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Pharmacognostical and physico-chemical studies of *Sesbania sesban* (L.) Merr. stem

T. Mythili[1*] and R. Ravindhran[2]

[1]*Department of Plant Biology and Plant Biotechnology, Ethiraj College for Women, Chennai-8*
[2]*Department of Plant Biology and Biotechnology, Loyola College, Chennai-34*

ABSTRACT

Sesbania sesban (L.)MERR.is commonly seen in Asian and African countries. In Tamil it is called as 'Sithagathi'. In olden days, the plant is used to treat various diseases. It acts as astringent, carminative, anti-inflammatory etc., Thehistochemical investigation of the stem indicated the presence of alkaloids, phenols, flavonoids etc., The physico-chemical parameters such as ash value, acid insoluble ash, loss on drying, water and alcohol extractive values were determined. Fluorescence analysis showed the plant sample is free of any foreign matter and adulterants. The reaction of the stem powder with different chemicals indicated the presence of the compounds such as starch, crystals and tannins. The pharmacognostic study conducted revealed the purity of the sample. The study establishes the pharmacognostical and physico-chemical standards of the crude drug and helps to differentiate the plant sample from the adulterants.

Keywords: *Sesbania sesban* , Sithagathi, anti-inflammatory, phenols, flavonoids pharmacognostic study, tannins.

INTRODUCTION

Since the time immemorial our traditional system of medicine and folklore claiming thatmedicinal plants as a whole or their parts are being used in all types of diseases successfully [1]. Traditional systems of medicine are popular in developing countries and upto 80% of populationrelies on traditional medicines or folk remedies for their primary health care needs [2]. Plants are the basis for the development of modern drugs and medicinal plants have been usedfor many years in daily life to treat disease all over the world [3, 4].

Sesbania sesban (L.)MERR.is very common throughout Africa and in Asian countries such as India, Malaysia, Indonesia and Philippines. It is commonly called as 'Sithagathi'in Tamil, 'Jayanti' in Marathi, 'Bichu' in Hindi and 'Egyptian pea' in English. Traditionally the plant is used in the treatment of inflammatory rheumatic conditions, diarrhoea, in excessive menstrual flow, to reduce enlargement of spleen and in skin diseases [5]. *S.sesban*has proved to be extremely popular due to its fast growth and because of its wide use as fuelwood and fodder. It has also proved to be extremely tolerant of a wide range of habitats such as saline, waterlogged etc., Being a legume, the tree fixes nitrogen and has proved to be popular as a fallow species and as a agroforestry species. The leaves are compound 12-18 cm long made up of 6-27 pairs of leaflets. The raceme has 2-20 flowers which are yellow with purple or brown streaks on the corolla. Pods are sub-cylindrical, straight or slightly curved up to 30 cm long and 5 mm wide containing 10- 50 seeds. The present study includes Macroscopic, microscopic and physicochemical analysis of stem of *S.sesban*.

MATERIALS AND METHODS

Plant material

Stem portion of *S.sesban*was collected sufficiently for all the experiments in a single lot and their authenticity was confirmed by the Botanical Survey of India, Coimbatore, India.

Pharmacognostic studies
The stem was dried under shade, powdered, stored in airtight containers and used for microscopicalpowder study, physico-chemical evaluation, histochemicaland fluorescence analysis.

Organoleptic evaluation
The colour of the outer and inner surface of the fresh and dried stem was observed. The texture and odour of the fresh, dried stem and the powder was studied.

Microscopical study
Cross sections of the stem were prepared and stained with reagents as per the standard procedure [6]. The sections were observed under the light microscope Olympus (10X). Powder characteristics were observed under the low power (10X) and subsequently under high power (40X), after stained with saffranin.

Physico-chemical studies
The percentage of foreign matter, loss on drying, total ash and acid insoluble ash were determined according to the method described in WHO guidelines on quality control methods for medicinal plants materials [7].

