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COMPARATIVE PHARMACOGNOSTIC STUDY OF LEAVES OF *ADHATAODA VASICA* AND *AILANTHUS EXCELSA*

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ABSTRACT: *Adhataoda vasica* and *Ailanthus excelsa* are distributed throughout tropical and subtropical parts of India. Their leaves are used as expectorant and bronchodilator. The present investigation deals with the comparative pharmacognostical study of the leaves of the two species and establishment of its quality parameters. Detailed morphological and qualitative as well as the quantitative microscopic study was carried out. Phytochemical screening of the species followed this. Leaf surface microscopy of *Adhataoda vasica* shows polygonal thin walled epidermal cells and diacytic stomata whereas *Ailanthus excelsa* shows penta and hexagonal epidermal cells and anomocytic stomata. The chief powder characteristics of *Adhataoda vasica* leaf powder are 2-4 celled blunt covering trichomes, sessile-glandular trichomes, acicular and prismatic calcium oxalate crystals whereas *Ailanthus excelsa* leaf powder shows multicellular bent thick walled covering trichomes, multicellular head and stalk glandular trichomes, cluster and rosette calcium oxalate crystals. The present work can serve as a useful tool in the identification, authentication, and standardization of the plant material and distinguishing the two species from each other. The present study can be very useful in distinguishing *Adhataoda vasica* and *Ailanthus excelsa*, standardizing their formulations as well as serving as a guide for isolating novel phyto-constituents from them.

INTRODUCTION: *Adhataoda vasica* Nees (Family - Acanthaceae), commonly known as Vasaka or Ardusi is found commonly in India^{1, 2}. These species are a rich source of polyphenolic compounds, flavonoids which are responsible for strong anti-oxidant properties that help in the prevention and therapy of various oxidative stress-related diseases.

It has been used for a multitude of disorders including; bronchitis, leprosy, blood disorders, heart troubles, thirst, asthma, fever, vomiting, loss of memory, leucoderma, jaundice, tumors, mouth troubles, sore-eye, fever, and gonorrhoea^{3, 4, 5}.

Ailanthus excelsa Roxb., (Family: Simaroubaceae) is a large, deciduous tree indigenous to central and Southern India and Sri Lanka^{6, 7, 8}. Traditionally or in Indian system of medicine, *A. excelsa* Roxb. is used in the treatment of asthma, cough, colic pain, cancer, diabetes and also used as antispasmodic and bronchodilator. It is known as the tree of heaven or tree of Gods, Maharuk in Hindi, Arduso in Gujarati, Mattipongilyam in Malayalam, Perumaruthu in Tamil also used as a substitute of

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A. vasica^{9, 10}. In the present investigation, the pharmacognostic study of *Adhatoda vasica* (leaves) and *Ailanthus excelsa* Roxb. (leaves) was carried out to lay down the standards which could be useful in future experimental studies. The present study deals with the comparative pharmacognostic study of the leaves of the two species. Morphological and anatomical studies of plant parts will enable to identify the crude drug. The information obtained from the preliminary phytochemical screening will be useful in finding out the genuity of the drug. These parameters used as reliable aid for detecting adulteration¹¹. These simple but reliable standards will be useful to a person in using the drug as a home remedy. Also, the manufacturers can utilize them for identification and selection of the raw material for drug production.

MATERIALS AND METHODS: Leaves of *Adhatoda vasica* and *Ailanthus excelsa* were collected from the campus of Pioneer Pharmacy Degree College, Vadodara in June 2013. Herbarium and voucher samples of *Adhatoda vasica* (PPDC/COG/1/2013) and *Ailanthus excelsa* (PPDC/COG/2/2013) were deposited in the college laboratory. The fresh leaves were compared morphologically and used for the transverse section, surface preparation, and quantitative microscopy¹². The dried leaves were powdered, stored in airtight containers and used for powder study and phytochemical screening. For microscopical studies, phloroglucinol and HCl were used for staining **Table 1**.

