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Pharmacognosy and preliminary phytochemical investigation on *Mollugo oppositifolia* L., A traditional medicinal herb

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Abstract

Pharmacognostic and phytochemical analysis of *Mollugo oppositifolia* L. has been undertaken. Microscopy showed the characters of the dorsiventral leaf, dicot stem and dicot root. Powder microscopy showed the presence of vessel elements, phloem fibres and tannin cells. Phytochemical analysis revealed the presence of carbohydrates, reducing sugar, glycosides, proteins, alkaloids, steroids, flavonoids, saponins, mucilage, and organic acids. Physicochemical studies revealed total ash (10.81 %), total moisture content (8.65 %), watersoluble ash (5.43 %), acid insoluble ash (6.21 %), sulphated ash (3.54 %), ethanol extractive (12.73 %) and water soluble extractive (11.21%).

Keywords: *Mollugo oppositifolia* L., fluorescence analysis, pharmacognosy, phytochemical evaluation, physicochemical analysis and powder microscopy

1. Introduction

Natural products play an important role of drug discovery process. In this medicinal plants and herbs have been proved to be great importance to the health of individuals and communities with less hazardous reactions. The World Health Organization estimates that some 80% of the people in developing world rely on traditional medicine and that to these 85% use plants or their products as the remedies [1]. *Mollugo oppositifolia* L. (family- Molluginaceae) is commonly known as slender carpet weed (English). It is a slender, spreading, smooth, branched annual herb, with branches as long as 20 to 30 cm high, commonly found in dry as well as moist areas. Leaves are opposite or whorled, in whorls of 4-5, unequal, oblanceolate or linear- lanceolate or sometimes rounded or acute and apiculate at the apex, much tapered into the petiole which is therefore obscure. Flowers are white, in axillary fascicles of two or more. Capsules ellipsoid with numerous dark brown seeds. Roots are creaper and adventitious [1]. The plant have many properties in traditional medicine as stomachic, earache, aperients, skin diseases. Leaves are bitter in taste and antiseptic. It has been reported that mollugo species possesses antimicrobial, anticancer, anti-inflammatory and hepatoprotective [2]. The present study was evaluated for the macroscopic study, phytochemical evaluation and physicochemical study of whole plant of *M. oppositifolia* L.

2. Materials and Method

Collection of plant material and extraction

Plant material of *Mollugo oppositifolia* L., was collected from Karnatak University campus, Dharwad, Karnataka state, India and authenticated by one of the authors in the Department of Botany, Karnatak University Dharwad. The whole plant was washed thoroughly in tap water to remove all unwanted materials, sand and soil in laboratory and the whole plant were spread out and shade dried in room temperature for 4 to 5 weeks. The dried plant materials were ground in to fine powder using mechanical machine and the powder was kept in small plastic bags with label.

Subsequently, thus obtained plant material subjected to solvents of increasing order of polarity namely, petroleum ether, chloroform, acetone, ethanol, and water using soxhlet apparatus for 24 hrs. The extracts were then dried at room temperature and used for further studies. The dried extracts were again dissolved in respective solvents (10 mg/ml) and used for the phytochemical analysis as mentioned below. The plant powder was used for the further physiochemical studies [3].

3. Results

3.1 Organoleptic and macroscopic characteristics of *Mollugo oppositifolia* L. presented in Fig.1 and Table 1.

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Root

The root is a typical taproot. The number of rootlets are 0.1 to 0.4 cm thick. The external surface is greenish brown with rootlets makes it slightly rough.

Stem

The glabrous or pubescent herbaceous stem is green, prostrate and dichotomously branched with long internodes.

Leaves

The glabrous leaves are opposite, length 2-3 cm and 0-1cm wide, whorls of 4-5, unequal, oblanceolate or linear-lanceolate, rounded or acute and apiculate at the apex, much tapered into the petiole which is therefore obscure, venation reticulate, odourless and bitter in taste.

Flowers

Flowers are white in axillary fascicles of two or more. Perianth glabrous outside, tepals 1 to 2 cm long, oblong with membranous margin. Stamens 2 to 4, carpels 1 to 3, ovary glabrous. Seeds numerous with raised tubercular points and dark brown in colour.

