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PHARMACOGNOSTICAL EVALUATION OF *SESBANIA PROCUMBENS*

V. Leslie^{*1}, Gurfateh Singh¹, S. Aron¹

¹*University School of Pharmaceutical Sciences, Rayat- Bahra University, Chandigarh-Ropar Highway, VPO Sahauran, Mohali, Punjab, India.

ABSTRACT

The nature has provided a complete depot of remedies to cure sicknesses of manhood. About 80 - 90 per cent of the world's population depends partly or exclusively on traditional medicine for its major health care needs. Herbal or plant medicines as the foremost therapy in traditional medical system have been used in clinical practice for many of years and have made a great support to maintain human health care. The present study revealed that a detailed pharmacognostical and phytochemical, morphological and microscopical and histological studies of the leaf stem and fruit, of the plant, *Sesbania procumbens*. The parameters presented in this study may be proposed to create the reality of leaf, root, stem and fruit of *Sesbania procumbens* and it may probably aid to differentiate the phytochemical, morphological and microscopical from its other species.

KEYWORDS

Sesbania procumbens, Histological, Pharmacognostical and Phytochemical.

Author for Correspondence:

Leslie V,
University School of Pharmaceutical Sciences,
Rayat- Bahra University,
Chandigarh-Ropar Highway,
VPO Sahauran, Mohali, Punjab, India.

Email: lesliempharm@gmail.com

INTRODUCTION

Naturally available medicinal plants and plant products are commonly playing a significant part in traditional medicines projected for the therapy of various kind health problems. But a crucial difficulty, which has delayed the promotion in the usage of substitute medications in the developed countries, is absence of evidence of certification and lack of inflexible quality control measures on the alternative medications. Due to this concern, it is now relatively needed to create an assurance about the standardization of the herbal plants and its parts to be used similar to a medicine. The various techniques and methodology are used for the

process of standardization like pharmacognostic and phytochemical approach on herbal plants. These available techniques and methods are helpful in identification and standardization of the plant components¹.

As a consequence of this purpose, we have accomplished pharmacognostic studies of *Sesbania procumbens* (Synonyms: *Aeschynomene procumbens*) Common known as *Trailing Sesban* belongs to family Fabaceae *Trailing Sesban* is an erect prickly annual herb, 1-1.5m tall. Branchlets are hairless, triped; leaves compound. up to 15cm long. Leaflets are linear, 1-1.5cm long, 2-5mm wide, blunt, with rounded base. Flowers are yellow, borne in pairs in leaf axils. Pods are straight, erect, torulose, up to 25cm long, beaked, seeds small, many. *Trailing Sesban* is a common weed of cultivated land and wasteland. *Trailing Sesban* is endemic to Peninsular India. Flowering: September-April. (www.flowersindia.net).

A literature review and scientific data states that lot of natural herbal medicines have already been explored as respects of their botany and chemistry, though a systematic standardization including Pharmacognostical, phytochemical and microscopically study is quiet lacking. Therefore the present study of *Sesbania procumbens*. [Fabaceae] is carried out to found certain botanical and chemical standards which might be helpful in identification of crude drug, testing of its adulteration, if any and also it would significantly provide in quality assurance of completed products of herbal drugs which is exposed to preliminary phytochemical screening according to their standard methods².

MATERIAL AND METHODS

Collection of specimens

Branchlets of *S. procumbans* are hairless, tripped; leaves compound. Up to 15cm long. *S. Procumbens* Leaflets are linear in size and it is 1-1.5cm long, 2-5mm wide-ranging, blunt, with rounded base. *S. procumbans* flowers are yellow in colour, borne in pairs are in leaf axils. Pods of the *S. procumbans* are straight, rigid, torulose, up to 25cm lengthy,

curved; seeds are small in size, many in numbers. Sprawling *Sesban* is a common weed of cultivated in land and also in waste land.

Sectioning

The essential samples of different parts were cut and removed from the plant and fixed in FAA solution (Formalin - 5ml + Acetic acid - 5ml +70% ethyl alcohol - 90ml). After 24 hours of fixing the specimens of selected parts were dehydrated with graded series of tertiary - Butyl alcohol as per the procedure given by (Sass, 1940). Infiltration of the specimens was carried out by slowly added by a paraffin wax (melting point 58-60 c) until TBA solution reached super saturation. Finally the selected specimens were cast into paraffin blocks.

For reviewing the stomatal morphology of the selected plant, venation pattern and trichome distribution, paradermal sections (sections taken parallel to the surface of the leaf) are carried out by clearing of leaf with 5% sodium hydroxide or epidermal peeling by partial maceration employed by using of prepared Jeffrey's maceration fluid³. Glycerine mounted temporary preparations were made for macerated materials of the specimen samples and the powdered materials of different parts of the specimens were cleared with NaOH solution and mounted in glycerine medium after completion of staining procedure. At the end different cell component of specimens were studied and measured.

Photomicrographs

Microscopic images of tissues are added with micrographs wherever needed. Photographs of different magnifications of tissues were taken with Nikon lab photo 2 microscopic units. For normal observations of the images a bright field was used. For the study of crystals, starch grains and lignified cells, polarized light was used. Subsequently these structures have birefringent property, under polarize light they appear bright against dark background. The magnifications of the figures are showed by the scale-bars. Descriptive expressions of the anatomical features are as given in the standard anatomy books.

