

Pharmacognostical and Phytochemical Studies of *Mirabilis Jalapa* Linn. Leaves

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ABSTRACT

Mirabilis Jalapa Linn. is a widely used traditional medicine in many parts of the world for the treatment of various diseases viz. virus inhibitory activity, anti tumour activity. No reports are available on the pharmacognostic and phytochemical nature of the leaves of *Mirabilis Jalapa* Linn. The present study deals with the macroscopic, microscopic and preliminary physico-chemical investigation. All the parameters were studied according to WHO and Pharmacopoeial guidelines. The qualitative chemical tests of the total alcoholic extract revealed the presence of triterpenoids, alkaloids, glycosides and flavonoids. Some of the diagnostic features of the leaf are the presence of multicellular trichomes, anisocytic stomata and calcium oxalate.

Keywords: *Mirabilis Jalapa* Linn; Phytochemical; Pharmacognostic; Microscopic; Traditional medicine.

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INTRODUCTION

Mirabilis Jalapa Linn. (Nyctaginaceae) is a perennial herb that reaches a height of 50-100 cm from a tuberous root (1). It produces beautiful flowers that usually open around 4 o'clock in the afternoon-hence its common name, *four o'clocks* (2). Leaves and roots are used medicinally in Ayurveda, Siddha and other traditional system of medicine for curing various ailments (3). In ayurveda, it is known by the name "Gulambasa". The plant is reported to possess tonic, diuretic and anti bacterial properties (4-5). The leaves are used traditionally in the treatment of inflammation (6). Adverse side effects and high cost of modern medicine has intensified the search for other effective alternatives. Natural products in general and medicinal plants in particular, are believed to be an important source of new chemical substances with potential therapeutic efficacy (7). The pharmaceutical use of traditionally used medicinal plants is hampered due to the lack of standards of quality, safety and efficacy (8). The present study comprises the macroscopical, microscopical and photochemical nature of the leaves of *Mirabilis Jalapa* Linn.

MATERIALS AND METHODS

The leaves of *Mirabilis Jalapa* Linn. were collected from the local areas of Hubli, Karnataka, and authenticated

by Dr. B.D. Huddar, Head, Department of Botany, H.S.K. Science Institute, Hubli, India. The anatomical studies were carried out as per standard methods given in WHO guidelines and Indian Herbal Pharmacopoeia. For anatomical studies, sections of 10-12µm thick were prepared and stained with phloroglucinol-hcl (1:1). Stomatal index was calculated as per standard methods (9). Clearing of leaf was done to study the venation pattern (10). Microphotographs at different magnification were taken. The physico-chemical characters such as extractive values, ash values, loss on drying were performed as per the official standard procedures (11-12). Coarsely powdered leaves were subjected to soxhlet extraction and the alcoholic extract obtained was subjected to successive fractionation with pet ether, n-butanol, and chloroform in the increasing order of polarity. All fractions were further subjected to qualitative test for identification of various phytoconstituents (13).

