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PHARMACOGNOSTICAL AND PHYTOCHEMICAL INVESTIGATION ON AERIAL PARTS OF *EVOLVULUS ALSINOIDES* L.: AN AYURVEDIC HERB

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ABSTRACT:

Background: Medicinal plants are a rich source of pharmacologically active compounds and are used traditionally by various cultural groups to treat many diseases. *Evolvulus alsinoides* is an important drug used in Ayurvedic system of medicine. **Objective:** The present study was undertaken to explore the pharmacognostical characteristics along with the phytochemical analysis on the aerial parts of *Evolvulus alsinoides*. **Materials and Methods:** To facilitate correct and easy identification of drugs, pharmacognostical studies covering macroscopical, microscopical and physiochemical parameters were studied. Preliminary qualitative phytochemical tests were performed for the identification of phytoconstituents present in the crude drug. Physico-chemical values such as the percentage of total ash, acid insoluble ash, water-soluble ash, water soluble extractives, alcohol soluble extractives and moisture content were calculated. **Result:** The study helped in the standardization of drugs in terms of quality, purity and sample identification. Organoleptic testing of the crude drug was mainly performed for qualitative evaluation based on the observation of morphological and sensory profile. In this study, various morphological, microscopical, physico-chemical standards have been studied. The present study reveals that the aerial parts of *Evolvulus alsinoides* contains alkaloids, glycosides, tannins, saponins, flavonoids and sterols. This shows the generality of the components in medicinal plants. **Conclusion:** As the medicinal plants are collected by untrained collectors on the basis of Sanskrit or local names, there is a chance of misidentification out of ignorance due to similar vernacular name. Moreover, Shankhapushpi is available as four different plant species. So, Shankhapushpi is often adulterated in the trade by other related/spurious species. Therefore, a reliable authentication method is needed to facilitate differentiation/ identification of the genuine material from its adulterants.

Keywords: *Evolvulus alsinoides,* Pharmacognostical, Authentication

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INTRODUCTION

Medicinal plants, also called medicinal herbs, have been discovered and used in traditional medicine practices since prehistoric times. Plants synthesise hundreds of chemical compounds or secondary metabolites for functions including defence against insects, fungi, diseases etc. [1, 2].

Evolvulus alsinoides L. (Convolvulaceae) is commonly known as *Shankhapushpi* in Indian traditional medicine. *Evolvulus alsinoides* tends to be an excellent herb for supporting the proper function of the brain and nervous system. It is well known for its therapeutic effect on brain disorders in Ayurvedic system of medicine [3]. It's a powerful herb that helps to rejuvenate the mind. It promotes memory, concentration and intelligence. *Shankhapushpi* promotes healthy blood flow to the brain and is said to help to stimulate higher cerebral functions. It calms the mind and supports mental health and emotional stability. The whole plant is used in form of decoction in nervous debility and loss of memory [4]. The plant is also useful as blood purifier and in bleeding piles. The fresh flowers with sugar are eaten as a brain tonic. The leaves are helpful in chronic bronchitis and asthma. It also improves complexion, voice and cures from intestinal worms. The plant is used as a vermifuge and, with oil for promoting growth of hair [5]. It is well known for its anxiolytic activity [6], immunomodulatory activity [7], adaptogenic [8], antidiabetic [9], antihypertensive [10], anthelmintic [11] and antioxidant properties [12]. Phytochemically the plant has been reported to contain aliphatic hydrocarbons, fatty acids and alkaloids. The plant contains alkaloids-*Shankhapushpi*ne, evolvine and betaine. Fresh plant contains volatile oil and potassium chloride. It also contains a yellow neutral fat, an organic acid and saline substances [13, 14].

Survey of literature revealed that it is available as four different plants species viz., *Canscora decussata* Schult., *Clitoria ternatea* L., *Convolvulus pluricaulis* Choisy. and *Evolvulus alsinoides* L. and used as drug in the different parts of the country. As the medicinal plants are collected by untrained collectors basing on the Sanskrit names or local names, there is a chance of misidentification out of ignorance due to similar vernacular name. Because of the adulteration in the Indian crude drug markets and increased demand and high price, *Shankhapushpi* is often adulterated in the trade by other related/spurious species. Therefore, a reliable authentication method is needed to facilitate differentiation/ identification of the genuine material from its adulterants.