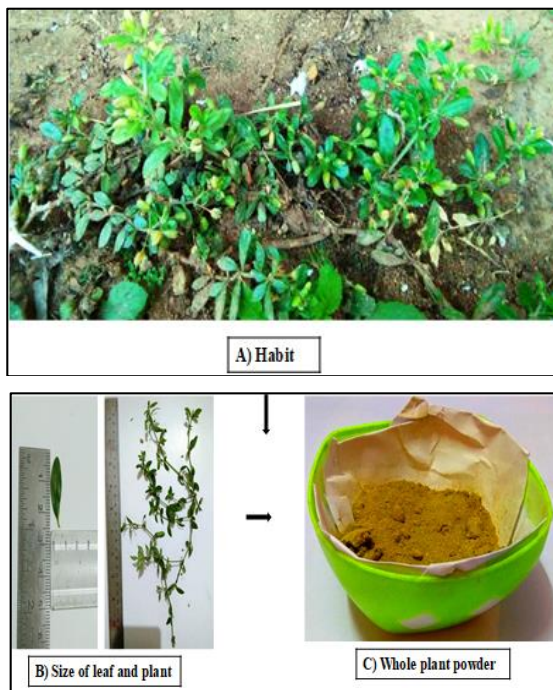


Fig 1: Macroscopic study of *Mollugo oppositifolia* L.