Macroscopic and microscopic analysis

The macroscopic and microscopy of the plant were studied according to the method developed by⁴. Cross sections were prepared and stained for the microscopically study as per the standard procedure described (Johannes, 1940)⁵. The micro-powder analysis was done according to the established method⁶.

Physicochemical analysis

Physicochemical values such as the percentage of ash values and extractive values were performed according to the official methods prescribed in Indian pharmacopoeia⁷ and the WHO guidelines on quality control methods for medicinal plant materials.

Preliminary phytochemical screening:

Preliminary phytochemical analysis was carried out by using standard procedures described by Harborne⁸.

RESULTS AND DISCUSSION

Anatomy of the leaf

The leaflet is uniformly thin and smooth on the surfaces. The midrib is slightly projecting on the adaxial part and smooth on the abaxial part. The leaf margin are bluntly conical. The epidermal layers are well preserved on both adaxial and abaxial sides (Figure No.1.1).

The midrib is small, conical and collateral in structure. It consists of a few short radial compact angular and thick walled xylem elements and on the abaxial side of the xylem occur small phloem elements distributed in three or four small units. The protoxylem is facing the adaxial side. The vascular bundle is a single layer of side angular vascular bundle sheath. (Figure No.1.2)

Lamina

The lamina includes very large spindle shaped adaxial and abaxial epidermal cells. Stomata occur both on the adaxial and abaxial epidermal layers, so the lamina is amphistomatic. (Figure No.2.2). The mesophyll tissue consists of single layer of wide and short palisade cells along the adaxial part. The spongy mesophyll consists of three or four lobed parenchyma cells with wide air chamber. (Figure

No.2.1 and Figure No.2.2). Small vascular strands with adaxial xylem and abaxial phloem units are seen in the middle part of the lamina. The vascular strand has prominent parenchyma bundle sheath and the lamina is 160 μ m thick. (Figure No.2.1).

Petiole

The petiole is rectangular with thick adaxial lobes and smaller abaxial lobes (Figure No.3.1). The petiole is 800 μ m thick in transverse plane. There is a small horizontally wide empty space in the adaxial part of the petiole. The petiole consists of small epidermal or circular slightly thick walled epidermal cells. The outer ground tissue includes thin cylinder of aerenchymatous parenchyma. There are cylindrical or circular cells with wide air chambers (Figure No.3.2). The vascular system of the petiole in multi stranded comprising 5 outer rings of bundles and one μ m thick and prominent central bundle. All the bundles are collateral with protoxylem facing the center. Phloem occurs in small group of sieve elements on the outer part of the vascular bundle sheath (Figure No.4.1 and Figure No.2).

Stem

The stem is more or less circular with five thin and wide ridges and one lateral thick ridge (Figure No.5.1 and Figure No.5.2). The stem is 2.3mm in diameter. The epidermal layer has small Squamish thin walled epidermal cells. The cortical zone consists of wide portion of parenchymatous cells and collenchymatous cell among the ridges. Inner to the cortical zone, occurs wide secondary phloem, where the sieve elements are also thick blocks of sclerenchyma cells located alternating with phloem elements. Secondary vascular tissues are seen along one parts of the stem. It includes secondary xylem with radial files of the fibres and short xylem rays. There are also wide angular thick walled primary xylem vessels in the inner part and small angular vessels in the outer part (Figure No.6.1 and Figure No.6.2).

Stomata

Stomata occurs both on the lower and upper part of the lamina. The epidermal cells are wide thin walled with wavy anticlinal walls. The stomata

were few and the guard cells are elliptical. The stomata are anisotypic with three unequal subsidiary cells surrounding the stomata (Figure No.7.1 and Figure No.7.2). The stomata are narrowly elliptical with slit like stomatal aperture. (Figure No.7.2 and Figure No.8.1). There are numerous circular tanniferous dark bodies distributed in the mesophyll tissue. The tannin containing cells are surrounded by radial circle of the triangular cells (Figure No.8.2). The tannin bearing cells are 30 µm diameters in size.

Fruit

The fruit is circular in cross sectional outline with wide splits on two opposite sites. The fruit is bicarpellary and syncarpous (Figure No.9.1). The pericarp consists of thin narrow epidermal cells and four or five elliptical mesocarp region and prominently wide tangentially elongated thin walled cells having tannin bodies. The endocarp region includes three or four radially elongated parenchyma cells and small vascular bundles are seen in the endocarp region (Figure No. 9.2).

The seeds are attached on the central vascular placental tissues. The seed has thick semi-circular band of sclerenchyma cells and vertically elongated compact parenchyma cells (Figure No.10.1 and 10.2). When the fruit matures the two seeds separate from each other and the seeds are left out (Figure No.11).

Flower

The flower consists of *papilionaceous corolla*. The flower is bisexual and polypetalous. The corolla is differentiated into standard petal, wing petal and keel petal. Androecium consists of ten stamens which are divided into one bundle of many stamens and one solitary stamen. The gynoecium has monocarpellary ovary with single vertically elongated chamber and numerous ovules on marginal placentation (Figure No.12.1 and 12.2). The sepal has thick vertically oblong outer epidermis and narrow small called inner epidermis. The mesophyll tissue includes four or five circular compact parenchyma cells. The wing petal has thick semi-circular ridges and deep furrows. It has thick wide epidermal layer and two or three palisade cells

(Figure No.13.1 and 13.2). In the lower part of the sepal the inner and outer layer of epidermal layer project in to hemi-circular or conical cells. (Figure No.13.2).