The present study was conducted with an aim of developing standard marker for proper identification of raw materials. In this investigation, the parameters adopted for identification of aerial parts of *Evolvulus alsinoides* includes physico-chemical values,

fluorescence analysis to develop their chemical parameters and diagnostic microscopic characters.

MATERIALS AND METHODS

Plant material

Aerial parts of *E. alsinoides* were collected from Vindhya Herbals, MFP-PARC, Bhopal, M. P.

Macromorphology

The aerial parts of *Evolvulus alsinoides* L. was evaluated for its sensory profile by observing their color, odor and taste along with some extra macroscopical characters as per standard WHO guidelines.

Microscopy

(a) Stem – Pieces of stem material (without leaf) were boiled in a solution of caustic alkali. Specimen of stem pieces were taken on the slide and covered with cover slip before examining.

(b) Leaf –Pieces of leaves were boiled in a test tube with chloral hydrate for several minutes until completely clarified. After clarification, leaf pieces were divided into two parts with the help of a scalpel or needle and carefully turned. The leaf could be examined from both the dorsal and ventral surfaces.

The detail microscopical characters were observed under Leica Compound Microscope Model DM 3000B with DFC2420 Camera & LAS Software digital microscope.

Physico-chemical Parameters

Physico-chemical values such as the percentage of total ash, acid insoluble ash, water-soluble ash, water soluble extractives, alcohol soluble extractives and moisture content were calculated. Evaluation of crude drug ensures the identity of a drug and determines the quality and purity of drugs. The main reason behind the need for the evaluation of crude drugs is biochemical variation in the drug, effect of treatment and storage of drugs, adulteration and substitutions.

Phytopharmacopoeial specification for the plant materials should be developed to enable the quality control person to verify and approve the materials.

Preliminary Phytochemical Screening

Preliminary qualitative phytochemical tests were performed for the identification of various phytoconstituents present in the crude drug.

Fluorescence Analysis

Fluorescence analysis is one of the Pharmacognostic procedures useful in the identification of authentic samples and recognizing adulterants. Fluorescence analysis was carried according to the method of Kokoski et al.

In the fluorescence analysis, the plant parts or crude drugs may be examined as such, or in their powdered form or in solution or as extracts. The merits of simplicity and rapidity of the process makes it a valuable analytical tool in

the identification of plant samples and crude drugs [15].

RESULTS AND DISCUSSION

Macroscopic Examination

Color- Dark dusty brown

Odour- Characteristic

Taste- Bitter

Stem slender, wirty, cylindrical, pubescent, exhibiting scars left by leaf and bud, fracture splintery. Leaf simple, alternate, exstipulate, appressed to the stem, elliptic oblong to oblong ovate, entire, mucronate, both the surface densely pubescent; petiole about 1 to 2 mm long; flowers tiny, bluish, solitary, axillary; calyx 5, persistent, densely hairy, lanceolate; corolla rotate or funnel shaped; fruit a globose capsule; seed brown, hard, plano-convex with reticulate surface.

Microscopic Examination

Stem- Transverse section of the stem is circular in outline bearing many, long unequally armed, simple unicellular and few glandular trichome; cortex parenchymatous, followed by a ring of pericyclic fibres and narrow phloem, xylem ring is wider, encircles the perimedullary phloem and the central wide pith. Detailed T.S. of the Stem shows a layer of epidermis covered with thin cuticle, bearing long, unicellular, unequally armed, covering trichomes, and few glandular trichomes of multicellular head. Hypodermis is composed of 4 to7 rows of cells followed by few rows of cortical parenchymatous tissue and an endodermis, which is distinct in young stem. Underneath the endodermis lies continuous to discontinuous ring of lignified pericycle fibres, in groups of 2 to 3, followed by a band of narrow phloem. Xylem consists of isolated vessels embedded in group of fibres, tracheids and parenchyma in the peripheral zone of xylem ring, its inner zone encircling the ring of perimedullary phloem tissue consists mainly of smaller sized groups of xylem vessels; uniseriate medullary rays in continuation with that of phloem [Figure 1-4].