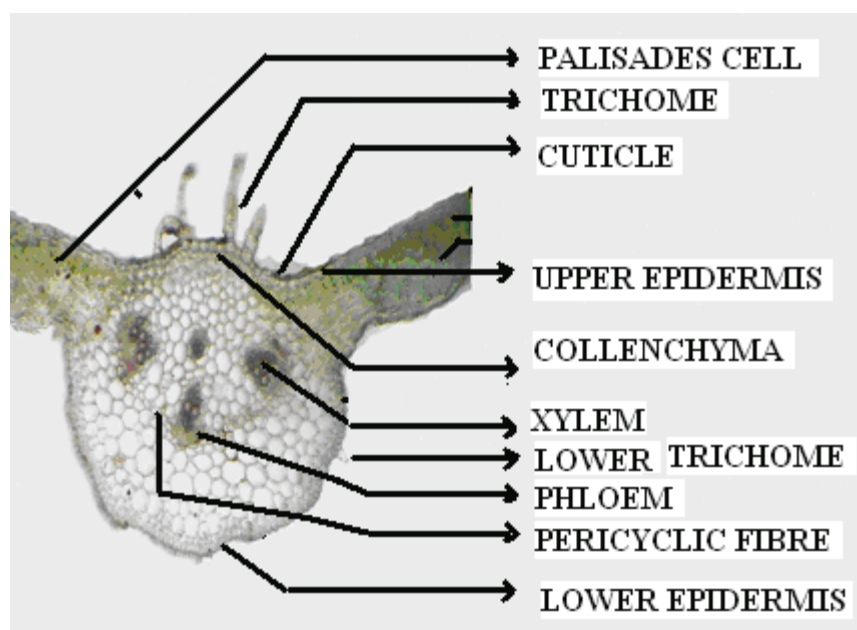
RESULTS AND DISCUSSION

a. Morphological Evaluation

Leaves are green, bitter and having characteristic odour. These are ovate shape, pinnatifid, acuminate apex, crenate, cordate base and 6-11cm in length, 5-7cm in width.

Table 1: Description of Transverse section of *Mirabilis Jalapa* Linn Fresh leaf

Sl.No	Features	Observation
1	Upper epidermis	Single layered-oval shaped parenchyma. Cells covered with cuticle having multicellular covering trichomes, but no stomata.
2	Lamina	Being dorsiventral leaf, it is differentiated into upper palisade cell and lower spongy parenchyma.
3	Vascular bundles (Mid rib)	Possess vascular bundles Xylem and phloem in collateral open arrangement.
4	Lower epidermis	Possess multicellular glandular trichomes with anisocytic stomata

**Figure 1:** T.S of *Mirabilis Jalapa* L. leaf**b. Microscopical Evaluation**

Transverse section of *Mirabilis Jalapa* Linn leaf shows presence of multicellular trichomes on both surfaces (Figure 1, Table 1). The upper and lower epidermis consists of oval shaped parenchyma cells in single layer (Figure 2). Upper epidermis shows absence of stomata, but lower epidermis shows presence of anisocytic stomata. The vascular bundles are composed of both xylem and phloem in collateral open arrangements. *Mirabilis Jalapa* Linn. leaves also show the presence of cuboidal calcium oxalate crystal and starch grains (Figure 2).

c. Physical Constants

Various physical constants namely Extractive values (Absolute alcohol and water soluble extractive values; 11% w/w and 19.0% w/w respectively) Moisture content (9.4% w/w), Total ash value (9.8% w/w), Acid insoluble ash (2.2% w/w), Water soluble ash (5.6% w/w) and Sulphated ash (9.1% w/w) were determined.

d. Phytochemical Investigations

Qualitative chemical examinations of various extracts revealed the presence of triterpenoids, alkaloids,