Fluorescence analysis
The stem powder was treated with different chemicals and seen under the normal light and UV radiations at 254 and 365 nm wavelengths as per the standard procedure. The colour development under the day light was also observed for the presence of various phytochemical compounds.

RESULTS AND DISCUSSION

Fresh bark was moist, the outer surface of the strip was light green and inner surface was white in colour. Dried bark was hard and the outer surface was yellow green and inner surface was white in colour.

Table -1 Organoleptic characters of stem of *Sesbania sesban*

S. No.	Character	Observation		
		When fresh	After drying	Powder
1	Colour	Light Green	Yellow Green	Yellow
2	Texture	Thick Hard	Hard fibrous	Coarse Powder
3	Odour	Characteristic	Characteristic	Characteristic

The cross section of the stem exhibited different layers such as epidermis, cortex, vascular elements and pith[8].The cortex portion showed different colour development when stained with different reagents. When stained with Dragendorf's reagent the cortex was red in colour. This positive reaction indicated the presence of alkaloids (Fig.1).When ammonium hydroxidewas added the cortex became yellow in colour and this confirmed the presence of flavonoids (Fig.2). The addition of ferric chloride resulted in the brown colour. This showed the localization of phenols in the cortex. These results provide a good reason for the wide use of this plant for pharmaceutical purposes.Histochemical reagents assisted in revealing thatterpenes, alkaloids, and tannins are mainly producedwithin the leaf cells and the secretory hairs. Although the reagents usedpresent medium specificity, if matched by controlsthey are considered as standard for such investigations. Production ofterpenes, flavonoids, and phenolic compounds seemsto a part of the leaf's defensive responseagainst the arid and hot environment [9].

The powder microscopy of the stem powder of *S.sesban* showed the presence of cork cells, stone cells, pitted xylem vessels, sclereids, starch grains, raphides, organic materials etc.,[10,11] (Fig.3).

Physico-chemical studies were conducted with the stem powder of *S.sesban* showed that the loss on drying was only 8.90%. The physico-chemical parameters are helpful in judging the purity and quality of the drug [12]. The percentage of active principles in the plant is determined only in the dry condition. Hence, the moisture lost percentage is very important to decide about the condition of the crude drug. The moisture should be kept minimum to prevent the drug from various kinds of decomposition. The percentage of ash was 5.93 and acid insoluble ash was 0.51. The total ash and the acid insoluble ash indicate the presence of any foreign matter, inorganic composition and purity of the drug. The low value in the stem powder showed that the sample is free of any foreign matter.

Extractive values are primarily useful for the determination of exhausted or adulterated drugs. The extractive value of the crude drug determines the quality as well as purity of the drug. Thus, alcohol and water soluble extractive values were determined.

Table 2- Physico-chemical studies of powdered stem of*Sesbania sesban*

S. No.	Parameter	Result (%)
1	Ash (% w/w)	5.93
2	Acid insoluble ash (% w/w)	0.51
3	Loss on drying	8.90
4	Water soluble extract	10.34
5	Alcohol soluble extract	5.76

The histochemical examination of the powder showed the colour development for the respective compounds such as black colour for the starch, orange yellow for the tannins and dark yellow for the crystals.

Table 3- Histochemical analysisof powdered stem of *Sesbania sesban*

S. No.	Sample	Observation in day light	Result
1	Powder + Sudan III	Dark Red	Presence of oil globules and crystals
2	Powder + Iodine solution	Black	Presence of starch
3	Powder + Silver nitrate	Precipitate formation	Presence of protein
4	Powder + HCl	Dark Yellow	Presence of crystals
5	Powder + HNO_3	Black	Presence of starch
6	Powder + H_2SO_4	Orange Yellow	Presence of tannins