Leaf- T.S. passing through the midrib is convexly protruding at its lower side and flat or concave at its upper side, a single or rarely two meristeles lie in the centre, with one to two collenchymatous layers under both the epidermii, the remaining ground tissue being parenchymatous. Lamina narrow, composed of 2 to 3 rows of palisade cells lying under the upper epidermis. The palisade cells are embedded with cigar shaped cystoliths, the remaining 3 to 4 layers of the mesophylls are composed of spongy parenchyma transverse with small sized meristeles and oval to spherical oil glands arranged in rows. Both the lower and upper epidermis contain stomata and bear long, unicellular, branched, simple and glandular trichomes just like that of stem [Figure 5-8].

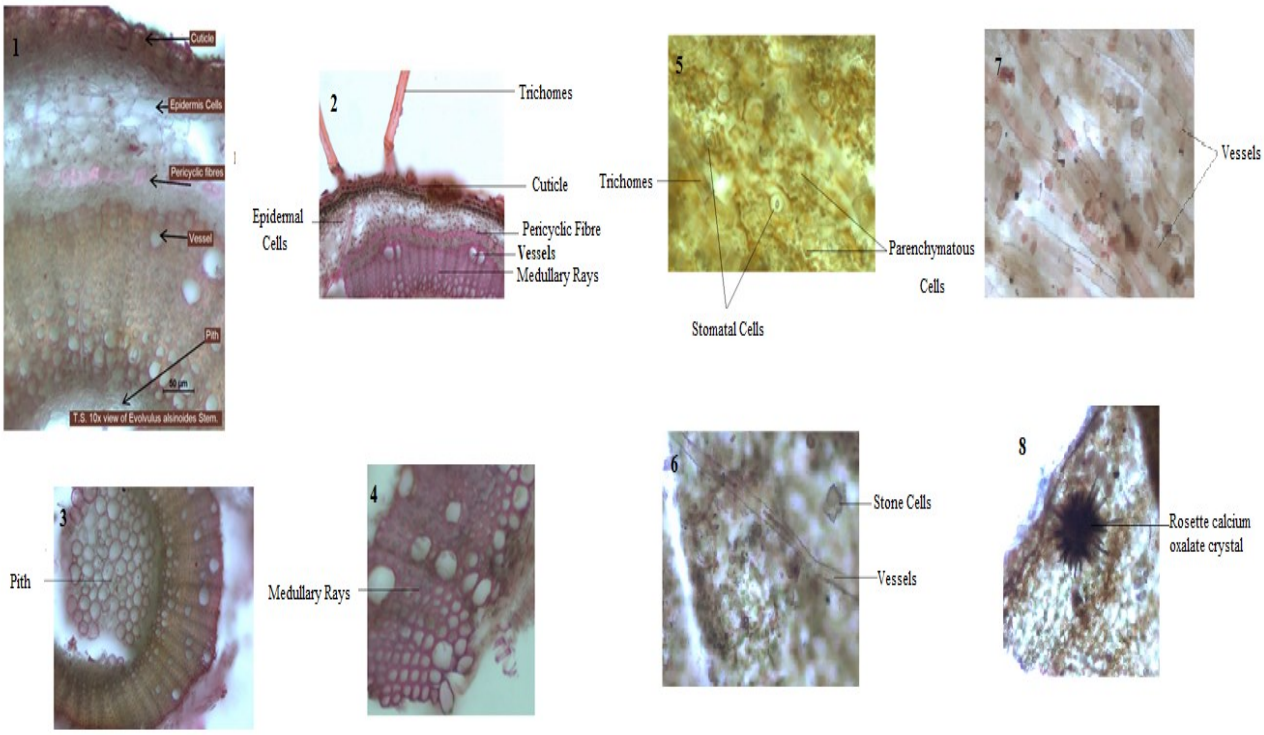

Figure 1. T.S. of *E. alsinoides* stem (10 X) view; **Figure 2.** Transverse section of *E. alsinoides* stem; **Figure 3.** Pith of *E. alsinoides* stem; **Figure 4.** Medullary rays of *E. alsinoides* stem; **Figure 5.** T.S. of *E. alsinoides* leaves; **Figure 6.** Stone cells and vessels in *E. alsinoides* leaves; **Figure 7.** Tracheids of *E. alsinoides* leaves; **Figure 8.** Rosette crystals of *E. alsinoides* leaves.

