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ORGANOLEPTIC AND POWDER CHARACTERISTICS AS TOOL FOR *ANDROGRAPHIS* SPECIES IDENTIFICATION

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ABSTRACT: *Andrographis paniculata* (Burm.f.) Nees and *Andrographis echioides* (L.) Nees are important plant species widely used in various medicinal preparations. Due to increase in demand and reduced raw drug availability, there is surge in usage of adulterants. Therefore, study of features leading to easy identification and characterization of the species and raw drugs are important. The present work focuses on the organoleptic evaluation and powder microscopy of these two taxa. Organoleptic characters of the vegetative plant parts and whole plant powder analysis data are promising in species identification. The whole plant body of *A. echioides* is covered by minute white hairs, greenish quadrangular stem, angles prominent and narrow winged. Fruits are capsules, ovoid, pointed at above and jaculators inside the fruits. Immature seeds are white changing into shades of yellow on maturity. Samples of *A. paniculata* are persistently with smooth stem, glabrous leaves, and fruit are capsular with jaculators. Seeds are small and brownish in shade. Powder microscopy reveals the presence of xylem vessels, trichomes, spiral thickening and calcium oxalate crystals in dried plant powder. The whole plant powder of *A. echioides* is pale green, astringent in taste and rough in texture. *A. paniculata* shows dark green colour, bitter in taste and rough in texture. Therefore, the organoleptic features and powder analysis are promising in determining the authenticity and for identifying the adulterants in medicinal plant raw drugs. As standardization of herbal drugs includes confirmation of its identity, quality and purity; the findings from the present study have future prospects in quality control.

KEYWORDS: *Andrographis paniculata, A. echioides*, organoleptic, powder analysis.

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1. INTRODUCTION

India is one of the twelve mega diversity countries of the world having rich vegetation with a wide variety of plants having medicinal value [1, 2]. Acanthaceae is one of the top nine families with a considerable number of medicinal plants [3]. According to International Plant Name Index (IPNI), the genus *Andrographis* Wall ex Nees *comprises* 40 species. These are of potential medicinal value and 26 species of the genus are found in India [4]. Two species included in the present study *Andrographis paniculata* (Burm.f.) Nees and *Andrographis echioides* (L.) Nees which are known for their useful phytochemical components. [5, 6]. *Andrographis paniculata* is considered to be one among the most important medicinally valuable taxa widely used for different therapeutic purposes and act as a immunostimulants. It is an annual herb native to India and Srilanka possessing immense therapeutic uses. Mostly used parts are roots, leaves and aerial part of mature twig [7]. Due to its bitter property, this is also known as "king of bitters". It is an active constituent in majority of Ayurvedic preparations and is official in the Ayurvedic Pharmacopoeia [8]. *Andrographis echioides* is a medicinally valuable species, widely distributed in the tropical India and Srilanka. *A. echioides* is traditionally used as anti-inflammatory, febrifuge, cooling, alternative for cut and wounds. The extract of the whole plant is used to cure fever [9]. A review of the pharmacollagecially relevant compounds of the genus *Andrographis* indicates the potentiality of the various species. [10] The relevant works in *Andrographis paniculata* [11 – 23] *Andrographis echioides* [24 – 29] have enhanced the pharmacological significance of both the species. Adulteration is the burning problem in the modern era. Mainly the incorrect knowledge, incorrect identification, deforestation and personal benefits have resulted in adulteration [30]. The present study is intended to search the role of organoleptic and powder characteristics in *Andrographis* species identification.

2. MATERIALS AND METHODS

1) Collection of the plant

The whole plant of *Andrographis paniculata* (Burm.f.) Nees and *Andrographis echioides* (L.) Nees were collected from Varapuzha (village area of Ernakulam district) of the Kerala state during the month of November 2018. Collected plants were carefully examined and identified with the help of regional flora [31].

2) Macroscopic and powder analysis

Fresh plant materials were used for macroscopic and organoleptic evaluation. Macroscopic evaluation of *A. paniculata* and *A. echioides* were carried out separately in different parts of selected plant species and observed some macroscopic characters such as surface, shape, size, colour, venation, phyllotaxy, length of the petiole length of the leaf were noted. Dried whole plant powder was used for powder microscopy. Powder preparations of the plants were examined under the microscope.

