were maintained and grown in the medicinal harbour at Department of Biotechnology, Kakatiya University, Telangana State, India.

**Preparation of extracts:** The leaves, stem and roots of *Momordica cymbalaria* were separated and kept for shade dry for 10 days. Then they were ground to coarse powder using motor and pestle. These powders were extracted separately with different solvents methanol, hexane, ethanol, chloroform and distilled water by using cold maceration technique.

Later the extracts were filtered through a Whatmann filter paper and concentrated using rotary evaporator and subsequently subjected for preliminary screening by using standard methods protocols.

**Preliminary phytochemical screening:** All extracts obtained were screened for the presence of phytochemicals by using the standard qualitative tests.

### Alkaloids

**Dragendorff's test:** 2 ml of HCl was added to 0.5 ml of plant extract followed by 1 ml of reagent. An orange red precipitate formation indicates the presence of alkaloids.

**Mayer's test:** A few drops of the reagent were added to 1 ml of the plant extract. The formation of a pale or cream color precipitate shows the presence of alkaloids.

**Wagner's test:** 10 ml of plant extract was acidified by adding 1.5% v/v HCl and a few drops of Wagner's reagent. The formation of a yellowish brown precipitate confirms the presence of alkaloids.

**Hager's test:** Few drops of Hager's reagent were added to 0.5 ml of plant extract; formation of yellow color precipitate indicated the presence of alkaloids.

**Tanic acid test:** Few drops of 10% tannic acid were added to 0.5 ml of plant extract; formation of buff color precipitate indicated the presence of alkaloids.

### Flavonoids

**Shinoda's test:** 1ml of plant extract was treated with few Mg turnings and a few drops of conc. HCl. Formation of pink/ crimson red/ green color indicated the presence of flavonoids.

**Alkaline reagent test:** 1ml of plant extract was treated with a few drops of NaOH solution. Formation of intense yellow color which disappears on addition of dilute acid indicated the presence of flavonoids.

**Zn-HCl reduction test:** 1ml of plant extract was treated with a mixture of zinc dust and conc. HCl. Occurrence of red color indicated the presence of flavonoids.

**Lead acetate test:** Lead acetate was added to 1ml of test solution. Bulky reddish brown precipitate indicates the presence of flavonoids.

### Glycosides

**Legal's test:** Few drops of pyridine and alkaline sodium nitroprusside solution were added to 1 ml of plant extract, appearance of blood red color indicated the presence of glycosides.

**Bromine water test:** Few drops of bromine water were added to 1 ml of plant extract. Formation of yellow color precipitation indicated the presence of glycosides.

**Conc. H<sub>2</sub>SO<sub>4</sub> test:** 1ml of conc. H<sub>2</sub>SO<sub>4</sub> was added to 1ml of test solution and allowed to stand for 2 min. Red precipitate indicates the presence of glycosides.

### Tannins

**FeCl<sub>3</sub> test:** Few drops of FeCl<sub>3</sub> solution were added to 1ml of plant extract. Formation of blue or green colour indicated the presence of tannins.

**Gelatin test:** Few drops of 1% gelatin solution containing 10% NaCl were added to 1ml of plant extract. Formation of white precipitation indicated the presence of tannins.

**Lead acetate test:** Basic lead acetate was added separately to 1ml of test solution. Bulky red precipitate indicates the presence of tannins.

**Alkaline reagent test:** The test solution was treated with sodium hydroxide solution. Yellow to red precipitate indicates the presence of tannins.

### Phenols

**FeCl<sub>3</sub> test:** 1 ml of extract was treated with a few drops of FeCl<sub>3</sub> solution. Blue colour indicated the presence of phenols.

**Ellagic acid test:** Few drops of 5% (w/v) glacial acetic acid and 5% (w/v) sodium nitrate solution were added to 2ml of test solution. Phenol is indicated by Niger brown precipitate.

### Saponins

**Foam test:** Extract was diluted with distilled water up to 20 ml and was agitated for 10-15 min. Formation of the foam layer indicated the presence of saponins.

### Results

Preliminary phytochemical analysis was done to identify the major groups of phytochemicals present in the *Momordica cymbalaria* plant extracts. Five solvent systems for the extracts of plant were done using various preliminary analysis tests by standard method.

All three plant parts leaf, stem and roots of *Momordica cymbalaria* revealed the presence of phytochemicals like alkaloids, flavonoids, glycosides, tannins, saponins and phenols. The phytochemical analysis is done in plant by using five different solvent systems (methanol, hexane, ethanol, chloroform and distilled water).

**Leaf extracts:** The leaf extract of *Momordica cymbalaria* showed high intensity of alkaloids in various solvents methanol, hexane, ethanol, chloroform and distilled water. Flavonoids were strongly present in hexane and aqueous, methanol extracts and completely absent in ethanol and chloroform extracts.