TABLE 1: MICROSCOPICAL COMPARISON BETWEEN ADHATODA VASICA AND AILANTHUS EXCELSA LEAVES

Parameters	<i>Adhatoda vasica</i> leaf	<i>Ailanthus excelsa</i> leaf
Nature of lamina	Dorsiventral	Dorsiventral
Transverse Section	Cystolith was observed in cortical parenchyma	Cystolith was absent in cortical parenchyma
Palisade	double layers	Single layer
Trichomes		
Covering trichomes	2-4 celled blunt Sessile	Multicellular bent thickly walled
Glandular trichomes		Multicellular head and stalk
Epidermal cell	Polygonal thin walled	Pentagonal and hexagonal
Stomata	Diacytic	Anomocytic

Photomicrography of the transverse sections and the powdered drug was performed using a camera. The quantitative microscopic study was performed using camera lucida and stage micrometer scale **Table 2**. Phytochemical screening of both the species was performed using the appropriate extracts (aqueous and alcoholic) and appropriate chemical tests **Table 3**.

TABLE 2: QUANTITATIVE MICROSCOPICAL COMPARISON BETWEEN ADHATODA VASICA AND AILANTHUS EXCELSA LEAVES

Parameters	Measured value	
	<i>A. vasica</i>	<i>A. excelsa</i>
Stomatal number	6.4-7.4-8.4	3-4-5
Stomatal index	11.5-12.5-13.5	9-10-11
Vein islet number	23-25	35-37
Vein termination number	35-37	43-45
Palisade ratio	5.5-6.5-8.5	6-8-10



TABLE 3: PHYTOCHEMICAL SCREENING OF ADHATODA VASICA AND AILANTHUS EXCELSA LEAF POWDER

Phytoconstituents	<i>Adhatoda vasica</i>		<i>Ailanthus excelsa</i>	
	Methanol Extract	Aqueous Extract	Methanol Extract	Aqueous Extract
Alkaloids	+ve	+ve	+ve	+ve
Saponin	+ve	+ve	+ve	+ve
Carbohydrates	+ve	+ve	+ve	+ve
Phytosterols	+ve	-ve	+ve	-ve
Phenolic glycoside/Tannin	+ve	+ve	+ve	+ve
Proteins	-ve	-ve	+ve	+ve
Gum and Mucilage	-ve	-ve	-ve	-ve
Flavonoids	+ve	+ve	+ve	+ve
Volatile Oil	-ve	-ve	-ve	-ve
Fixed Oil	-ve	-ve	-ve	-ve

Various chemical tests performed for screening of various phyto-constituents of *Adhatoda vasica* and *A. excelsa* leaf powder and shown in **Table 3**.

RESULTS: The fresh leaves were compared morphologically and shown in **Table 4**.

TABLE 4: MORPHOLOGICAL COMPARISON BETWEEN *ADHATODA VASICA* AND *AILANTHUS EXCELSA* LEAVES

Parameters	<i>Adhatoda vasica</i>	<i>Ailanthus excelsa</i>
		
Colour	Light green	Grayish green
Size	10-13cm long	20-30cm long
Apex	Acuminate	Acute, slightly curved
Shape	Ovate-lanceolate	Lanceolate
odor	Characteristic	Disagreeable
Taste	Bitter	Characteristic bitter
Margin	Slightly crenate to entire	Irregularly toothed
Base	Symmetric	Asymmetric
Texture	Leathery	Velvety
Venation	Pinnate	Pinnate