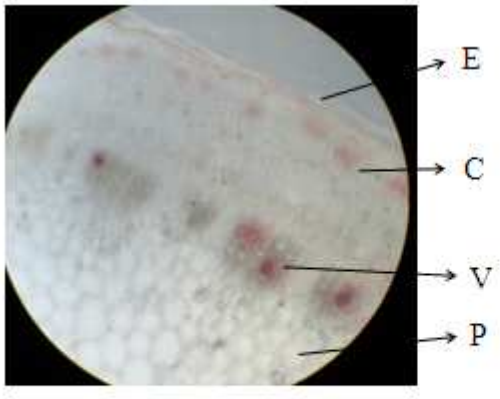

Fig.1 C.S of stem stained with Dragendorf's reagent (10X)

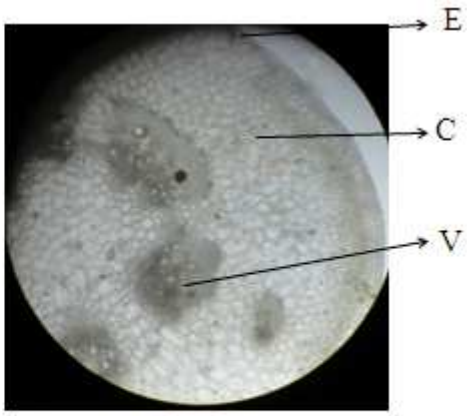

Fig.2 C.S of stem stained with ammonium hydroxide (10X)

(E- epidermis, C- cortex, V- vascular elements, P- pith)

Table 4- Fluorescence analysis of powdered stem of*Sesbania sesban*

S. No.	Sample	Day Light	UV light at 254 nm	UV light at 365 nm
1	Powder as such	Pale Brown	Light Green	Pale Brown
2	Powder + Water	Light Yellow	Lemon Yellow	Lemon Yellow
3	Powder + HCl	Dark Yellow	Lemon Yellow	Yellow
4	Powder +HNO_3	Orange Yellow	Yellow Green	Grass Green
5	Powder +H_2SO_4	Black	Deep Blue	Dark Brown
6	Powder + NaOH	Brown	Dark Green	Brown Yellow
7	Powder + alc. NaOH	Yellow	Lemon Yellow	Lemon Yellow
8	Powder + alc. KOH	Yellow	Grass Green	Lemon Yellow
9	Powder + Acetic acid	Light Brown	Pale Green	Pale Brown
10	Powder + Picric acid	Yellow	Blue Green	Lemon Yellow
11	Powder + Ferric chloride	Dark Brown	Dark Brown	Dark Brown
12	Powder + Iodine solution	Brown Black	Pale Yellow	Pale Yellow
13	Powder + Ammonia	Pale Brown	Lemon Yellow	Lemon Yellow
14	Powder + Ethanol	Pale Brown	Lemon Yellow	Lemon Yellow
15	Powder + Methanol	Pale Brown	Lemon Yellow	Lemon Yellow

The fluorescence analysis was done and observed in the day light and UV light in order to find out the presence of any adulterants and specific compounds. The exposure of the powder to UV light revealed the development of respective colours. Some crude drugs are often assessed qualitatively in this way and it is an important parameter of pharmacognostical evaluation.

Today, natural products derived from plants are being tested for the presence of new drugs with new modes of pharmacological action, utilizing the special feature of higher plants to produce a large number of secondary metabolites [13].The studies such as physical evaluation, preliminary phytochemical test andFluorescence analysis add to the quality control and quality assurance for proper identification of the plant [14].