Glycosides were weakly detected in all the extracts except chloroform extract. Tannins were present in all the solvents except ethanol extract. Phenols were strongly present in all solvent extracts. Methanol, hexane, ethanol and aqueous extracts were rich in saponins.

**Stem explants:** Phytochemical analysis of all the solvents of stem revealed the presence of alkaloids, flavonoids, saponins, glycosides and tannins whereas phenols were completely absent. Alkaloids were strongly present in all the explants (Table 2).

**Table 1**  
**Preliminary Screening of Phytochemicals from Leaf powder extract of *M. cymbalaria***

Alkaloids					
	Methanol	Hexane	Ethanol	Chloroform	Aqueous
Dragondroff	++	+	+	+	+
Mayer	+	+	-	++	+
Wageners	++	+	++	-	-
Hagers	+	+	-	+	+
Tannic	++	+	+	-	+
Flavanoids					
Shinoda	+	+	-	-	++
Alkaline	+	++	-	-	++
Zn-HCl	+	+	-	-	+
Lead acetate	+	+	-	-	+
Glycosides					
Legal's Test	+	+	+	+	-
Bromine water	+	-	-	+	+
Conc. H <sub>2</sub> SO <sub>4</sub>	+	+	-	++	-
Tannins					
FeCl <sub>3</sub>	+	-	-	+	+
Gelatin	+	+	-	+	-
Lead acetate	-	-	-	+	+
Alkaline reagent	+	+	-	+	-
Phenols					
FeCl <sub>3</sub>	++	+	+	+	+
Ellagari Test	+	+	+	+	+
Saponins					
Foam Test	+	+	+	-	+

**Table 2**  
**Preliminary Screening of Phytochemicals from Stem powder extract of *Momordica cymbalaria* Fenzl.**

Alkaloids					
	Methanol	Hexane	Ethanol	Chloroform	Aqueous
Dragondroff Mayer	++	+	+	+	+
Wageners Hagers	+	+	+	+	+
Tannic	+	++	++	+	+
	+	+	+	+	+
	++	+	+	+	+
Flavanoids					
Shinoda Alkaline	+	+	-	+	+
Zn-HCl	++	-	-	+	-
Lead acetate	+	+	-	+	+
	+	+	-	-	+
Glycosides					
Legal's Test	+	+	+	+	-
Bromine water	+	+	-	+	-
Conc. H <sub>2</sub> SO <sub>4</sub>	++	+	+	-	+
Tannins					
FeCl <sub>3</sub>	+	+	-	-	+
Gelatin	+	-	-	+	+
Lead acetate	++	+	+	+	+
Alkaline reagent	++	+	+	-	+
Phenols					
FeCl <sub>3</sub>	-	-	-	-	-
Ellagari Test	-	-	-	-	-
Saponins					
Foam Test	+	+	+	+	+

**Table 3**  
**Preliminary Screening of Phytochemicals from Root powder extract of *Momordica cymbalaria* Fenzl.**

Alkaloids					
	Methanol	Hexane	Ethanol	Chloroform	Aqueous
Dragondroff	++	+	+	+	+
Mayer	+	+	++	+	+
Wageners	+	+	+	+	+
Hagers	++	+	+	+	+
Tannic	++	+	+	+	++
Flavanoids					
Shinoda	+	++	-	-	+
Alkaline	-	+	+	-	-
Zn-HCl	-	+	-	+	-
Lead acetate	+	++	+	-	+
Glycosides					
Legal's Test	-	-	-	-	-
Bromine water	-	-	-	-	-
Conc. H <sub>2</sub> SO <sub>4</sub>	-	-	-	-	-
Tannins					
FeCl <sub>3</sub>	+	+	-	-	+
Gelatin	+	-	-	+	+
Lead acetate	++	+	+	+	+
Alkaline reagent	++	+	+	-	+
Phenols					
FeCl <sub>3</sub>	+	+	-	+	++
Ellagari Test	+	-	+	+	++
Saponins					
Foam Test	+	+	++	+	+

Flavonoids were moderately present in methanol, hexane, chloroform, aqueous extracts whereas completely absent in ethanol extracts. Glycosides showed high intensity in all the solvent extracts except in aqueous extract. Tannins were strongly present in methanolic extract and weakly present in remaining solvents. Saponins were weakly present in all the extracts.

**Root extracts:** Different solvent extracts of roots of *Momordica cymbalaria* revealed the presence of alkaloids, flavonoids, saponins and phenols whereas glycosides were present only in methanol extracts (Table 3). All the extracts showed the presence of alkaloids whereas methanolic extracts showed high intensity of alkaloids. Flavonoids were strongly present in hexane extract compared with other solvent extracts. Tannins were shown in all the solvent extracts. Phenols were present strongly in methanolic extracts compared with other solvent extracts.