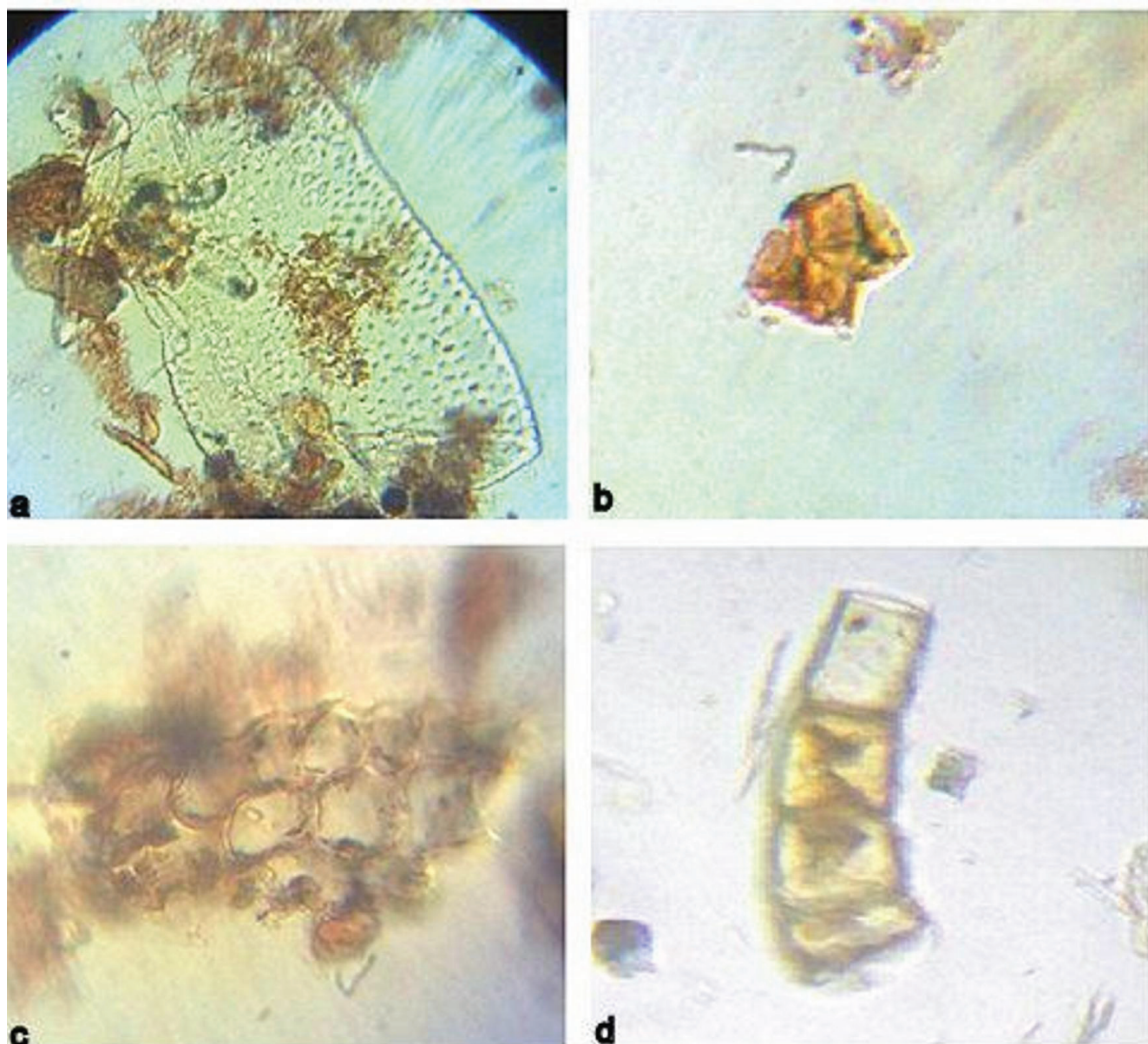


Figure 2: Photographs of cellular components of powdered drugs. Phloem with sieve plates (a), wavy type epidermal cells (b), Rhombohedral type calcium oxalate crystals (c), Multicellular surface trichome (d).

glycosides, carbohydrates and flavonoids, Further, TLC studies for various extracts substantiated the presence of triterpenoids in total alcoholic, pet.ether fraction and successive butanolic fraction, presence of alkaloid in total alcoholic and successive chloroform fraction, glycoside in total alcoholic, successive butanolic fraction and aqueous fraction. Carbohydrates in total alcoholic and successive aqueous fraction were found. Flavonoids were also found in the total alcoholic and successive butanolic fraction and aqueous fraction.

CONCLUSION

Herbal drugs are derived from heterogeneous sources leading to variations. This makes the standardization of herbal medicines all the more important as erroneous results can cause variations in pharmacological and phytochemical studies. The pharmacognostic characters and phytochemical values reported in this paper could be used as a diagnostic tool for the standardization of this medicinal plant. Presence of adulterants can be