The gynoecium has thick cylindrical long ovary with single vertical wide ovary chamber with in the ovary chamber are seen vertical row of thick conical ovules which are attached on the marginal part some of the ovules have embryo sac (Figure No.14.1 and 14.2).

The anthers of the androecium are ditheous two chambered structure with thick radially long epidermal cells. The pollens are located within the pollen chamber. (Figure No.15.1 and 15.2).

The pollen grains are triangular and circular. The exine layer of the pollen is smooth. The ovary in cross section appears circular with wide carpellary chamber. The ovary consists of thick papillae epidermal cells and 4 or 5 layers of circular compact parenchyma cells. (Figure No.16.1 and 16.2). The pollen grains are 15µm diameters in size.

Table No.1: Preliminary phytochemical screening of the plant *S. procumbens*

S.No	Compounds	Leaf	Stem	Flower	Fruit	Seeds
1	Carbohydrate	+	+	+	+	+
2	Flavonoids	+	+	+	+	+
3	Fixed oils and fat	+	+	+	+	+
4	Volatile oil	+	+	+	+	+
5	Saponins	+	+	+	+	+
6	tannins	+	+	+	+	+
7	Phytosterols	+	+	-	-	-
8	Phenolic compounds	-	-	-	-	-

+ denotes the presence of the respective group of compounds.

-denotes the absence of the respective group of compounds.

Table No.2: Ash values of the leaf, stem, flower, fruit and seed powder of *S. procumbens*

S.No	Parameters	Value % w/w				
		Leaf	Stem	Flower	Fruit	Seeds
1	Total ask	13.32	10.39	13.43	12.12	14.32
2	Acid insoluble ash	6.44	3.73	5.45	4.75	3.43
3	Water soluble ash	5.32	6.34	4.31	4.32	6.46
4	Sulphated ash	19.64	17.64	21.63	20.56	22.63

Table No.3: Extractive values of the leaf, stem, flower, fruit and seed powder of *S. procumbens*

S.No	Parameter	Value % w/w				
		Leaf	Stem	Flower	Fruit	Seeds
1	H2O soluble extractive	6.72	4.45	3.64	5.23	4.32
2	Ethanol soluble extractive	5.56	3.83	4.02	4.54	5.32
3	Ether soluble extractive	1.31	0.72	0.53	0.42	0.62

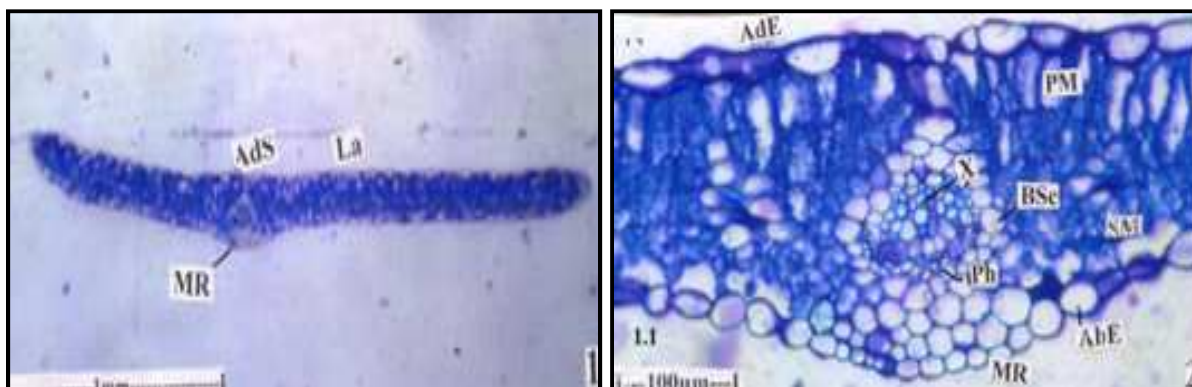


Figure No.1: T. S of leaflet entire view Figure No.1.1: T. S of lamina through Midrib

Figure No: 1: Microscopic evaluation of *S. Procumbens*

[AbE- Abaxial Epidermis, AdE- Adaxial Epidermis; AdS- Adaxial side; BSc- Bundle Sheath cells; La- Lamina; MR- Mid Rib; Ph- Phloem; PM- Palisade Mesophyll; SM- Spongy Mesophyll; X- Xylem]

