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PHARMACOGNOSTIC STUDY OF LEAVES OF *CHROMOLAENA ODORATA* LINN

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ABSTRACT

The pharmacognostic characterization of a herbal drug holds a significant role in the standardization for quality, purity and identification. In this study, various pharmacognostic characteristics of *Chromolaena odorata* leaves are carried out in order to establish the parameters for the identification and the determination of quality and impurities if present. Morphological characteristics of the leaves were determined using organoleptic evaluation. Transverse section of the leaf was prepared and studied. Powder drug study of the leaves was also carried out using microscopy. This study also includes the numerical and quantitative leaf microscopy, ash values and extraction values. The pharmacognostic profile of *Chromolaena odorata* was first time studied in this research paper.

Key words: Pharmacognostic study, *Chromolaena odorata*, phytochemical screening

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INTRODUCTION

Nearly 80% of the world's population are depending on herbs for their health care needs. India is having a long tradition of administering herbs for medicinal purposes. Ayurveda, the traditional medicinal system of India is almost entirely based on herbal medicines. More than 4000 plant species are used in India for their therapeutic activities. At least 15000 flowering plant species have been reported from India¹. Only a fraction of the available flora has been evaluated for medicinal properties. Even then, most of the plants with the proven therapeutic activity have not been standardized yet. Efforts should be made to preserve of these natural resources from

extinction and to establish their activities if any and to standardize them. As, correct identification and evaluation of the raw material are the first steps in the development of emerging plant medicines, it is essential to establish the quality standards for these newly discovered plant materials^{2,3,4}.

Chromolaena odorata (Asteraceae) is regarded as a highly invasive weed. It is found throughout the world especially in the pacific region under different names like Siam weed, devil weed, French weed, communist weed, hagonoy, co hoy etc. it is an important weed plant that extends its territory from America in to the Asian countries like India, China, Bangladesh, Thailand etc^{6, 8}. *Chromolaena* is being used traditionally for its many medicinal

properties, especially for external uses as in wounds, skin infections, inflammation etc. Studies have demonstrated that the leaf extract has antioxidant, anti-inflammatory, analgesic, antimicrobial, cytoprotective and many other medicinally significant properties^{5, 7}. Due to the increased interest in the plant, efforts are being made to formulate the *Chromolaena* in to oral and topical preparations. As the first step in the lengthy process of herbal drug development, different measures for the standardization of this drug are underway. The crude drug is being analyzed for the pharmacognostic parameters in this study.

OBJECTIVE

The objective of the study is to determine the pharmacognostic parameters of the leaves of the plant *Chromolaena odorata* Linn.

MATERIALS AND METHODS

Plant materials

Leaves of *Chromolaena odorata* were collected from Kerala, India in June 2011. The specimen was identified by Professor E.J. VINCENT, Head of the Department of Botany, Christ College, Irinjalakkuda, Kerala. The leaves were powdered for microscopic study and fresh plant material was used for cross section study.

Macroscopy

The following macroscopical characters of the leaves were noted: size and shape, colour, surfaces, venation, presence or absence of petiole, the apex, margin, base, lamina, texture, odour and taste.

Microscopy

The microscopy of the powdered drug and the cross section of the leaves were carried out using

Figure 1: leaves of *Chromolaena odorata*, macroscopical view



digital microscope attached with computer system (LEICA)⁹.

Leaf indices

Leaf microscopy was carried out for determination of palisade ratio, stomata number, stomatal index, vein islet number and vein termination number.

Physicochemical characteristics

The plant powder was also tested for moisture content, total ash, acid insoluble ash, water soluble ash and extractive values including water soluble extractive & alcohol soluble extractives.

Preliminary phytochemical screening

Petroleum ether, ethyl acetate and methanolic extracts of the leaves were prepared and checked for the presence of chemical groups such as alkaloids, glycosides, carbohydrates, phenolics, proteins, tannins, terpenoids, steroids etc.

