Morphological, Anatomical and Preliminary Phytochemical Study of *Sesbania grandiflora* (L.) Poir. in Sagaing University Campus

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Abstract

Sesbania grandiflora (L.) Poir belonging to family Fabaceae, is an important medicinal plant in the tropical regions. In the present study the morphological, anatomical and preliminary phytochemical screening of *Sesbania grandiflora* (L.) Poir leaves and flowers were investigated through phytochemical tests. The specimens were collected from Sagaing University Campus from June to July 2023. The collected plant was identified by Backer (1946) and fully described with color photographs. Morphology of both vegetative and reproductive parts of the plant and anatomy of the leaves (lamina, midrib and petiole), stems and roots were studied and described by the methods of Metcalfe & Chalk (1950). The dried powder of leaves and flowers was examined. Various methods of preliminary phytochemical analysis showed that proteins, glycosides, phenols, flavonoids, tannins, alkaloids, starchs, carbohydrates, saponins were present and reducing sugars were absent in leaves and flowers. Phytochemical characters were studied by the method of Harbone (1991).

Introduction

The present research paper deals with the study on morphological, anatomical and preliminary phytochemical characters of *Sesbania grandiflora* (L.) Poir, belonging to the family Fabaceae. The plant was collected and studied from Sagaing University Campus.

In India, Fabaceae is represented by over 100 genera and 750 species, with variety of habitats. The members of family are distributed in plain as well as hilly areas (Reddy, 2008).

Plant anatomy plays an important role in the understanding of plant biology. The anatomical characters are very usefully informative for identification and classification. (Mathew *et al*., 2014).

The phytochemical constituents are mainly secondary metabolites secreted by all plants in small quantities. These compounds play a significant role in survival of the plants under harmful conditions and also in the protection from microbes. Research around the globe has proved that the phytochemicals from the plants possess various medicinal properties. Hence the phytochemical screening is necessary to find out the bioactive profile of plants having therapeutic significance (Funk *et.al*, 2005).

The flower of *Sesbania grandiflora* is also utilized make various popular human dishes such as a favourite South India dish Agathi Kerrai. The leaves of this plants are used for treating fever, itchiness, respiratory disorder, diuretic, purgative, anthelmintic. (Prodip Roy & Soumi chattopadhyay, 2021).

The aims and objective of this study are to provide the application of morphological and anatomical characters for standardization of crude drug and to study the phytochemical analysis of various solvents extracts of *S. grandiflora* (L.) Poir. of leaves and flowers for the detection of plant constituents.

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Materials and Methods

After being collected, the specimens were measured, recorded in detail for taxonomic description, properly dried, pressed and mounted on the herbarium sheets. The vegetative and reproductive parts of the plant specimens were used for identification with the help of dissecting microscope available literatures such as Backer (1946). The color photographs of plants were taken for record.

Leaves, stems and roots of the fresh specimens were cut into thin sections by using razor blades to obtain thin sections under a light microscope according to the methods of Metcalfe & Chalk (1950).

The fresh leaves and flowers of *S grandiflora* (L.) Poir. were first cleaned with water thoroughly and air-dried in the shade place at room temperature for 2 to 3 weeks. After being completely dried, the leaves and flowers were pulverized and ground by machine to get powder and put in air tight containers by method of Harbone (1991). The preliminary phytochemical investigation on the powder of leaves and flowers of *S. grandiflora* (L.) Poir. was carried out to determine the presence or absence of proteins, glycosides, phenols, flavonoids, tannins, alkaloids, starch, carbohydrates, saponins and reducing sugars by Harbone (1991) methods.

Results

Morphological characters of *Sesbania grandiflora* (L.) Poir

Perennial, small trees. Leaves unipinnately compound, paripinnate, alternate, stipulate, petiolate. Inflorescences axillary raceme, pendulous. Flower red or white, bisexual, zygomorphic. Calyx 5-lobed, tubular-campanulate; Corolla papilionaceous; standard broadly obovate, white, glabrous; wings oblanceolate, white, glabrous; keels oblong, white, glabrous. Stamens 10, diadelphous (9+1); filament filiform, curved, greenish-white; anthers dithecous, dorsifixed, dehiscing by longitudinal slit. Carpel 1, superior, linear-oblong, curved, pale green, unilocular with many ovules in each locule, marginal placentation, glabrous; style glabrous; stigma simple. Pods linear, ab pale brown, glabrous. Seeds ellipsoid to sub-reinform, reddish brown.

