Morphological and Anatomical Studies of Stem of *Ageratum conyzoides*

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Abstract

**Context:** *Ageratum conyzoides* Linn. (Asteraceae) is an important medicinal plant used in African traditional medicine for healing mental and infectious disorders. **Objective:** The objective of this work was to contribute to the pharmacobotanical standardization of *A. conyzoides*. **Materials and Methods:** Cross sections of the stem were obtained, by hand, for microscopic characterization of the stem. Powder microscopical characteristics were studied by microscope and scanning electron microscopy. Macroscopic characters and physicochemical standards of drug were also studied through standard methods mentioned in the WHO. **Results and Discussion:** Morphology of *A. conyzoides* showed that the outer surface of the stem was light green and inner surface was cream white in color, having slight bitter taste, and aromatic odor. Acicular calcium oxalate, sclerenchyma, thin long fibers, and hexagonal cork cells were observed in powder microscopy. Scanning electron microscopy showed the arrangement of vascular tissue in transverse section of the stem. **Conclusion:** These anatomical features are useful for the diagnosis of the species and provide support to their quality control.

Key words: Standardization, *Ageratum conyzoides*, Pharmacognostic, Microscopic, Morphological

INTRODUCTION

Asteraceae is a vast plant family that comprises roughly 1500 genera and 25,000 species in different habitats. Members of family are mostly herbaceous plants, but some shrubs and climbers are also present. Vegetation of this family easy to distinguish as they have characteristic inflorescence. *Ageratum* is one of the genera in the family which is commonly known as “billygoat weed,” “mentrasto,” and “eating-de-bode.”

It is widely used as traditional remedy in several countries around the world. It is used as a purgative, febrifuge, anti-inflammatory, analgesic, anesthetic, and in the treatment of ulcers.

*Ageratum conyzoides* is an annual branching herb grown in different western countries because of its wide adaptability, superior reproductive potential, and allelopathy. The plant contains variety of secondary metabolites which include alkaloids, tannins, coumarins, flavonoids, and mono- and sesquiterpenoids. Some other properties of plant extract are also reported such as antibacterial activity, antifungal activity, healing, and anticancer activity. Studies show that antimicrobial activity of the plant is due to the presence of essential oil. The main constituents reported in essential oil the chromenes, precocene I and precocene II, and the sesquiterpenes caryophyllene, and germacrene-D. As this plant had multifarious biological activities and used traditionally to treat various ailments, therefore, it must be authenticated and standardized to avoid any kind of adulteration. Taking in view its importance, this study was designed to evaluate pharmacognostic parameters and develop its monograph.

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MATERIALS AND METHODS

Plant material

The dried plant of *A. conyzoides* was collected from Sri Venkateswara University Tirupati, Andhra Pradesh and authenticated by the Dr. K. Madhava Chetty, Assistant professor, Department of Botany; Sri Venkateswara University Tirupati. A voucher specimen was prepared and deposited in the herbarium, Guru Nanak Dev University, Amritsar, Punjab, under the collection number 993.

Pharmacognostic evaluation

**Macroscopic characters**

Morphological characteristics such as color, odor, and taste of the dried stems of *A. conyzoides* were observed with naked eye or with the aid of a magnifying lens.

**Microscopic characters**

Transverse sections of stems of *A. conyzoides* were cut and placed on glass slide. Few drops of chloral hydrate were added and just warmed it to obtain clear sections. Few drops of glycerin were added (mounting agent). Further staining of thin section was done by safranin dye or fast green for staining xylem and phloem cells, respectively, and visualized under scanning electron microscope (Zeiss Company. EVO/LS10).

**Powder microscopic characters**

Prepared glass slides were observed under the microscope (Magnus Ltd.). The powdered plant material was also treated with various reagents for the evaluation of microscopic features of the powdered plant material.