The methods used in this study for the evaluation are recognized by the WHO guidelines for quality control of herbal drugs and other relevant sources.

RESULTS

Macroscopy

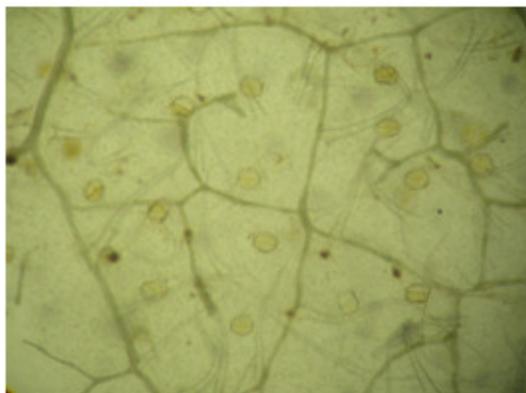
Chromolaena is a much-branched perennial shrub that forms dense tangled bushes 1.5–3 m in height in open conditions, and occasionally reaching 6–10 m by scrambling up other taller vegetation. The stems are circular, hairy or almost smooth and much branched. The leaves are opposite, triangular shaped, young ones slightly reddish purple, have toothed margins, with three main veins, and give off a pungent odour when crushed. The flowers are pale blue to white. Seeds are borne in the composite flower heads. The individual seed is about 5 mm long, with a pappus with angled hooks to aid seed dispersal. The appearance of the leaves is given in Figure 1.



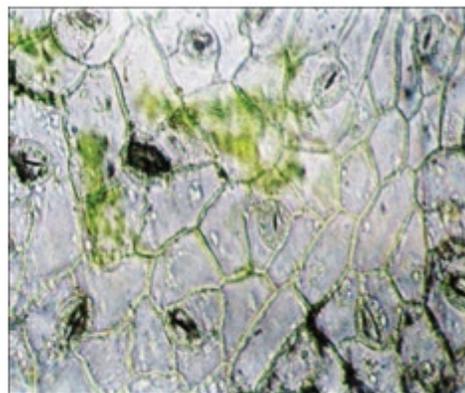
Microscopy

The microscopic study of the leaves consists of the powder drug study and the transverse section. The results of the powder drug study are given in the Figure 2. The prominent parts of the powder drug

Figure 2: Microscopical view of the leaf surface



Surface view



Anisocytic stomata

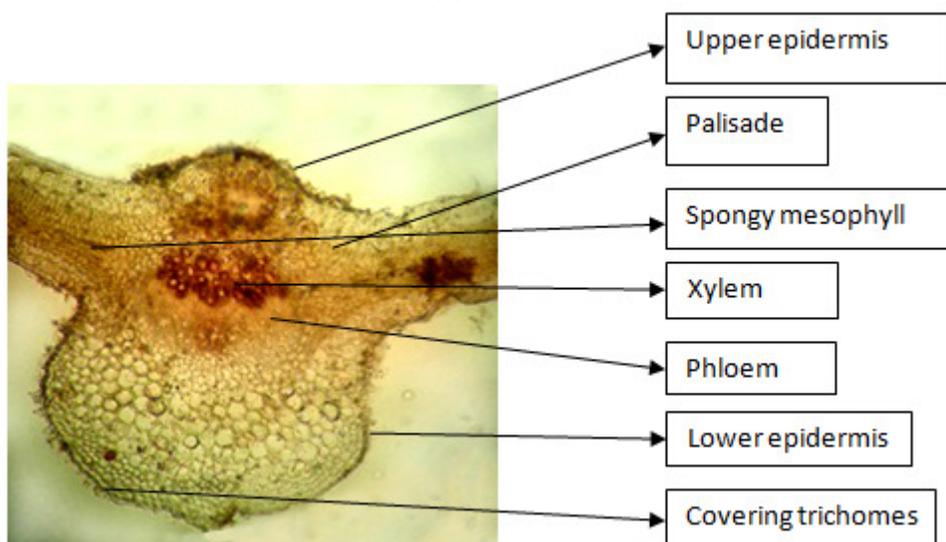


Multicellular glandular trichome



Sessile glandular trichomes

Figure 3: Transverse section of the leaves (microscopy)