## Discussion

Scientists have identified thousands of phytochemicals in several medicinal plants including alkaloids, flavonoids, anthraquinones, phenolic acids, glucosinolates and phytates.<sup>13</sup> The present study revealed that *Momordica cymbalaria* is a source of phytochemicals. Phytochemicals are usually associated with plant pigments. The phytochemical tests of three plant parts (leaves, stem and roots) were carried out by standard methods with reference

to alkaloids, flavonoids, glycosides, saponins, tannins and phenols.

Earlier several phytochemical screening studies of *Momordica cymbalaria* have been carried out in different parts of the plant such as leaves<sup>14</sup>, leaves and roots<sup>15</sup> and fruits<sup>16</sup>.

The present study revealed the presence of alkaloids in all explants. Among five solvents, methanol extracts of all explants showed the high intensity of alkaloids. Similar results were reported by Kolluru et al<sup>17</sup> in *Momordica cymbalaria*. Alkaloids have been used for medicinal industry for their biological properties. Many researchers reported that alkaloids are cytotoxic<sup>18</sup>, anti plasmodic and antibacterial<sup>19</sup> and they are used as anaesthetic agent. Methanolic extract of *Momordica cymbalaria* represents burn wound healing in experimental burn animals<sup>20</sup> and also shows anti cancer activity against Ehrlich Ascites carcinoma in mice<sup>21</sup>.

The extracts of *Momordica cymbalaria* leaf, stem and root extracts revealed to contain flavonoids. In leaf extracts, hexane and aqueous extracts showed high intensity of flavonoids followed by methanol extract. In stem extracts methanol extract showed positive results followed by hexane, chloroform and aqueous extracts and totally absent in ethanolic extracts. In root extracts hexane extract showed

high intensity of flavonoids and they are present moderately in methanol, ethanol, chloroform and aqueous extracts.

Flavonoids are hydroxylated phenolic substances which are synthesized by plants and they are effective antioxidants and show anti cancer properties<sup>12,21</sup>, anti inflammatory<sup>12</sup> anticonvulsant.<sup>22</sup>

In the present analysis glycosides were present in leaf and stem extracts. In leaf extracts, chloroform extracts show strong results for glycosides and they are moderately present in methanol, hexane, ethanol and aqueous extracts. In stem extracts, methanolic extracts show high intensity of glycosides followed by hexane extracts.

In our analysis, tannins were present in all three plant part extracts. In leaf extracts chloroform extracts shows strong results for tannins followed by methanol, hexane and aqueous extracts and completely absent in ethanolic extracts. In stem extracts methanolic extracts showed high intensity of tannins followed by aqueous extracts and moderately present in hexane, ethanol and chloroform extracts. In root extracts hexane extracts show strong results for tannins and moderately present in methanol, ethanol, chloroform and aqueous extracts.

Tannins and flavonoids have been reported to cause regeneration of damaged pancreatic islets, stimulate calcium and glucose uptake.<sup>23</sup> Lai et al<sup>24</sup> reported the effective antioxidants, antimicrobial and anti carcinogenic agents observed in tannins and saponins.

In our analysis, phenols were present in leaf and root extracts. In leaf extracts methanolic extracts show strong results of phenols followed by hexane, ethanol, chloroform and aqueous extracts. Similar results were reported by Ruvini Liyanage et al<sup>25</sup> in *Tricosanthes cucumerina*. In root extracts aqueous extracts show high intensity of phenols and moderately present in methanol, chloroform, hexane and ethanol extracts. Rao et al<sup>26</sup> reported that the aqueous extracts of *Momordica cymbalaria* have hypoglycemic activity in diabetic rabbits.

In our result saponins were present in leaf, stem and root extracts. In leaf extracts, methanol, hexane, ethanol and chloroform show positive results. In stem extracts all five solvents methanol, hexane, ethanol, chloroform and aqueous extracts show positive results. In root extracts, ethanol extracts showed high intensity of saponins followed by methanol, hexane, chloroform and aqueous extracts. Similar results were reported by Kumar et al.<sup>27</sup> Saponins have been reported as antidiabetic<sup>28,29</sup>, cardioprotective<sup>30</sup>, hepato protective<sup>31</sup>, neuro protective<sup>28</sup>, nephro protective.<sup>27</sup>

## Conclusion

The preliminary phytochemical screening of various parts of *Momordica cymbalaria* i.e leaf, stem and root in different solvents methanol, hexane, ethanol, aqueous and

chloroform showed that the plant possesses medicinally important phytochemicals. Leaf and root extracts possessed highest concentration of alkaloids, flavonoids and phenols.

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