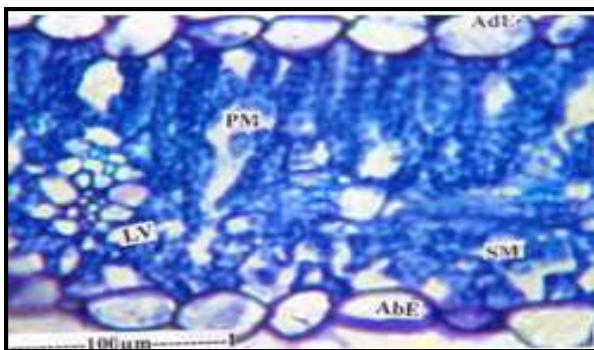


Figure No.2.1: T. S of lamina with lateral vein

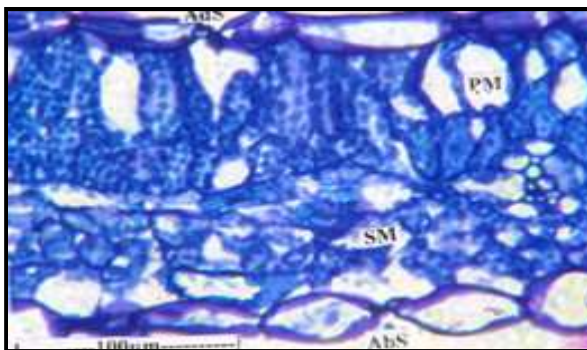


Figure No.2.2: T. S of lamina showing amphistoma

[AbE- Abaxial Epidermis; AbS- Abaxial Side; AdE- Adaxial Epidermis; AdS- Adaxial Side; Ep- Epidermis; LM- Leaf Margin; LV- Lateral Vein; PM- Palisade Mesophyll; SM- Spongy Mesophyll.]

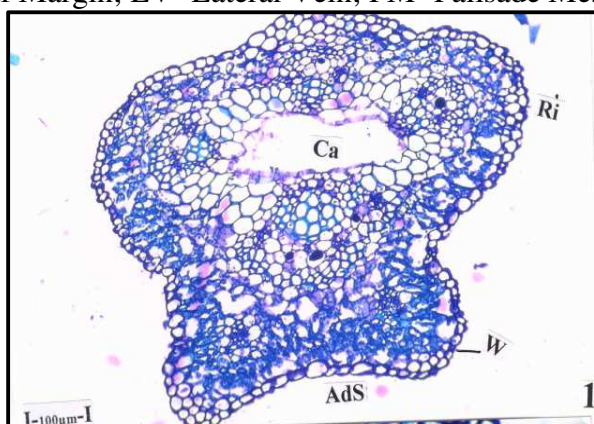


Figure No.3.1 T.S of petiole entire view showing the vascular system

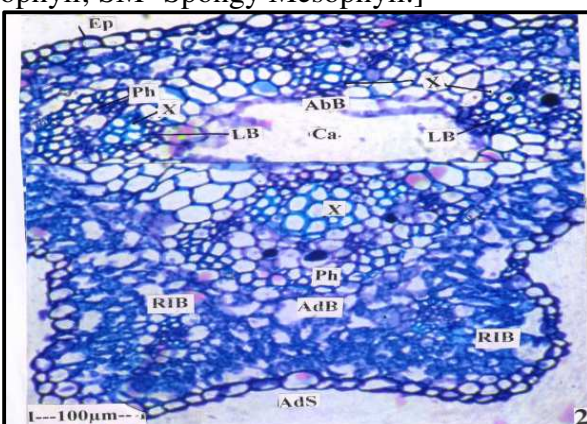


Figure No.3.2: T.S of petiole enlarged

[AbB- Abaxial Bundle; AdB- Adaxial Bundle; AdS- Adaxial Side; Ep- Epidermis; Ca- Cavity; LB- Lateral Bundle; ph- Phloem; RIB- Ridge Bundle; W- Wing; Ri- Ridge; X- Xylem]

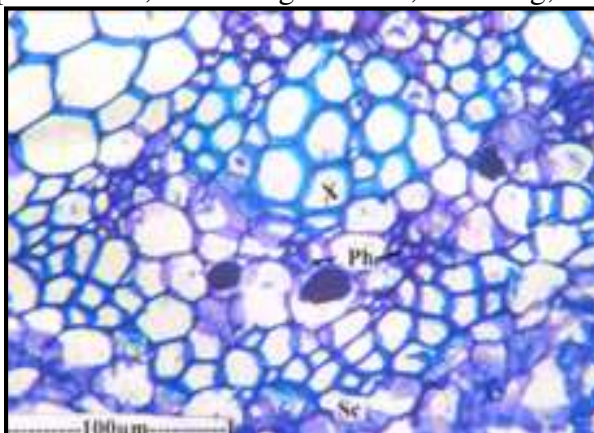


Figure No.4.1: T.S of petiole - Abaxial vascular bundle

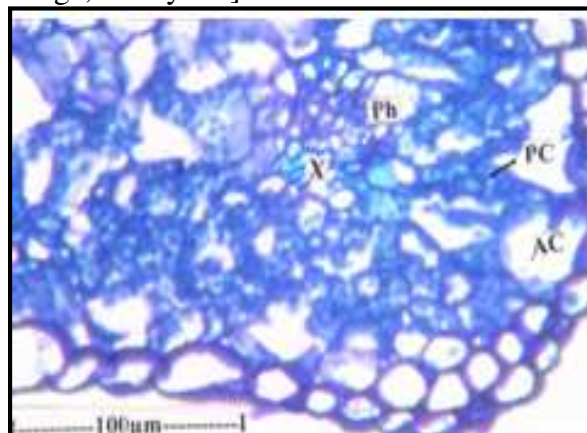


Figure No.4.2: Wing vascular bundle

[AC- Air Chamber; Ep- Epidermis; PC- Palisade cell; ph- Phloem; SC- Sclerenchyma; X- Xylem]