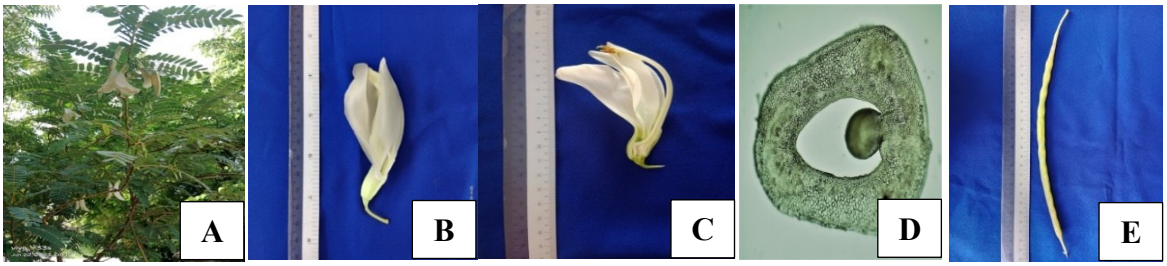

Figure 1. Morphological characters of *Sesbania grandiflora* (L.) Poir

A. Habit
B. Flower
C. L.S of flower
D. T.S of ovary
E. Fruit

Anatomical Characteristics of *Sesbania grandiflora* (L.) Poir.

Internal structure of Lamina (Figure-2)

In transverse section, the lamina of *S. grandiflora* (L.) Pior was typically dorsiventral and reticulate venation. It was distinguished into dermal, ground and vascular tissue systems.

In surface view, upper and lower epidermal cell rectangular to polygonal, stomata occurred on both surfaces, anisocytic type more abundant on upper surface. In transverse section, mesophyll cells were differentiated into palisade and spongy parenchyma. Vascular bundles embedded in the mesophyll cell, closed collateral type.

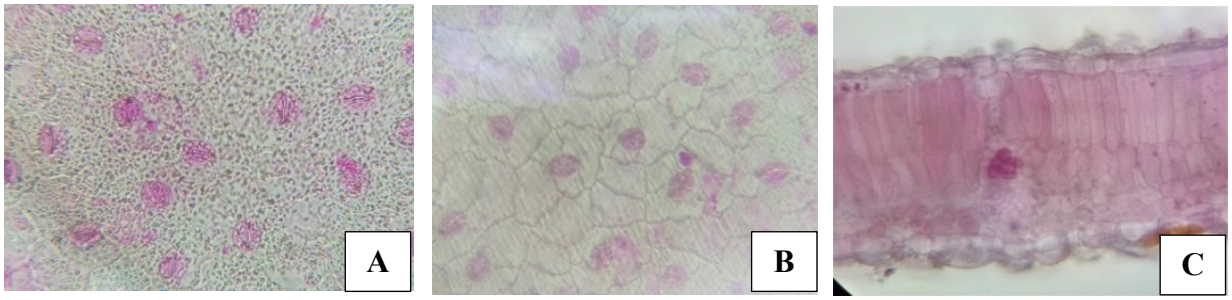

Figure 2. Anatomical characters of *Sesbania grandiflora* (L.) Poir.

A. Adaxial surface view of lamina
B. Abaxial surface view of lamina
C. Transverse section of lamina

Internal structure of midrib (Figure-3)

In transverse section, the midrib of *S. grandiflora* (L.) Poir. was plano-convex in outline. It was distinguished into dermal, ground and vascular tissue systems.

In surface view, epidermal cell wall rectangular. In transverse section, upper and lower epidermal cells, rectangular or barrel shaped, thick cuticle and wavy. Comp osed of collenchymatous cells, parenchymatous cells and pericycle, sclerenchymatous cell. Vascular bundle located at the center and opened collateral type, spindle-shaped; .

Figure 3. Anatomical characters of *Sesbania grandiflora* (L.) Poir.

A. Surface view of midrib
B. Transverse section of midrib
C. Vascular bundles of midrib

Internal structure of Petiole (Figure-4)

In transverse section, the petiole of *S. grandifolia* (L.) Poir. was pear shaped in outline. It was distinguished into dermal, ground and vascular tissue systems.

Surface view was composed of anisocytic stomata and epidermal cells. Composed of outer collenchymatous, inner parenchymatous, endodermis, pericycle and pith. Main vascular bundles were in the center, two small vascular bundles on the opposite, circular and rounded shaped, opened collateral type...