3. RESULTS AND DISCUSSION

Table No 1: Macroscopic and organoleptic evaluation of fresh plant material of two *Andrographis* species

Characters	*Andrographis paniculata* (Burm.f.) Nees	*Andrographis echioides* (L.) Nees
ROOT		
Root type	Tap root	Tap root
Root external characters	Secondary and tertiary branching present	Less branched and many root hairs present
Root colour	Greenish	Greenish white
Taste	Bitter	Bitter
STEM		
Stem type	Quadrangular	Quadrangular
Stem external characters	Smooth and without hairs	Covered with small white hairs, angles prominent and narrowly winged
Stem colour	Green	Light Green
Taste	Bitter	Astringent
LEAF		
Leaf size	4.5 X 1.2 cm	5 X 1.4 cm
Leaf shape	Lanceolate	Oblong-lanceolate, Oblong-elliptic
Leaf texture	Glabrous	Densely covered with hairs
Leaf margin	Entire	Entire
Leaf venation	Reticulate venation	Reticulate venation
Petiole	0.3 cm	Sessile/subsessile
Taste	Bitter	Bitter
FLOWER		
Pedicel	0.5 -1.4 cm	0.9-1.2 cm
Calyx	Sepals 5	Sepals 5
Corolla	Petals bilipped	Petals bilipped
FRUIT		
Fruit type	Capsule, Jaculators present	Capsule, Jaculators present
Fruit size	1.3 X 0.4 cm	1.1 X 0.2 cm
Fruit shape	Oval, flattened	Ovoid, Pointed above
Fruit external	Non-hairy	Hairy

characters		
SEEDS		
Seed colour	Immature seeds - white, Mature seeds -brownish	Immature seeds- white Mature seeds -yellowish shade
Number of seeds	12	4

Table No 2: Macroscopic and organoleptic features of dried whole plant powder of two *Andrographis* species

Characters	***Andrographis paniculata* (Burm.f.) Nees**	***Andrographis echioides* (L.) Nees**
Colour	Dark green	Green
Odour	Characteristic	Pungent
Taste	Bitter	Astringent
Texture	Rough	Rough, fibrous

Table No 3: Powder microscopic characters of two *Andrographis* species

Powder microscopic characters	***Andrographis paniculata* (Burm.f.) Nees**	***Andrographis echioides* (L.) Nees**
Calcium oxalate crystals	+	+
Epidermal cells with stomata	+	+
Epidermal cells with cystolith	+	+
Non glandular trichomes	–	+
Glandular trichomes	–	+
Curved trichomes	–	+
Sclerids	+	+
Oil globules	–	+
Reticulate vessels	+	–
Spiral vessels	+	–
Starch grains	+	+

Herbal formulation involves use of fresh or dried plant parts. Therefore, proper and correct identification of the plant material is very much essential for their evaluation and standardisation [3, 30, 32 - 35]. Correct identification of the material is an essential prerequisite to ensure reproducible quality and will contribute immensely to its safety and efficacy [36]**.** Macroscopic and organoleptic dissimilarity is an important identification tool for selected species *of Andrographis (*Table1, 2 & 3*)*. In *A. echioides* the whole plant is covered with minute hairs. However this character was completely absent in *A. paniculata*. Another dissimilarity is observed in the nature of stem. In *A. echioides* stem is quadrangular and is covered with small white hairs, angles are prominent and narrowly winged. These features are entirely absent in *A. paniculata*. Distinct variation is observed in leaf shape, leaf texture and in the length of the petiole. In *A. echioides* leaf is oblong – lanceolate or oblong – elliptic in shape, pubescent leaf surface and petiole are completely absent. In *A. paniculata* leaf is lanceolate in shape and glabrous in texture; small sized petiole is also observed. Fruit shows variation in their size and shape. In *A. echioides* shows capsular fruits which are ovoid in shape and pointed in the above. However in *A. paniculata* the *oval* shaped capsular fruits are flattened in appearance. Another contrasting character is observed in the number seeds. *A. echioides* has only four seeds per fruit and attains yellowish colour at their maturity. *A. paniculata* carry 12 seeds per fruit and are brownish in shade at their mature stage. The organoleptic characters of dried plant powder are included in this study. Powder microscopy of both *Andrographis* species showed some dissimilar characters (Table 3). The powder microscopic characters such as Calcium oxalate crystals, spiral vessels, starch grains, cystolith, epidermal cells, stomata, reticulate vessel, oil globules and different types of trichomes were identified and recorded. Cystoliths are silicified bodies with cellulose skeleton or occasionally not encrusted. They are generally found in vegetative parts in several acanthaceous species [37]. They vary in nature, size shape and colour. In *A. echioides* cystoliths were linear in shape and in *A. paniculata* they were rounded in appearance. *A. echioides* showed comparatively larger sized cystoliths. Presence of glandular and non-glandular trichomes was the most important powder microscopic feature of *A. echioides*. The result of present macroscopic and organoleptic (colour, odour, and taste) of the *Andrographis* species and its powder provides an important tools and significant in identifying this plant species. The authentication of the crude drug material is necessary because it maintains the quality of crude drug as well as claimed therapeutic activities [38].

4. CONCLUSION

In conclusion, present study of two *Andrographis* species have provided useful information based on their macroscopic, organoleptic and powder characters. The plants were identified based on their different macroscopic and organoleptic characters. All the parts of the selected taxa have their own distinct and unique features. Thus the macroscopic, organoleptic and powder microscopic features relate to the authentication of the original source and it is the preliminary step in the standardization

of raw drug.

CONFLICT OF INTEREST

Authors have no conflict of interest.

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