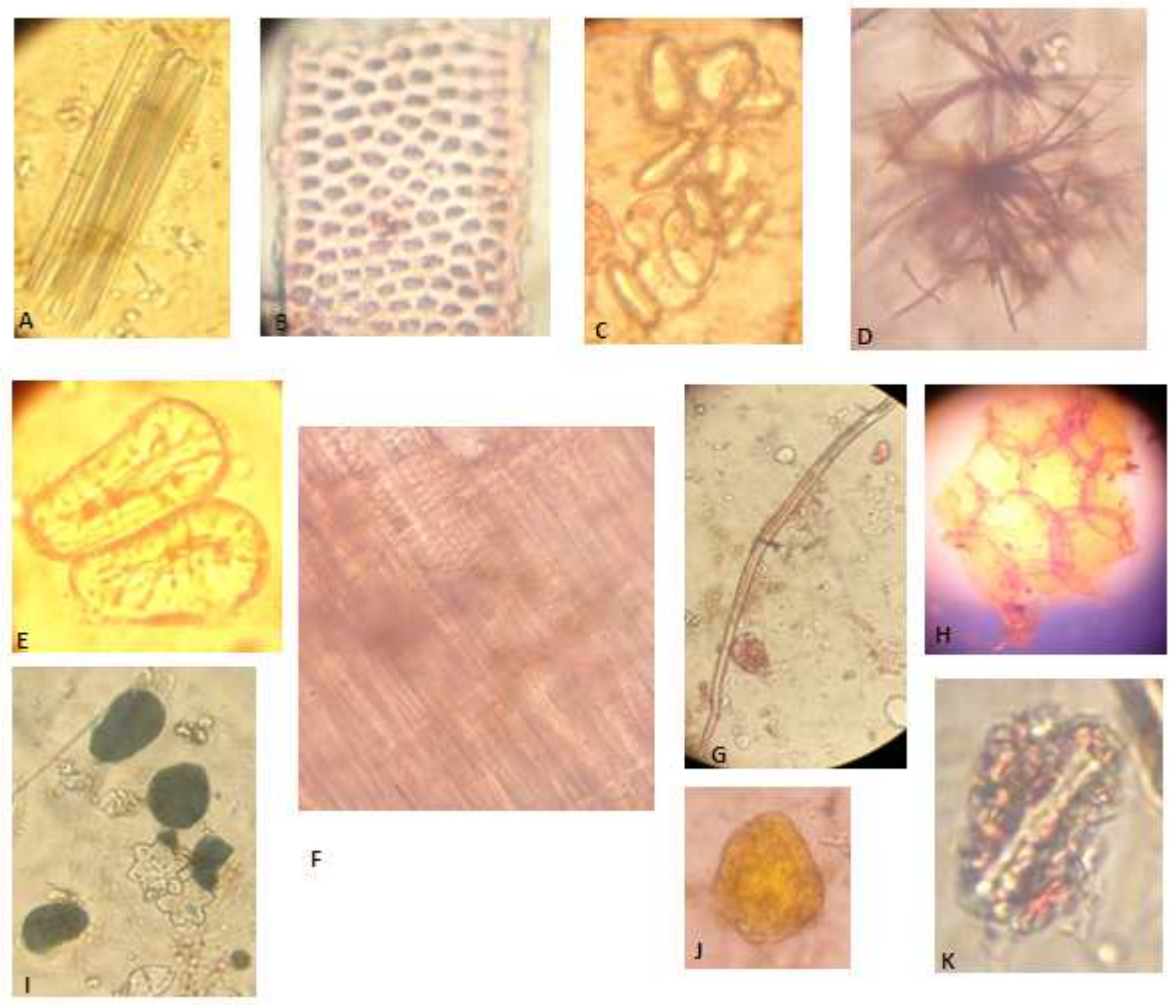

Fig.3 Powder characteristic of *Sesbania sesban* stem (40X) : A-raphides, B- pitted xylem vessel, C- laticifers showing articulations and sclereids, D- asteroscleroid, E- stone cells, F- stem portion showing xylem vessel, G- libriform fibre, H- cork cells , I- starch grains, J- tannin, K- osteosclereid.

CONCLUSION

Establishing the standards is an essential step to identify the quality and purity of the drug. This can be achieved through the pharmacognostical and phytochemical analysis. The study undertaken with the *Sesbania sesban* stem revealed different parameters that will be useful in scientific evaluation, identification and authentication of the drug.

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