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Research Article

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Pharmacognostical evaluation on the leaves of *Solanum trilobatum*

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ABSTRACT

Solanum trilobatum is a traditional herb used widely in siddha system of medication for several ailments. Drug is being taken as powder, decoction and electuary. However characterization of the drug components would facilitate in better drug formulation strategies. Macroscopic analysis of leaves of S. trilobatum was performed to facilitate distinct identification of species. Pharmacognostical evaluation of leaves showed total ash content of 17.62 percentage; which comprises of 10.81 percentage water soluble and 6.81 percentage acid soluble ash. Also extractive value of drug powder was evaluated and results showed that alcohol soluble compounds were 3. 83 percentage and water soluble compounds were 11.24 percentage. Fluorescence analysis also was performed for drug powder using standard reagents and solvents, the results obtained were compared with established standards to indicate presence of various phyto-chemicals. Thus the above study gives the basic solubility composition and purity of drug compounds in the sample based on which drug formulations can be made for effective action.

Key words: *Solanum trilobatum* leaves, drug, pharmacognostical evaluation, fluorescence, ash values, extractive values.

INTRODUCTION

Solanum trilobatum (Solanaceae) an ethno botanical herb is a thorny creeper that has been used traditionally in siddha system [1] as it is called as “kayakalpa”. The medicinal properties of the plant are due to the various chemical active constituents present in different parts. It can be consumed as decoctions, powders and electuary [2]. The clinical efficacy of this herb towards treating bronchial asthma show a progressive improvement in the ventilator functions of asthma individuals [3]. It contains various phyto-chemicals and the leaves has rich amount of calcium, iron, carbohydrates, minerals, iron, crude fibers and phosphorus [4].

The interest in plant derived drugs is due to the fact that “green medicine” is safer and this rich mineral element cures several health problems. It is shown to exhibit various biological activities like anti diabetic, antibacterial due to the presence of tannins [5] and saponins [6], antifungal, antimitotic, antioxidant property that produce hypoglycemic effect, anti-tumors that protect from ROS(Reactive Oxygen Species) and suppress cell proliferation. The extract has an inhibitory effect on metal corrosions in alkaline solutions [7]. It shows a significant decrease in lipid levels (anti-hyperlipideamic effect) [8] and it possess hepato-protective activity against metal induced toxicities by regenerating the damaged liver cells [9]. It is an effective reducing agent for the synthesis of nanoparticles .It possess acaricidal and larvicidal activity of synthesized nanoparticles [10].It also act as a immune stimulant that enhance the innate immune system and the production of cytokines [11].

In regard to “Green Medicine”, the composition of constituents in the particular herbal drug is of prime importance. Usage of same vernacular name for two or more herbs poses a serious problem in identification of specific herb. Standard and authenticity of herbal drug is established by its pharmacognosy[12]. Herbal drugs are dried and powdered where they lose their morphological features which increases chance of adulteration. Pharmacognosy

deals with analysis of drug powders instead of sectioned plant specimen. The characterization of the herbal drug for certain specifications is to be established that are relevant and comprehensive [13]. The pharmacognostical characters such as total ash (inorganic part after complete combustion),water soluble and acid insoluble ash and total extractive values serve as characteristic features of this herbal drug and establish a authenticity of it [14]. It may assist in the standardization protocols to assess the quality, purity and to differentiate it from other drug species.

EXPERIMENTAL SECTION

Chemicals used

Distilled water, 2M HCl, absolute ethanol, whatman filter paper no.1[13], 1N HCl, 1N NaOH, 50% HNO_3, 50% H_2SO_4, 5% KOH, acetic acid, $FeCl_3$, 5% iodine, Ammonia, 1N NaOH in CH_3OH, 70% ethanol, methanol, chloroform, ethyl acetate, petroleum ether, dichloro-methane[13].

Plant sample preparation

Fresh leaves were collected from healthy *S. trilobatum* plants at local nursery, Coimbatore, Tamil Nadu, India during December 2013. The plant sample was identified to be *Solanum trilobatum* by Botanical Survey of India, TNAU, Coimbatore, Tamil Nadu, India [ID No. BSI/SRC/5/23/2013-14/Tech/1688]. The leaf samples were washed thoroughly with running water to remove the dirt from these samples. These samples were blotted dry with tissue papers. The collected and cleaned leaf sample was shade dried for 3 – 4 days till samples were free of moisture. The dried samples were powdered using clean mechanical blender to obtain fine sized leaf powder sample.

Macroscopic analysis

The fresh cleaned leaf sample was placed in between blotting papers and a moderate weight was placed over the leaf to make the leaf surface flat and clear for analysis. Care was taken not to damage any of the natural appearances in the leaf. After pressing, various macroscopic parameters were noted. Organoleptic properties of drug is analyzed in this procedure which is a major element that decides the consumer preference of the drug/medicine.

Pharmacognostical evaluation of leaves of *Solanum trilobatum*

Total ash value determination

The total ash was evaluated by incinerating 5g of powdered leaves in a silica crucible at 550^{o}C. Weight of incinerated ash is measured and the (w/w) percentage of total ash with respect to the amount of powdered leaves was calculated.

Acid insoluble ash value determination

The ash obtained by incinerating 5g of powdered leaves was boiled with 6.25ml of Hydrochloric Acid in a boiling water bath and then filtered using whatman filter paper no.1. The residue was again washed with water, ignited to obtain ash and then weighted. The percentage of acid insoluble ash with respect to powdered leaves was calculated.