Leaf indices

The investigations of the leaf indices are helpful in setting standards for a leaf drug as these

are epidermis, anisocytic stomata, different trichomes including the sessile glandular trichomes, v shaped and hook shaped trichomes. The microscopy of the cross sections of the leaf is as shown in the Figure 3.

parameters are mostly constant for a plant. The palisade ratio, stomata number, stomatal index, vein islet number and vein termination number

were determined for this plant. The detail is given in Table 1. These parameters are valuable in evaluation of a crude drug and prevention of adulteration.

Table 1: Leaf indices

| Leaf indices | Values |
|-------------------------|--------|
| Stomatal number | 72 |
| Stomatal index | |
| Adaxial | 3-7 |
| Abaxial | 16-21 |
| Palisade ratio | 3.5 |
| Vein termination number | 3 |
| Vein islet number | 3 |

Physicochemical characteristics

In order to protect the crud drugs from microbial growth, the moisture content should be considered. The lower the moisture content the higher will be the stability of that drug and chance of microbial growth will be less and vice versa. The shelf life of the drug also increases with lowering the moisture contents. The moisture content of the *Chromolaena odorata* in the dried form was found to be 7.96%. Mean ash values (%) was found to be 7.30 (total), 2.34 (acid insoluble ash) and 2.44 (water soluble ash). Total ash value was relatively low, which may be due to low inorganic components. Ash value is useful in determining authenticity and purity of drug and also these

Table 3: Results of Phytochemical Screening

| Sl. No. | Tests | Petroleum Ether Extract | Ethyl Acetate Extract | Methanol extract |
|---------|--------------------------|-------------------------|-----------------------|------------------|
| 1 | Alkaloids | + | + | + |
| 2 | Carbohydrates | - | + | + |
| 3 | phenolics | + | + | + |
| 4 | Proteins & Amino acids | - | - | - |
| 5 | Tannins | + | + | + |
| 6 | terpenoids | + | + | + |
| 7 | Steroids | + | + | + |
| 8 | Saponins | + | + | + |
| 9 | Flavonoids | + | + | + |
| 10 | Anthraquinone glycosides | - | - | - |
| 11 | Cardiac glycosides | - | - | - |

values are important quantitative standards. The extractive values were determined using ethanol and water. The water soluble extractive value was found to be 14.70 and the alcohol soluble extractive value was found to be 11.77. The results of the physicochemical characterization are given in the table 2.

Table 2: Physicochemical characteristics

| Physicochemical characteristics | Values |
|---------------------------------|--------|
| Total ash | 7.30 |
| Acid insoluble ash | 2.44 |
| Water soluble ash | 2.38 |
| Water soluble extractive | 14.70 |
| Alcohol soluble extractive | 11.77 |
| Moisture content | 7.96 |

Preliminary phytochemical screening

The phytochemical study revealed the presence of different chemical groups present in the leaf extracts. The study showed the abundant availability of flavonoids and phenolics in the leaf specimen. It has also shown the presence of entities such as alkaloids, saponins, terpenoids, carbohydrates and proteins in the leaves of *Chromolaena odorata*. The solvents used for the phytochemical screening are petroleum ether, ethyl acetate and methanol. The results of the study are depicted in the table 3.

DISCUSSION

The different pharmacognostic parameters of *Chromolaena odorata* have been determined in the study. The study was aimed at developing quality control parameters for *Chromolaena odorata* to aid in the course of standardization. The preliminary phytochemical screening revealed the presence of a significant amount of phytochemicals in the plant. This study can be considered as a preliminary step in the evolution of a weed plant (*Chromolaena odorata*) in to the herbal drug status.

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