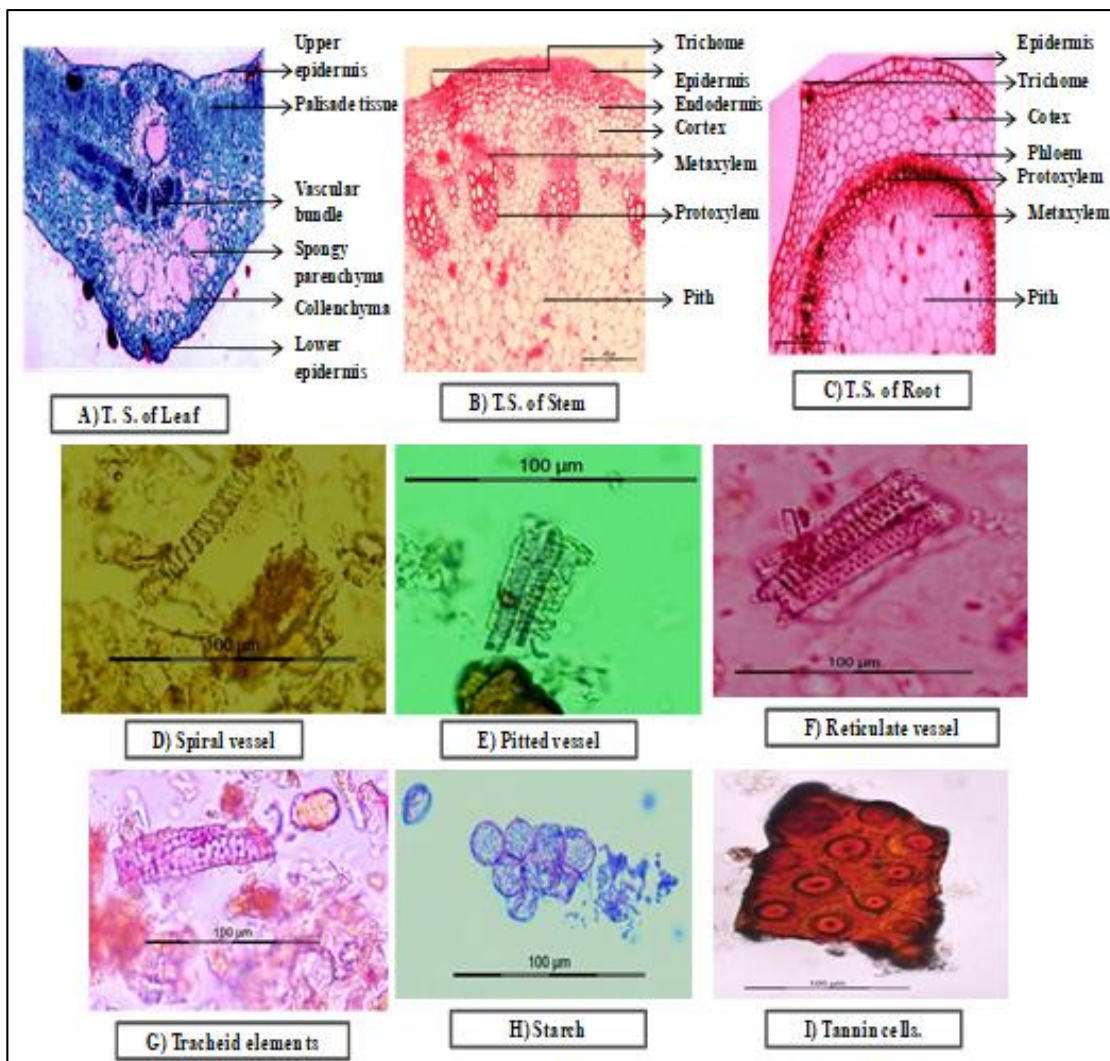


Fig 2: Microscopic study of *Mollugo oppositifolia* L.

3.2 Preliminary phytochemical analysis

The phytochemical analysis of *Mollugo oppositifolia* L. shown the presence of carbohydrates, reducing sugar,

glycosides, proteins, alkaloids, steroids, triterpenoids, flavonoids, tannins, lipids, oil, saponins, mucilage and organic acids (Table 2).

3.3 Physico-chemical analysis

Ash values

Total ash, water soluble ash, acid insoluble ash and sulphate ash values of whole plant powder were found to be 10.81w/w, 5.43w/w, 6.21w/w and 3.54w/w Table 2 (A) [7]. Acid insoluble ash was found to be less than total ash, water soluble ash and sulphated ash. Water soluble ash was found to be more than total ash, acid insoluble ash and sulphated ash. Ash value is a method to measure the quality and purity of the drug [4]. Table 3 (A).

Extractive values

The extractive values were determined to find out the amount of soluble compounds. Extracts were prepared with various solvents [8]. The extractive values of whole plant powder in water, ethanol, ethyl acetate and acetone were found to be 11.21w/w, 12.73w/w, 6.9w/w and 5.98w/w. The plant showed more amounts of water soluble components than rest three solvents. Percentages of the extractive values were calculated with reference to air-dried powder [5]. Table 3(B).

Loss on drying

The moisture content of whole powder was about 8.65 w/w (Table 3).

Behaviour analysis of powder material towards some chemical reagents

The behaviour analysis of the whole plant powder studied by treating with sodium hydroxide (1N), con. sulphuric acid, con. hydrochloric acid, potassium hydroxide (5%), iodine solution

(Table 4).

Fluorescence analysis

Fluorescence analysis of whole powder plant has been carried out in daylight and under U. V. light. The powder was treated with different organic solvents and solutions and observed in normal Fluorescent light and under U. V. light. (Table 5).

4. Discussion

The phytochemical analysis of *Mollugo oppositifolia* L., revealed the presence of carbohydrates, reducing sugar, glycosides, proteins, alkaloids, steroids, flavonoids, saponins, mucilage and organic acids. These phytoconstituents known to be useful in the treatment of various diseases. Phytochemicals such as saponins, flavanoids and alkaloids have hypoglycemic activity [6]. Clinical studies of these phytoconstituents revealed the ability to strengthen the skin and enhanced the concentrations of antioxidants in the wound. Standardization and quality control of herbal drugs in the process involved in physicochemical evaluation should include efficacy and stability of the crude drug [7].

The physicochemical parameters like ash values, acid insoluble ash, water soluble ash, and sulphated ash were found within the limits of standard and it measures the quality and purity of drug. The extractive values were maximum in water and ethanol solvents in whole powder. Similar pharmacognostic studies have been reported for different species namely *Mollugo pentaphylla* L. [2], *Mollugo cerviana* L. [8], leaves and roots of *Mollugo nudicaulis* L. [9].

Table 1: Organoleptic features of *Mollugo oppositifolia* L.

Characters	Observations		
	Part	Leaves	Stem
Arrangement	Opposite or whorled	Differentiated nodes and internodes	Not differentiated nodes and internodes
Size	2-3 cm long, 1cm wide	0.2 cm thickness, 20-30 cm height	0.1 - 0.4cm thickness, 5-10 cm depth
Shape	Oblanceolate or Linear- lanceolate	Dichotomously branched	Tap root system
Colour	Green	Green	Greenish brown
Odour	Odourless	Odourless	Odourless
Taste	Bitter	Bitter	Bitter
Appearance	Smooth	Herbaceous	Rough
Margin	Entire	Membraneous	-
Apex	Rounded or acute and apiculate	-	-
Base	Attenuate	-	-
Petiole	Small	-	-
Texture	Smooth	-	-
Veination	Reticulate	-	-
Outer surface	Green in colour	Green in colour & circular with smooth surface	Number of Rootlets/ root hairs

Table 2: Phytochemical analysis of *Mollugo oppositifolia* L.