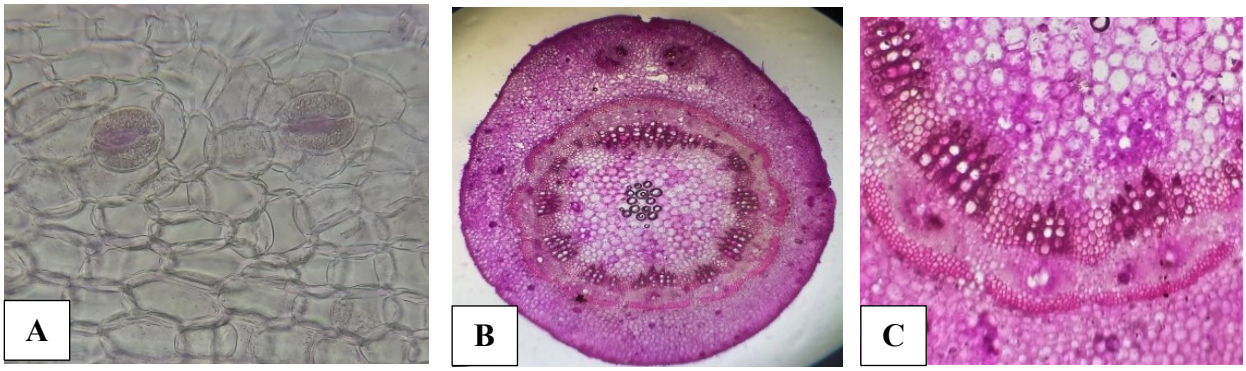

Figure 4. Anatomical characters of *Sesbania grandiflora* (L.) Poir.

A. Surface view of petiole
B. Transverse section of petiole
C. Vascular bundles of petiole

Internal structure of stem (Figure-5)

In transverse section, stems were circular shaped in outline. It was distinguishable into dermal, ground and vascular tissue systems**.** Surface view was composed of thin-walled parenchymatous, epidermal cells.Composed of parenchymatous, endodermis, pericycle and pith.Large and small vascular bundles were arranged in a ring, opened collateral type.

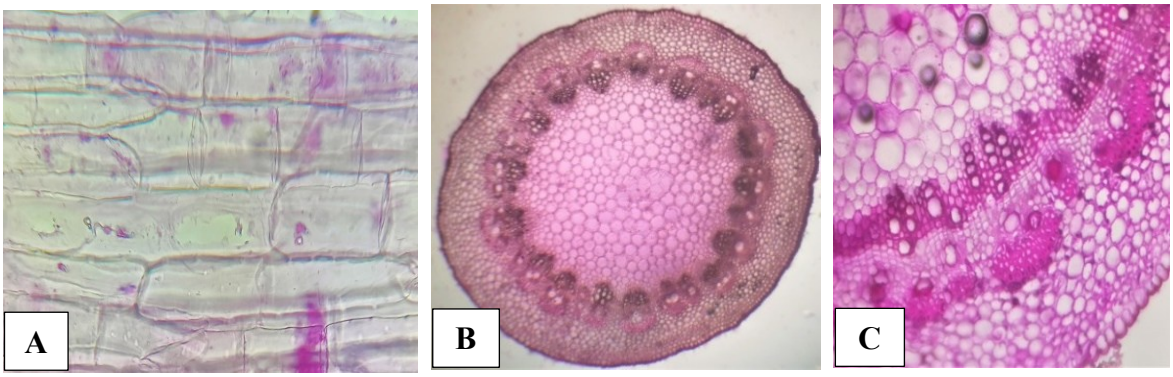

Figure 5. Anatomical characters of *Sesbania grandiflora* (L.) Poir.

A. Surface view of stem
B. Transverse section of stem
C. Vascular bundle of stem

Internal structure of young root (Figure-6)

In transverse section, the young roots were circular shaped in outline. It was distinguished into dermal, ground and vascular tissue systems.Transverse section of root, epidermal cells one layered, parenchymatous, irregular in shaped. Cortex is composed of parenchymatous cells, oval or rounded shaped, intercellular space present. Endodermis and pericycle .Vascular bundles were found radial and tetra-arch; phloem cells are located between the xylem; protoxylem towards the periphery and metaxylem towards the center.

Figure 6. Anatomical characters of *Sesbania grandiflora* (L.) Poir
A. Transverse section of root B. Vascular bundle of root

Microscopical characters of powdered leaves of *S. grandiflora* (L.) Poir. (Figure-7)

The powdered of *S. grandiflora* (L.) Pior. leaves was green color. The odour was bitter and pungent. The texture is fibrous. The fragments of vessels, stomata, Fibers and fiber tracheids were also found.