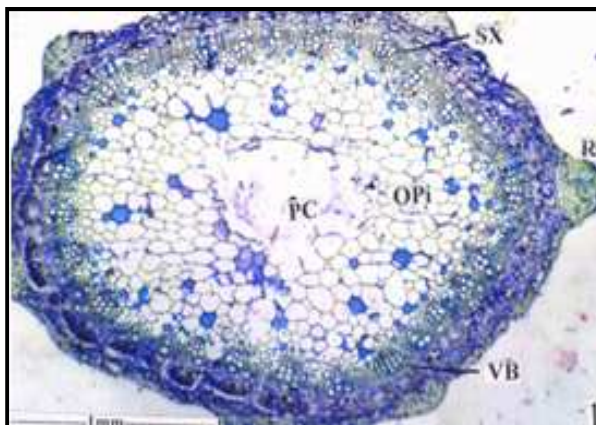


Figure No.5.1: T.S of stem entire view

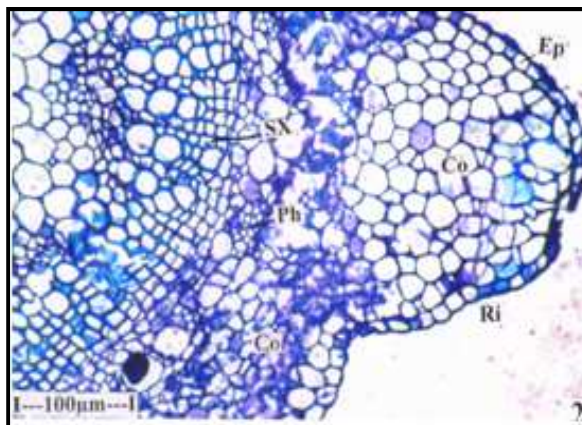


Figure No.5.2: Ridge portion of the stem enlarged

[CO- Cortex; Ep- Epidermis; PC-Pith Cavity; OPI- Outer Pithy; ph- Phloem; Ri- Ridge; SX- Secondary Xylem; VB- Vascular Bundle]

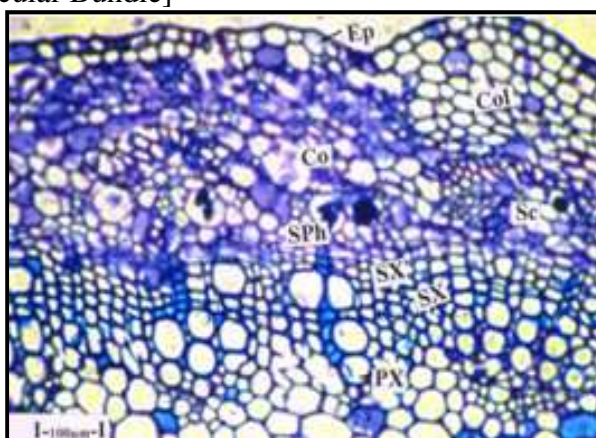


Figure No.6.1: T.S of stem a sector enlarged stem

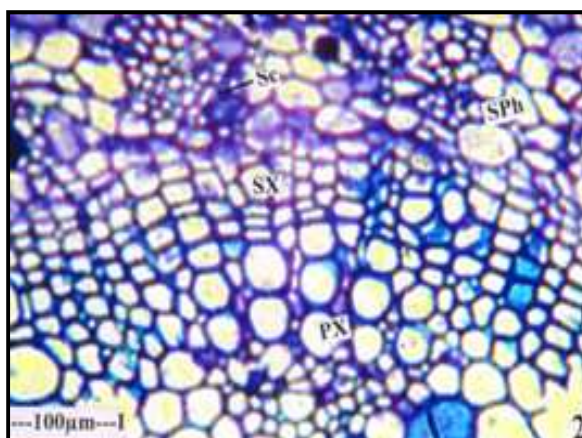


Figure No.6.2: Vascular bundle of the enlarged

[Col- Collenchyma; CO- Cortex; Ep- Epidermis; PX- Protoxylem; SC- Sclerenchyma; SX- Secondary Xylem; Sph- Secondary Phloem]

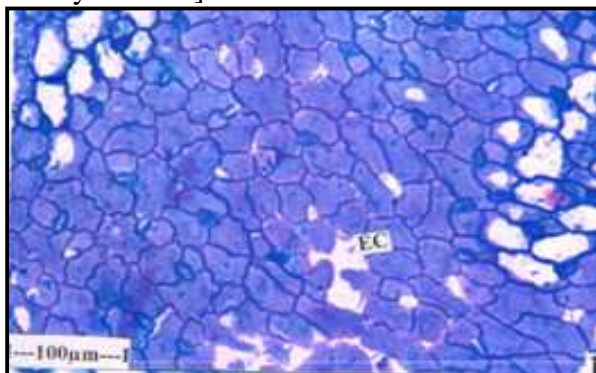


Figure No.7.1: Paradermal section of the abaxial epidermis showing stomata and epidermal cells

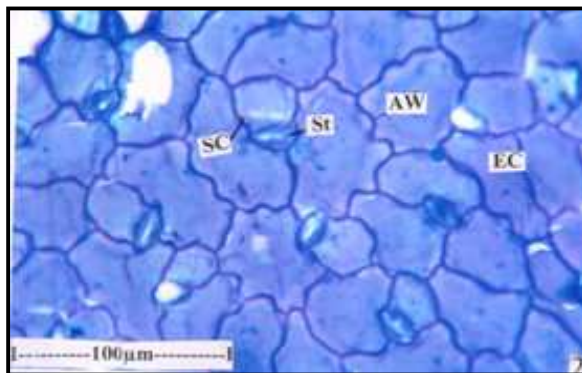


Figure No.7.2: Surface view of the stomata and epidermal cells enlarged

[AW- Anticlinal Wall; EC- Epidermal cell; SC- Subsidiary cell; St- Stoma]