Physicochemical Evaluation

The result of moisture content signifies whether the drug was properly dried and stored or not. The determination of ash value is useful for detecting low grade products, exhausted drugs and excess of sandy or earthy matter. The determination of extractive values is useful while selecting the solvent for extraction and also gives an idea about the nature of major phytoconstituents present in the drug. Physico-chemical values such as the percentage of total ash, water soluble ash, acid-insoluble ash, water and alcohol soluble extractives and moisture content were calculated [Table 1].

Table 1. Physicochemical Parameters of *E. alsinoides*

Parameters	
Total ash (w/w)	5.84±0.89
Water soluble ash (w/w)	1.35± 0.74
Acid- insoluble ash (w/w)	0.71±0.39
Water soluble matter (%)	9.45±0.14

Alcohol soluble matter (%)	10.62±1.32
Moisture content (%)	4.70±1.05
Foreign Matter	Nil

Table 2. Qualitative chemical tests of Ethanolic Extract of *E. alsinoides*

S.No.	Test	Inference
1.	Glycosides	+ve
2.	Alkaloids	+ve
3.	Sterols	+ve
4.	Flavonoids	+ve
5.	Phenolic Compounds	+ve
6.	Tannins	+ve
7.	Carbohydrates	-ve
8.	Proteins	+ve
9.	Resins	-ve

Fluorescence Analysis

The characteristic fluorescence properties or colours recorded through this study are depicted in Table 3.

Table 3. Fluorescence Properties of *E. alsinoides* whole plant powder

S.No.	Treatment	Fluorescence
1.	Powder as such	Yellowish green
2.	Powder treated with n-hexane	Greenish yellow
3.	Powder treated with chloroform	Greenish yellow
4.	Powder treated with methanol	Yellowish red
5.	Powder treated with acetone	Brownish green
6.	Powder treated with 1 N NaOH	Bright yellowish green
7.	Powder treated with 1 N HCl	Dull yellowish green
8.	Powder treated with H_2SO_4 (50%)	Yellowish green

Organoleptic testing of a crude drug is mainly for qualitative evaluation based on the observation of morphological and sensory profile. In this report, various morphological, microscopical, physico-chemical standards have been studied. *Shankhapushpi* is considered as one of the controversial drugs in Ayurvedic System as it is available in four different species. Hence, we have undertaken this study to serve as a tool for developing standards for identification, quality and purity of aerial parts of *Evolvulus alsinoides*. Various sophisticated modern research tools are available today, for evaluation of the plant drug but microscopic method is still one of the simplest and cheapest methods to start for establishing the correct identity of the source material. Adulteration and misidentification of crude drugs can cause serious health problems to consumers and legal problems for the pharmaceutical industries. It can be conducted via variety of techniques, namely macroscopic, microscopic identification and chemical analysis [16]. The observation of cellular level morphology or anatomy is a major aid for the authentication of drugs. These characters are especially important for identification of powdered drugs, because in these cases most of the morphological diagnostic features are lost. Determination of moisture content is important because high moisture content may cause the decomposition of plant drug. Presence or absence of inorganic matter such as metallic salts and/ or silica can be determined by performing the total ash. This includes both 'physiological-ash' which is derived from the plant tissue itself, and 'non-physiological ash' which is the residue of extraneous matter adhering to the plant surface. Water-soluble ash is the water soluble portion of total ash. Acid-insoluble ash indicates the non-physiological ash due to adherence of inorganic dust, dirt to the crude drug. The ash values of the crude drug signify the presence or absence of adulteration [17].

CONCLUSION

The present study reveals that the aerial parts of *Evolvulus alsinoides* contains alkaloids, glycosides, tannins, saponins, flavonoids and sterols. This shows the generality of the components in medicinal plants. Biological actions are primarily due to these secondary metabolic components in a complex form concern with synergistic or antagonistic activities. The combinations of such phytochemicals show a broad spectrum of biological effects and pharmacological properties.

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Conflicts of Interest

The authors declare that they have no known conflicts of interests with the manuscript.

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