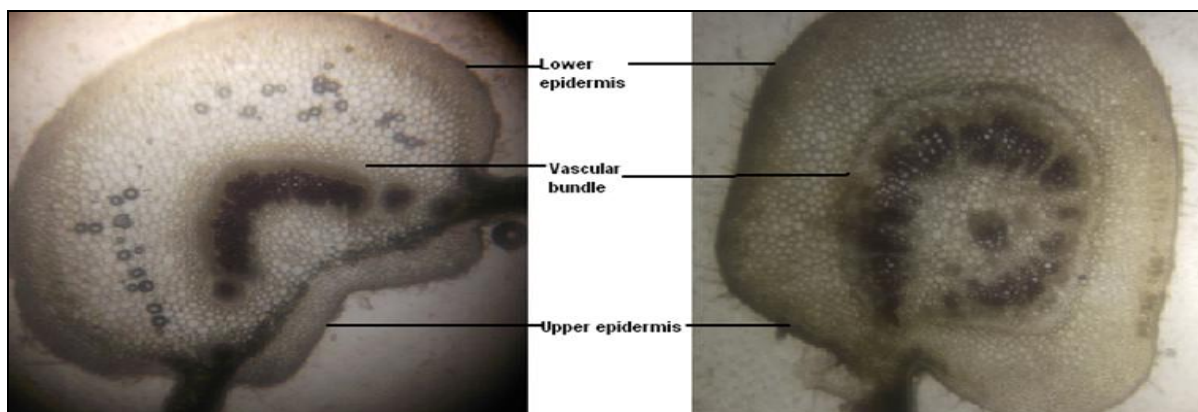
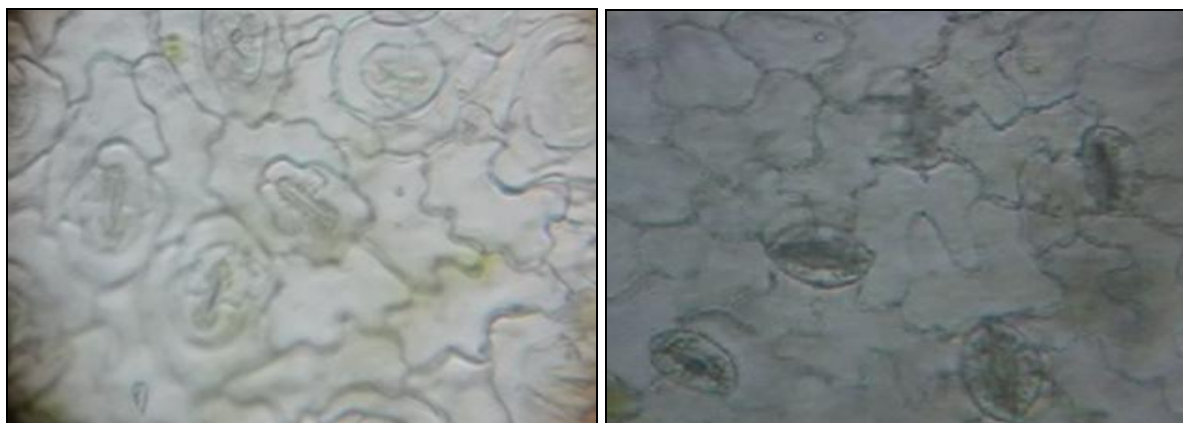


FIG. 1: TRANSVERSE SECTION OF *ADHATODA VASICA* AND *AILANTHUS EXCELSA* LEAVES



Diacytic stomata in *A. vasica* leaf

Anomocytic stomata in *A. excelsa* leaf

FIG. 2: SURFACE PREPARATION OF *ADHATODA VASICA* AND *AILANTHUS EXCELSA* LEAVES

DISCUSSION: A detailed comparative pharmacognostic study of leaves of *Adhatoda vasica* and *Ailanthus excelsa* has been performed. Leaf surface microscopy of *Adhatoda vasica* shows polygonal thin walled epidermal cells, and diacytic stomata whereas *Ailanthus excelsa* shows

penta and hexagonal epidermal cells and anomocytic stomata. The chief powder characteristics of *Adhatoda vasica* leaf powder are 2-4 celled blunt covering trichomes, sessile-glandular trichomes, acicular and prismatic calcium oxalate crystals whereas *Ailanthus excelsa* leaf

powder shows multicellular bent thick walled covering trichomes, multicellular head and stalk glandular trichomes, cluster and rosette calcium oxalate crystals. Various quantitative microscopic parameters were also established. Alkaloids, flavonoids, phenolics, saponins, and sterols were detected in both the species, but proteins were detected only in *Ailanthus excelsa*.

CONCLUSION: The pharmacognostic standards for the leaves of *Adhatoda vasica* and *Ailanthus excelsa* are laid down for the first time in this study. Morphological and anatomical studies of plant parts will enable to identify the crude drug. The information obtained from the preliminary phytochemical screening will be useful in finding out the genuity of the drug.

These simple but reliable standards will be useful to a person in using the drug as a home remedy. Also, the manufacturers can utilize them for identification and selection of the raw material for drug production. So further study should be carried out in future to isolate the specific chemical constituents as well as detailed pharmacological activity will be carried out in proper scientific way.

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CONFLICT OF INTEREST: Nil

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