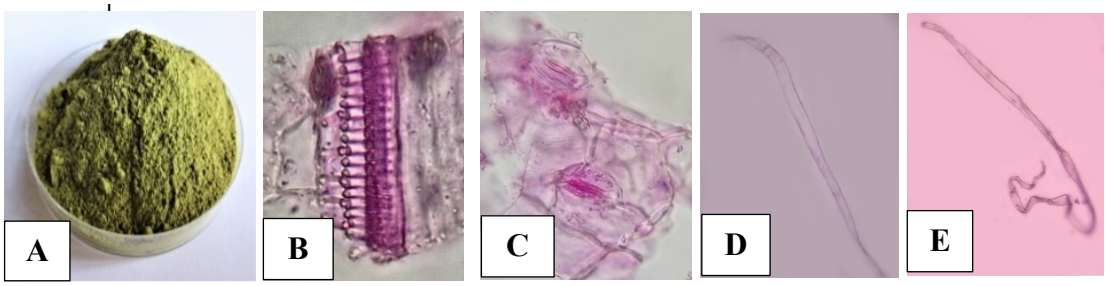

Figure 7. Powder microscopical characters of leaves in *Sesbania grandiflora*(L.) Poir.
A. Sample of leaf powder D. Fibre tracheid
B. Stomata E. Fibre
C. Fibre tracheid

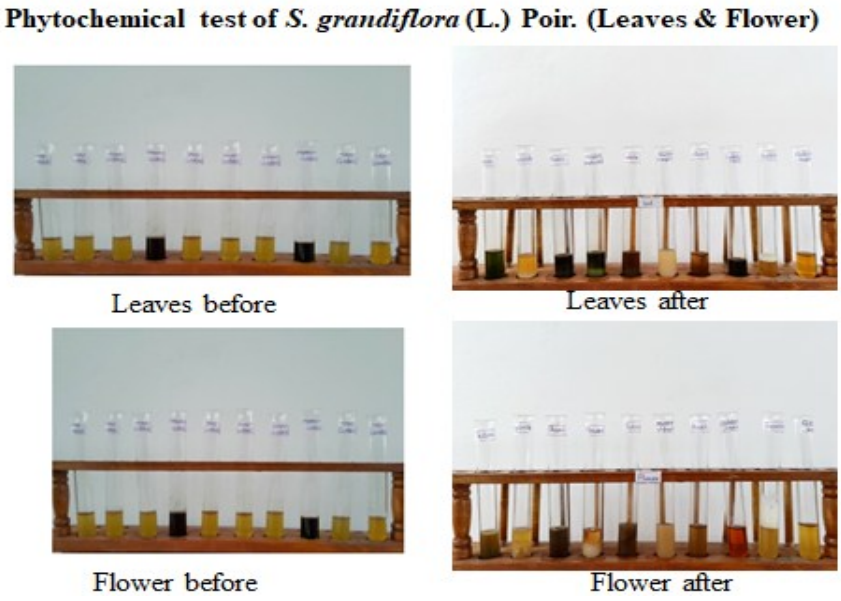

Figure 8. Phytochemical test of *Sesbania grandiflora* (L.) Poir.
A. Before phytochemical test on leaves of *S. grandiflora* (L.) Poir.
B. After phytochemical test on leaves of *S. grandiflora* (L.) Poir.

The results of Preliminary Phytochemical Investigation were shown in Table 1.

Table 1. Result of Phytochemical test of leaves and flowers extracts of *S. grandiflora* (L.) Poir.

No	Test	Extract	Test reagent	Observation	Results
1	Proteins	D/W	NaOH+ 3%$CuSO_4$	Green	+
2	Glycosides	D/W	10% Lead acetate solution	White ppt Orange Color	+
3	Phenols	D/W	5% $FeCl_3$ solution	Brown Color	+
4	Flavonoids	Ethanol	Mg (a small pieces) + HCL	White ppt Dark green color	+
5	Tannins	D/W	1% $FeCl_3$ solution	Reddish Brown Color	+
6	Alkaloids	1%HCL	Mayer's reagent Wagner's reagent	Cream ppt Reddish brown	+
7	Starch	D/W	Iodine solution	Dark orange	+
8	Carbohydrates	Methanol	Benedict's solution + Conc: H_2SO_4	Dark red	+
9	Saponins	D/W	Vigously shaken	Frothing	+
10	Reducing sugars	D/W	Benedict's solution	No ppt	-

+ = Present - = Absent ppt = Precipitate

Microscopical characters of powdered flowers of *S. grandiflora* (L.) Poir. (Figure-12)

The powdered flowers were pale brown color. The odour was bitter and strongly pungent. The fragments of vessels, fibers, tracheids were found in powdered flowers. The fibers were long and non-septate.