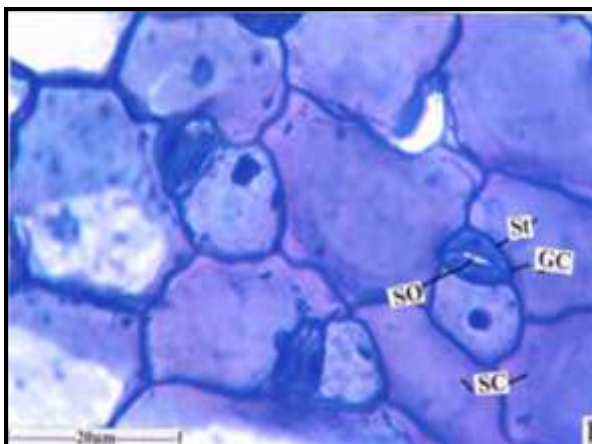


Figure No.8.1: Three Stomata enlarged With anisocytic subsidiary cells

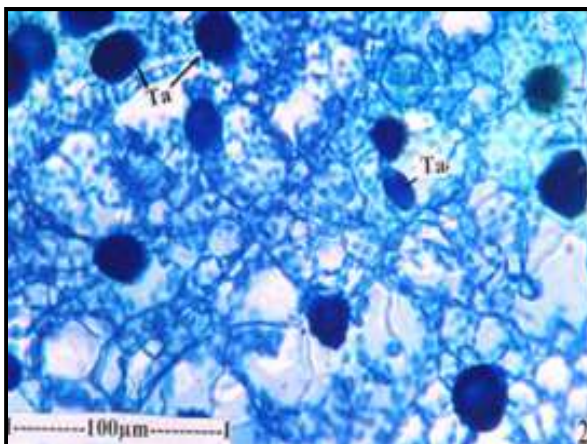


Figure No.8.2: Mesophyll II tissue of the leaf with tannin containing bodies

[GC- Guard cell; SO- Stomatal Opening; St- Stoma; SC- Subsidiary cell; Ta- Tannin containing cells]

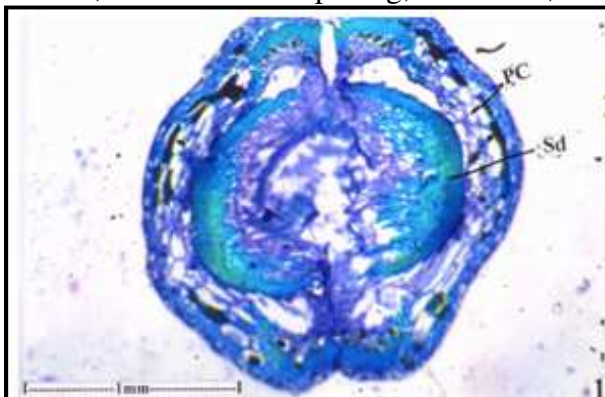


Figure No.9.1: T. S of fruit entire view seed

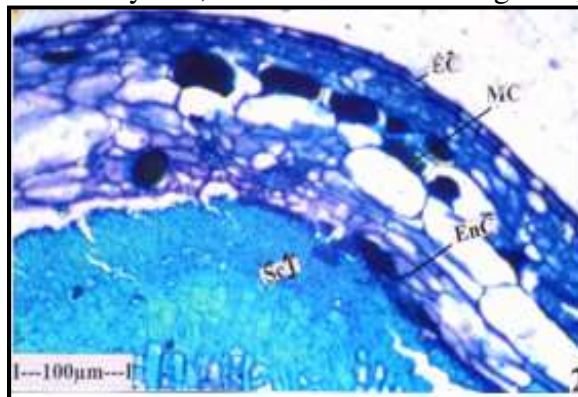


Figure No.9.2: A sector of the fruit with

[EC- Epicarp; EnC- Endocarp; MC- Mesocarp; PC- Pericarp; Sd- Seed; SaT- Sarco Testa; ScT- Sclero Testa]