Physical Evaluation

**Ash values**

Ash values are helpful in determining the quality and purity of a crude drug, especially in the powdered form. The objective of ash values of vegetable drugs is to determine the inorganic matter present in the drug. On incineration, crude drugs normally leave an ash usually consisting of carbonates, phosphates, sulfates and silicates of sodium, potassium, calcium, and magnesium.[17]

**Extractive values**

The extracts obtained by exhausting crude drugs are indicative of approximate measures of their chemical constituents. Varieties of chemical compounds are available in crude drugs having variable properties. Various solvents are used for extraction of various chemical compounds in a particular amount.[18]

RESULTS AND DISCUSSION

**Macroscopic characters**

Standardization is an important step for authentication and identification of plants. Macroscopy of stem of *A. conyzoides* was carried out using naked eye and the characteristics observed are: stems are round shaped, hairy, and solid [Table 1].

**Microscopic characters**

Microscopic characters of transverse section of the stem were studied using scanning electron microscope, and the transverse section of stem showed the presence of cork cells and pith [Figure 1a], phloem and xylem vessels [Figure 1b], fiber [Figure 1c], and cork cells [Figure 1d].

**Table 1: Organoleptic features of stem of *A. conyzoides***

<table>
<thead>
<tr>
<th>Organoleptic Features</th>
<th>Dry stem</th>
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<tbody>
<tr>
<td>Color</td>
<td>Outer surface: Light green</td>
</tr>
<tr>
<td></td>
<td>Inner surface: Creamish white</td>
</tr>
<tr>
<td>Odor</td>
<td>Aromatic</td>
</tr>
<tr>
<td>Taste</td>
<td>Slightly bitter</td>
</tr>
<tr>
<td>Shape</td>
<td>Hairy, cylindrical with enlarged nodes</td>
</tr>
</tbody>
</table>

**Figure 1:** Scanning electron microscopy of the stem of *Ageratum conyzoides* (a) transverse section of the stem showed pith and cork cells (b) phloem and xylem vessels (c) fiber (d) cork cells
Powder microscopy

Powder of *A. conyzoides* stem was studied using microscope under ×10 magnification. It revealed the presence of cork cells [Figure 2a], fiber [Figure 2b], calcium oxalate crystal [Figure 2c], and sclerenchyma [Figure 2d].

Physical parameters

Physicochemical study is an important part of the standardization of plant material. Ash value tests are useful for the determination of quality and purity of a crude drug. Total ash gives idea about the inorganic matter present in plant material and acid insoluble ash tells about the silica present in the powdered plant. Results showed that the total ash value was 9.75%, acid insoluble ash was 0.75%, and water-insoluble ash was 0.65%. Extractive value was mainly used for the evaluation of crude drug, especially for the determination of the amount of the active constituents of crude drug. The ether soluble extractive value of *A. conyzoides* was 2%, chloroform soluble extractive value was 2.16%, alcohol soluble extractive value was 5.52, water-soluble extractive value was 11%, and loss on drying was 6.03%. The air-dried powdered stem of *A. conyzoides* was subjected to physical evaluation and the results obtained are shown in Table 2 given below.

The standardization process involves all the quality control parameters which are helpful in the authentication of plant material. All these parameters are necessary to ensure the quality and purity of a plant material and to supply medicinal plants of good quality having uniform efficacy.

CONCLUSION

All the above diagnostic macroscopic, microscopic features and pharmacognostic parameters could be a useful tool for the identification, authentication, and preparation of suitable monograph of *A. conyzoides*. This study would also helpful to check the adulteration of this important medicinal plant and is of much importance for further research on this plant.

REFERENCES

9. Moreira MD, Picanc MC, Barbosa LCA, Guedes RN, Barros EC, Campos MR. Compounds from *Ageratum conyzoides*: Isolation, structural elucidation and

<table>
<thead>
<tr>
<th>Physical parameter</th>
<th>% age yield w/w</th>
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<tbody>
<tr>
<td>Alcohol soluble extractive</td>
<td>5.52</td>
</tr>
<tr>
<td>Water-soluble extractive</td>
<td>11</td>
</tr>
<tr>
<td>Ether soluble extractive</td>
<td>2</td>
</tr>
<tr>
<td>Chloroform-soluble extractive</td>
<td>2.16</td>
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<tr>
<td>Total ash</td>
<td>9.75</td>
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<tr>
<td>Acid-insoluble ash</td>
<td>0.75</td>
</tr>
<tr>
<td>Water soluble ash</td>
<td>0.65</td>
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<tr>
<td>Loss on drying</td>
<td>6.03</td>
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