Tests	Name of Tests	Name of the extracts				
		Petroleum Ether	Chloroform	Acetone	Ethanol	Water
1) Carbohydrates	Molisch's test	+	+	+	+	+
2) Reducing Sugar	Fehling's test	+	+	+	+	+
3) Glycosides	Anthrone test	+	+	+	+	+
4) Polysaccharides	Iodine test	+	+	+	+	+
5) Proteins	Free amino Acids	+	-	+	-	+
	Bradford's test	+	+	+	+	+
6) Alkaloids	Drangendroff's Test	+	+	+	+	+
	Mayer's test	+	+	+	+	+
7) Steroids	Lieberman- Burchard test	+	+	+	+	+
	Salkowski test	-	+	-	+	-
8) Triterpenoids	Chloroform test+con.H ₂ SO ₄	+	-	+	-	-
9) Flavonoids	Shinoda test	-	-	-	-	-
	With Sodium	+	+	+	+	+

	Hydroxide					
10) Tannins	FeCl ₃ test	–	+	+	–	+
	HNO ₃ test	–	+	+	–	–
11) Lipids	Iodine test	–	+	–	+	–
12) Oil	Filter paper test	+	+	–	+	+
13) Saponins	Foam test	–	+	+	+	–
14) Gums	Benedict' test	–	–	–	–	–
15) Mucilage	KOH test	+	+	+	+	+
	Oxalic acid	+	+	+	+	+
	Tartaric acid	–	–	–	–	–
	Citric acid	–	–	–	–	–
17) Organic acids	Malic acid	–	–	–	–	–

[(+) Present and (-) Absent]

Table 3: Physicochemical parameters of aerial part of *M. oppositifolia* L.**A) Ash values**

S. No.	Types of values	Values (w/w)
1.	Total ash value	10.81%
2.	Water soluble ash value	5.43 %
3.	Sulphated ash value	3.54%
4.	Acid insoluble ash value	6.21%
5.	Moisture content	8.65 %

B) Extractive values of the powder with different solvents.

Sl. Nos.	Types of solvents	Extractive values (w/w)
1.	Water soluble	11.21%
2.	Ethanol soluble	12.73%
3.	Ethyl acetate	6.9 %
4.	Acetone	5.98 %

C) Nutritive content

Sl. Nos.	Nature of content	Percentage
1.	Ash	5.69%
2.	Moisture	7.21%

Table 4: Behaviour analysis of whole plant powder different chemical reagents

Sl. Nos.	Chemical reagents	Observation
1	Powder as such	Light green
2	Powder + NaOH (1N)	Green
3	Powder + Con.H ₂ SO ₄	Brown
4	Powder + Con. HCL	Ash
5	Powder + KOH	Yellowish green
6	Powder + Iodine solution	Brown
7	Powder + Con. Nitric acid	Orange

Table 5: Fluorescence analysis of crude powder of *Mollugo oppositifolia* L.

Sl. Nos.	Treatment	Fluorescent light	UV- Light (365 nm)
1.	Powder + Benzene	Light green	Blue
2.	Powder + Ethyl acetate	Greenish	Orange
3.	Powder + 50% ethanol	Brown	Light green
4.	Powder + 1M HCl	Ash	Dark
5.	Powder + 1N NaOH aqueous	Dark	Yellow
6.	Powder + 1N NaOH alcoholic	Green	Green
7.	Powder + Acetic acid	Brown	Blue
8.	Powder + Nitric acid + Ammonia	Orange	Blue
9.	Powder + Conc. Nitric acid	Orange	Brown
10.	Powder + 50% H ₂ SO ₄	Dark	Brown

5. Conclusion

The present investigation on *Mollugo oppositifolia* L. revealed that the pharmacognostic and phytochemical parameters can be used as standard for the identification and authentication. This can be further subjected to GCMS analysis for identification of different bioactive chemical compounds and their pharmacological activities.

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