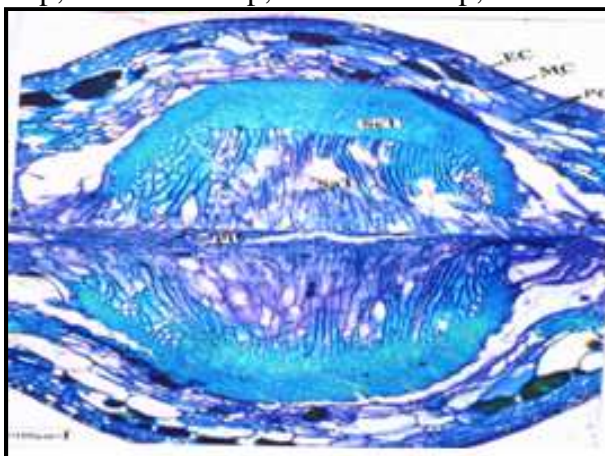


Figure No.10: T. S of legume- enlarged

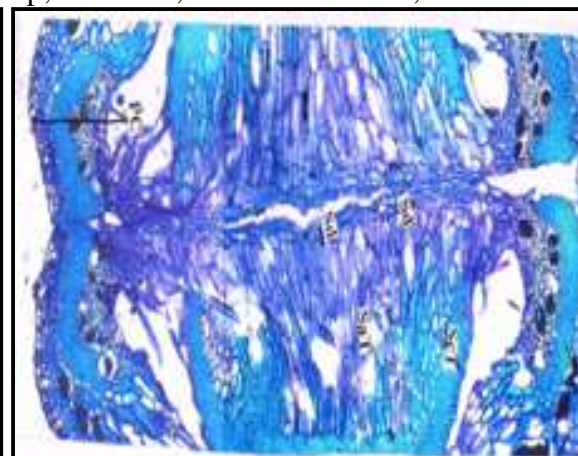


Figure No.11: T. S of legume showing the Central median placental tissue

[EC- Epicarp; MC- Mesocarp; PC- Pericarp; SaT- Sarco Testa; ScT- Sclero Testa; Pl- Placentum][EC- Epicarp; MC- Mesocarp; PC- Pericarp; Sd- Seed; SaT- Sarco Testa; ScT- Sclero Testa; SC- Sclerenchyma]

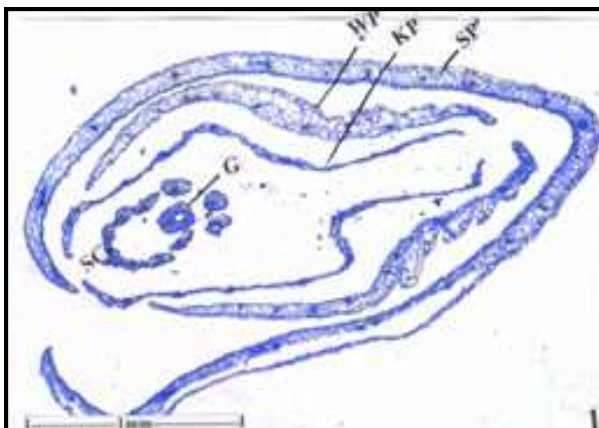


Figure No.12.1: T. S of flower

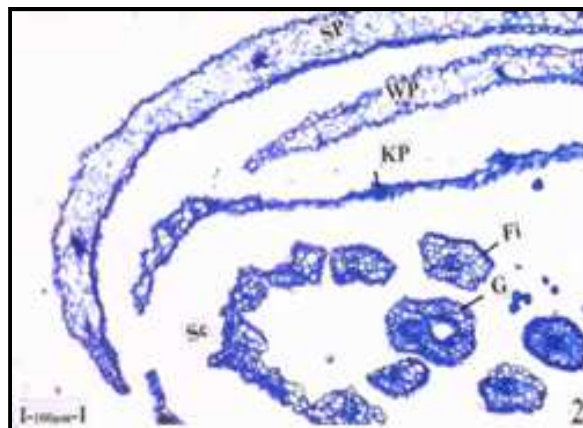


Figure No.12.2: T. S of sepals- enlarged

[G- Gynoecium; Fi- Filament; KP- Keel petal; SC- Stominal column; SP- Standard petal; WP- Wing petal]

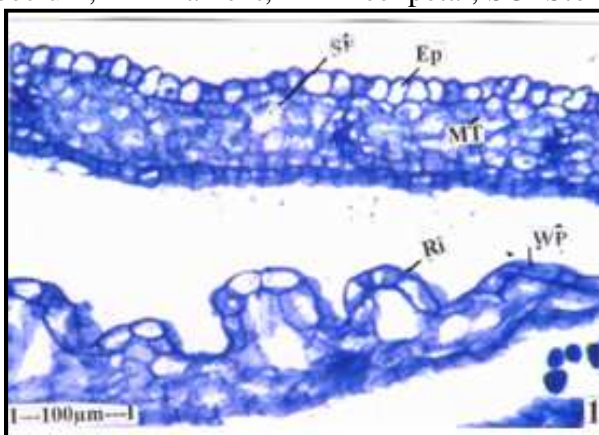


Figure No.13.1: T. S of sepal and petal enlarged

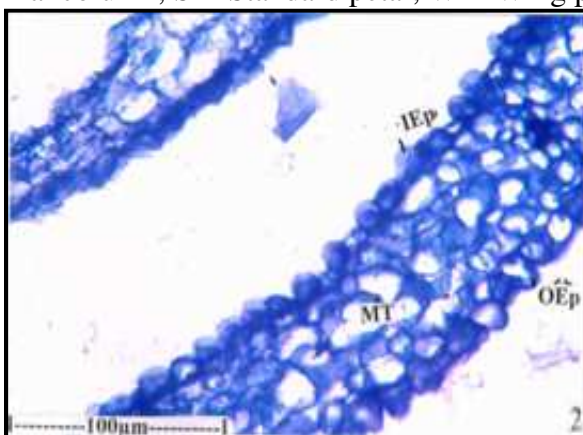


Figure No.13.2: T. S of sepal further enlarged

[Ep- Epidermis; IEP- Inner Epidermis; OEp- Outer Epidermis; MT- Mesophyll tissue; Ri- Ridge; SP- Spongy parenchyma; WP- Wing petal]