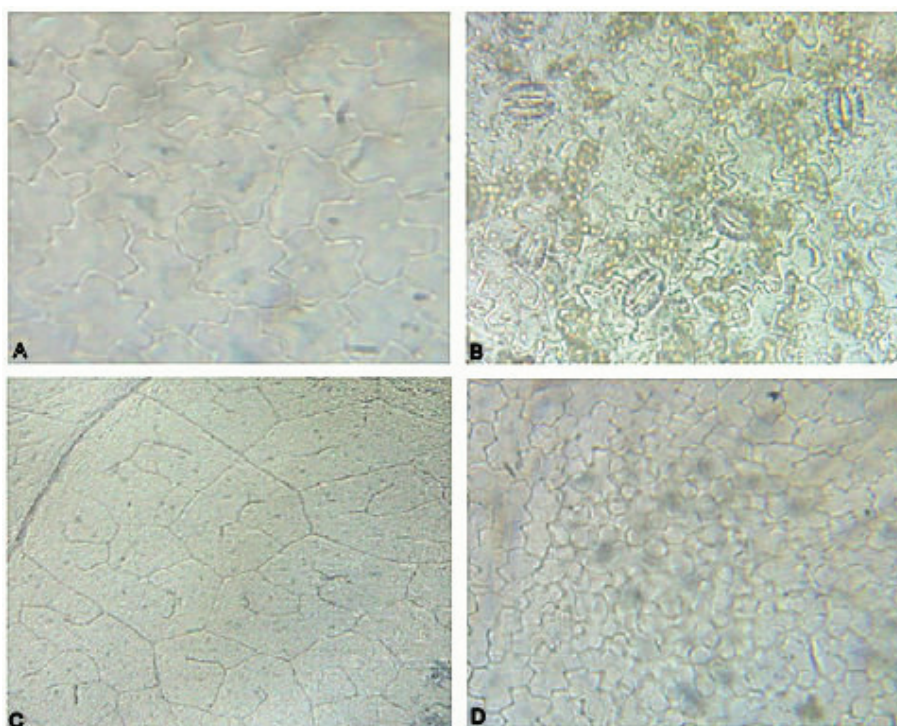


Figure 3: Photographs of *Mirabilis Jalapa* Linn leaves. Upper epidermis without stomata (A), Lower epidermis with anisocytic stomata (B), Vein islet and vein termination (C), Palisade cells below the epidermal layer (D).

Table 2: Description of powder characteristics of *Mirabilis Jalapa* Linn leaf

Sl.No	Features	Observation
1	Nature	Coarse powder
2	Color	Light Green
3	Odour	Characteristic
4	Taste	Acrid
Microscopic		
5	Xylem vessel	Sieve plate type
6	Trichome	Multicellular glandular type
7	Stomata	Anisocytic stomata with wavy walled surrounding the epidermal cells
8	Ca oxalate crystals	Rhombohedral crystal

Table 3: Details of Leaf surface data

Sl.No	Leaf surface data	Value
1	Stomatal Index of Upper Epidermis	---
2	Stomatal Index of Lower Epidermis	12.5–13.5
3	Vein Islet Number	8–10
4	Vein termination number	6–8
5	Palisade Ratio (Upper epidermis) (Lower epidermis)	5–7 3–5

Table 4: Details of physical constants

Sl.No.	Parameter	Determined Value % w/w
A	Extractive value	
1	Alcohol soluble extractive value	11.00
2	Water soluble extractive value	19.00
B	Moisture Content	
1	Total Moisture content	9.40
C	Ash Values	
1	Total ash	9.80
2	Acid insoluble ash	2.20
3	Water soluble ash	5.60
4	Sulfated ash	9.10

easily identified using these parameters. The microscopic features could help in laying down micro morphological standards as per WHO guidelines for authentication of the drug.

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Table 5: Details of preliminary phytochemical studies

Sl.No	Extract and consistency	% Dry weight in gm	Colour
1	Alcoholic Characteristic Sticky	14	Blackish green
Successive fractionation			
2	Petroleum ether (40–60°C) Characteristic Waxy	18.9	Pale yellow
3	Chloroform Characteristic Sticky	29.1	Dark green
4	Butanol Characteristic Sticky	33.7	Dark brown
5	Water Characteristic Powder	18.3	Dark brown

Table 6: Details of chemical evaluation

Sr.No	Phyto-Constituent	Alcoholic extract	Successive fractions			
			PE	CL	BU	AQ
1	Carbohydrate	+	–	–	+	+
2	Glycosides	+	–	–	+	+
3	Phytosterol Steroids	+	+	–	–	–
4	Triterpenoids	+	+	–	+	–
5	Tannins and Phenolic Group	+	–	–	+	+
6	Alkaloids	+	–	+	–	–
7	Flavonoids	+	–	–	+	+

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