Figure 9. Powder microscopical characters of flowers in *S. grandiflora*(L.) Poir.

A. Sample of flower powder
B. Vessels with spiral thickening
C. Fibre tracheid
D. Fibre

Discussion and Conclusion

In present work, *Sesbania grandiflora* (L.) Poir was found abundantly in Sagaing University and its surrounding area. The leaves of *S. grandiflora* (L.) Poir. were unipinnately and paripinnate compound and the ovary was unilocular with many ovules in each locule on marginal placentation in this study. This characters were in agreement with the observation of Ei Ei Phyu (2014).

Anatomical characters of *S. grandiflora* (L.) Poir. was also studied in this paper. In lamina of surface view, the stomata are anisocytic type, observed on both surfaces and more abundant in upper surface. In transverse section, the vascular bundles of lamina are closed collateral type. But the stomata are abundant on lower surface revealed by Khin Myo Win (2019).

The transverse section of midrib of *S. grandiflora* (L.) Poir. is plano-convex shaped, opened collateral type in this studies. These characters are uniform with Verrabhadrappa K.V *et.al* (2017). But the vascular bundle consists of one large and closed collateral type reported by Khin Myo Win (2019).

In this research, transverse section of petiole of *S. grandiflora* (L.) Poir. was pear shaped in outline. Vascular bundles were open collateral type and protoxylem towards the inner metaxylem towards the outer. But more or less tetragonal outline revealed by Verrabhadrappa *et.al* (2017) and Khin Myo Win (2019).

The transverse section of stem of *S. grandiflora* (L.) Poir. was circular shaped in outline,large and small bundles are arrange in a ring. found. These characters agreed with Sontosh *et.al* (2021).

In transverse section of young root, one layer of epidermis in parenchymatous layers, pericyclic parenchyma cells surround the vascular bundles and one layered of endodermis are found in the cortex. vascular bundles were found radial and tetrarch; . These characters agreed with Metcalfe and Chalk (1950).

In the present study, according to the result of its powdered leaves, it was found that proteins, glycosides, phenols, flavonoids, tannins, alkaloids, starch, carbohydrates, saponins were present and reducing sugars were absent. These characters agreed with Khin Myo Win (2019).

According to the preliminary phytochemical investigation on the flower of *S. grandiflora* (L.) Poir. proteins, glycosides, phenols, flavonoids, tannins, alkaloids, starch, carbohydrates, saponins were found to be present. These results were in accordance with the findings of Shoheb Shakil Shaikh (2022).

The aqueous extracts of flower *S. grandiflora* (L.) Poir. the presence of alkaloids, saponins, flavonoids and tannins mentioned by Jean N. Guillasper *et.al* (2020) agreed with the present study. This study did not agree in the absence of phenols mentioned by Neethu S. Kumar (2016).

Chemical investigation of aqueous extract of leaves *S. grandiflora* (L.) Poir the presence of proteins, glycosides, phenols, flavonoids, tannins, alkaloids, starch, carbohydrates,saponins in this study. But Arun.A *et.al* (2014) reported that the absence of glycosides, saponins and flavonoids in aqueous extracts. The difference may be due to solvent capacity to extract the active principles, difference in the extraction methods and collection time.

According to Chandrulekha Bhokre *et.al*., (2022) described that *S. grandiflora* (L.) Poir flowers were rich in carbohydrate, flavonoids and higher amount of phenolic compound. Edible flowers were rich in a great variety of natural antioxidants including flavonoids and many other phenolic compounds. Edible flowers exerted potent activities against cancers of the liver, bladder, prostate, breast and colon. Suresh Kashyap and Sanjay Mishra (2012) reported that the plant is rich in tannin and flavonoids.

According to the results of the present study, it can be concluded that the identification of the morphological and anatomical characters of plant parts will be useful for producing the crude drug. The preliminary phytochemical screening will be useful in finding out the genuity of the drug. The result of this study would be helpful for further research work on processing and value addition of *S. grandiflora* flowers and leaves.

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