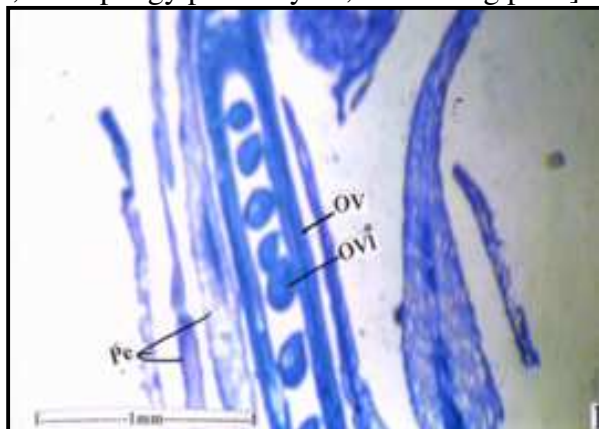


Figure No.14.1: L. S of ovary showing marginal ovules

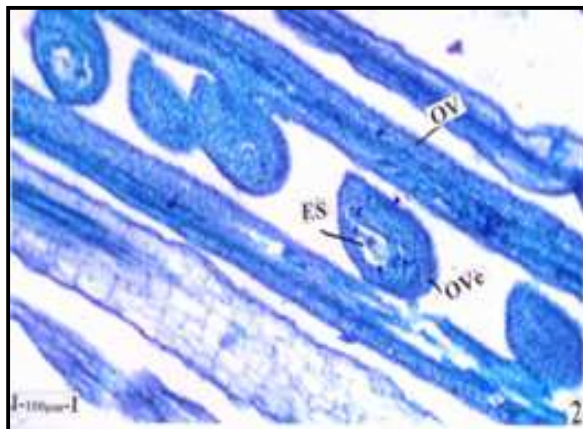


Figure No.14.2: L. S of ovary and ovules enlarged

[ES- Embryo Sac; Ovi- Ovule; OV- Ovary; Pe- Perianth]

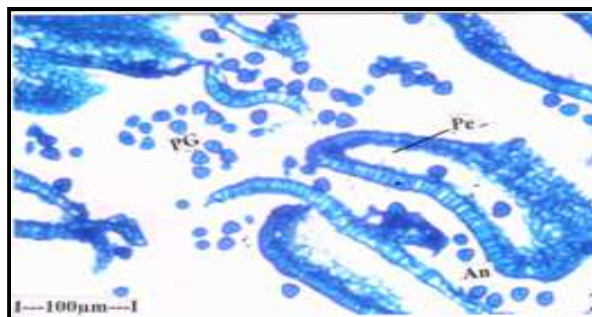
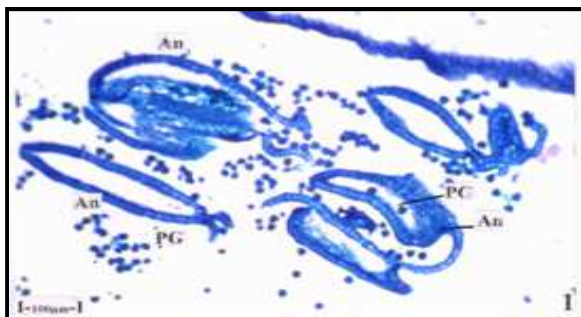


Figure No.15.1: T. S of anthers with pollen grains **Figure No.15.2: One anther and pollen grains enlarged**

[An- Anther; PC- Pollen Chamber; PG- Pollen Grains]

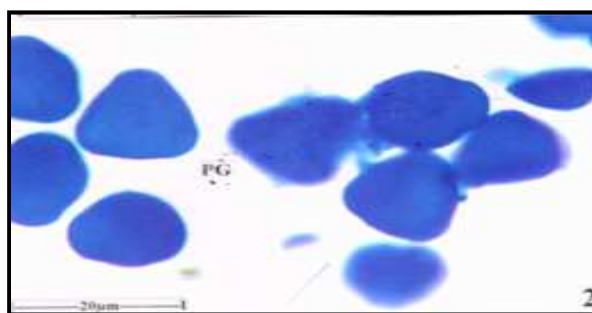
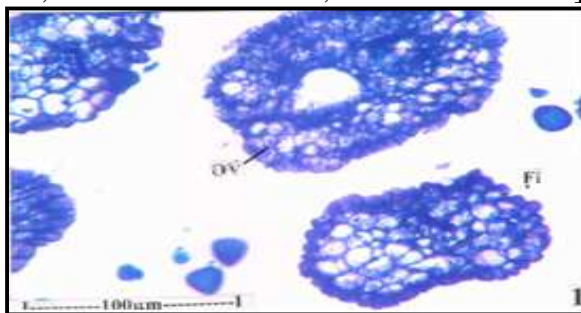


Figure No.16.1: T.S of Ovary

Figure No.16.2: Pollen grains enlarged

[Fi - Filament; OV- Ovary; PG- Pollen Grains]

CONCLUSION

The leaves, stem, fruit, flower and seeds of *S. Procumbens* were ethno-medically used by local people to treat various diseases without standardization. The standardization of a crude drug is an important part to launch the correct identity and authenticity of this medicinally useful plant of *S. procumbens*. The results of these investigations could notify about the proper identification, collection and exploration of the selected plant. The pharmacognostic features explored on *S. Procumbens* in the current study may serve as tool for validation of the raw material and its standardization.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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