Water soluble ash value determination

The ash obtained by incinerating 5g of powdered leaves was boiled with 6.25ml of distilled water and filtered through whatman filter paper no.1. The residue was then washed and ignited to obtain ash. The ash obtained was weighted and the percentage of water soluble ash with respect to powdered leaves taken was calculated.

Extractive value determination

5 g of powdered leaves were weighed and 100 ml of alcohol was added and mixed frequently for 24 hrs and set aside for 2 hrs. The filtrate was evaporated to dryness by heating it on a water-bath and dried in an oven at 100^{o}C. Cooled and weighed. Thus the percentage of alcohol soluble extractive values was calculated with respect to air - dried leaves powder. Water was used instead of alcohol for water soluble extractive values [15].

Fluorescence analysis

Small amount of drug powder was mixed with 1-2ml of various chemical reagents/ solvents and viewed under long UV (365 nm), short UV (254 nm) and visible light. Colour appearances under various light sources were noted [16-18].

RESULTS AND DISCUSSION

Macroscopic analysis:

Macroscopic study includes analysis of organoleptic features of the herbal drug species. Herbal plants usually have their characteristic organoleptic properties. Macroscopic characters of leaves of *S. trilobatum* such as colour, odour, taste, shape and size were observed and tabulated in table 1.

Table.1 Macroscopic analysis of leaves of *S. trilobatum*

S. No	Macroscopic Characters	Observation
1.	Colour	Green
2.	Odour	Characteristic
3.	Taste	Mild Bitterness
4.	Shape	Hastate
5.	Margin	3 or 5 lobed
6.	Apex	Acute
7.	Surface	Thorny
8.	Size	Length: 5.5 – 8 cm Breadth: 2.5 – 4 cm

Pharmacognostical evaluation of leaves of *Solanum trilobatum*

The unique feature of a drug from herbal origin is defined only when it has a detailed pharmacognostical studies. The parameters like ash values, extractive values with different solvents provide a confirmation of the identification of purity of drug .The water soluble extractive values were comparatively higher than alcohol soluble values. Also water soluble ash values were higher than acid insoluble ash values. These values were tabulated in table 2. On comparison with pharmacognostical evaluation of *Solanum nigrum*, has extractive values of 21.04% and 19.22% in water and alcohol respectively [19].

Table. 2 Ash and Extractive values of *Solanum trilobatum* leaves

S.No	Parameters	Percentage(w/w)
	Ash Values	
1.	Total Ash	17.62
2.	Water soluble ash	10.81
3.	Acid insoluble ash	6.81
	Extractive value	
4.	Alcohol soluble	3.83
5.	Water soluble	11.24

Fluorescence analysis

Fluorescence analysis of dry powder on reaction after treatment with chemical reagents was performed by visualizing the colours under visible light, long UV light (365 nm) and short UV light (254 nm) for quality estimation. Results were obtained as different shades of green and brown. Mostly brown shades were seen in long UV. Various shades of green and brown were seen in short UV and visible light. Results were tabulated in tables 3 and 4.

Table. 3 Fluorescence analysis of *Solanum trilobatum* leaves on treatment with chemicals/reagents under Ultra Violet (UV) radiations

S.No	*Treatment* Chemicals / Reagents	*Observation*		
		Short(254nm)	*Long(365nm)*	*Visible light*
1.	1N HCl	Light yellow	Light brown	Yellowish brown
2.	1N NaOH	Orangish pink	Red	Olive green
3.	50% HNO_3	Light yellow	Brown	Dark yellow
4.	50%H_2SO_4	Light brown	Blackish brown	Dark green
5.	5% KOH	Orangish pink	Red	Olive green
6.	Acetic acid	Brownish pink	Brown	Greenish brown
7.	5% $FeCl_3$	Dark brown	Brown	Brown
8.	5% Iodine	Dark brown	Dark brown	Dark brown
9.	Ammonia solution	Light yellow	Light brown	Light brown
10.	1N NaOH in methanol	Brownish pink	Dark brown	Green

Table. 4 Fluorescence analysis of *Solanum trilobatum* leaves on treatment with solvents under Ultra Violet (UV) radiations

S.No	*Treatment* Solvents	*Observation*		
		Short(254nm)	*Long(365nm)*	*Visible light*
1.	Water	Light yellow	Light brown	Light brown
2.	70% Ethanol	Reddish pink	Red	Light olive green
3.	Absolute Ethanol	Dark red	Light brown	Yellowish brown
4.	Methanol	Dark red	Blackish brown	Dark green
5.	Chloroform	Dark red	Red	Dark olive green
6.	Ethyl acetate	Reddish pink	Brown	Light green
7.	Petroleum ether	Reddish pink	Light brown	Light yellow
8.	Dichloromethane	Dark red	Blackish brown	Dark green

CONCLUSION

In traditional medicine, the plant derived compounds are attracting much of attention. Scientists aim at exploiting these plants for application in pharmaceuticals and food industries. Macroscopic analysis of leaves depicts the distinctive appearance of the leaves of this herb and can often be mistaken as *Solanum xanthocarpum*. The pharmacognostical evaluation parameters like ash values, extractive values and fluorescence analysis is used to determine the authenticity and purity of the drug from the crushed plant samples and can be used in herbal industries. From the present study, it is found that both ash and extractive values, water soluble values are high; it indicates the presence of more polar constituents in leaf extracts. Fluorescence analysis of leaf extracts qualitatively indicated the presence of various phyto-chemicals in different extracts. Isolation of individual drug compounds and subjecting the isolated individual compounds for animal studies helps in herbal drug formulation.

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