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Morphological, anatomical and phytochemical screening of *Sida acuta*, Burm. F.; Kannur district, Kerala

Amitha TV[1], Sincy Joseph[2]
[1, 2] Department of Botany, Nirmala College for Women, Coimbatore, Tamil Nadu, India

Abstract
Sida acuta, Burm. F.; is a profusely branching annual herbaceous weed belongs to the family Malvaceae. The ethno medicinal values of plants form the basis of the herbal drug industry. *Sida* species are ethno medicinal plants of Malvaceae, commonly used in Indian traditional system of medicines. It used for treating common ailments like cough and cold, fever, stomach, kidney and liver disorders, pains, snake bite, inflammations and wounds. The medicinal properties of the plants are due to the phytochemicals present in them. The present study discloses the phytochemical compounds of *Sida acuta*, Burm. F.; along with its morphological and anatomical observations.

Keywords: malvaceae, phytochemical, morphological, anatomical, *sida acuta*, burm. f.

Introduction
Plant is one of the major forms of life on earth. The ethno medicinal values of plants form the basis of the herbal drug industry. India has contributed its knowledge of traditional system medicines (Ayurveda and Siddha) to develop herbal medicines with negligible side effects (Jasmeet Kaur Abat *et al*., 2017). Malvaceae or the mallows, is a family of flowering plants estimated to contain 244 genera with 4225 known species (Anami Augustus Arul *et al.*, 2017) [5].
The genus *Sida* is larger and one of the more complex genera of the family Malvaceae. The *Sida* is used for the prevention and treatment of different diseases such as diarrhea, dysentery, gastrointestinal and urinary infections, malarial and other fevers, skin ailments, cardiac and neural problems, asthma, bronchitis and tuberculosis. Plant morphology is the study of the physical form and external structure of plants. Plant morphology is useful in the visual identification of plants. Plants exhibit natural variation in their form and structure. This variation is most easily seen in the leaves of a plant, though other organs such as stems and flowers may show similar variation. Plant morphology deals with external features such as development, form and structure of a plant. Plant morphology observes both the vegetative as well as the reproductive structures of plants. Plant morphology examines the pattern of development and the process by which structures originate. The morphological characters of plants can be used to compare, measure, count and describe the differences or similarities in plant taxa and these characters are used for plant identification, classification and descriptions. The anatomical features are used for the preparation of an identification key. Plant anatomy is a study of internal structure of plants. Anatomical data are applied to improve classification schemes and it is often used for identification. Wide range of anatomical data is used by systematics including anatomy from stem, leaf, petiole, stipule, node, flower, fruit and seed. Often these anatomical features are correlated with environmental factors. Anatomy of a plant is more conserve than morphological data therefore useful to describe the taxa with wide morphological variations (Saikat Naskar, 2016) [11]. The phytochemical research approach is considered effective in discovering bioactive profile of plants of therapeutic importance. Some of these phytochemicals are believed to protect cells from damage that could lead to cancer. Phytochemical screening refers to the extraction, screening and identification of the medicinally active substances found in plants. The medicinal plants are useful for healing as well as for curing of diseases because of the presence of phytochemical constituents.

Materials and Methods
Collection of Sample
The collection of the botanical material and of *Sida acuta*, Burm. F.; was carried out in Kannur, Kerala during flowering period. Microscopic studies were performed based on hand sections of the root and stem were observed under compound microscope. *Sida acuta* leaves, the sample for phytochemical screening are collected and then washed in running tap water. The leaves then spread over a newspaper. Then the leaves are shade dried, powdered and stored in air tight containers for further analysis.

Morphological study
After collecting, the plant is washed gently under tap water to remove dirt and dust. After proper washing, the plant parts are separated carefully and observed well using a hand lens and simple dissection microscope.

Anatomical study
After morphological observation, each plant part is taken out and takes out small and thinnest sections which are stained using safranin. The stained sections are well observed under compound microscope. The perfect sections are mounted using glycerine and put on a cover glass for further observation.

Phytochemical analysis
Phytochemical screening was carried out to evaluate to the presence of carbohydrates, amino acids, glycosides,

terpenoids, steroids, flavonoids, saponins and tannins based on standard phytochemical protocol.

Results and Discussion

Sida acuta, Burm. F.; is a perennial or annual herb or undershrub. It is erect or prostrate in structure. Stellate, glandular or simple hairs are present in whole plant body. It is a profusely branching herbaceous weed. The root is thin, long, cylindrical and very rough. The bark is smooth and greenish. The stem is pubescent with simple stellate hairs. The leaves are lanceolate or oval and the flowers are light yellow in colour. It has pedicellate, actinomorphic, hypogynous, bisexual, pentamerous and complete flower. The calyx consists of green sepals which is connate at the base and persisstant. The sepals are five in number. The corolla is light yellow in colour and the petals- 5.

Transverse section of root is circular in outline with a very wide central part. The outer most layers composed of single layered epidermis composed of compactly arranged parenchymatous cells without intercellular spaces. Root hairs were noticed in the epidermis. It is followed by multi layered cortex composed of parenchymatous calls. The last layer of the cortex is the endodermis. It composed of one layered barrel shaped cells which are closely arranged without intercellular spaces. Next to endodermis there is a single layered pericycle. Phellogen layer is consisting of single layer of rectangular shaped cells. Cortex narrow and is comprising of 3-4 rows of tangentially elongated cells. Medullary rays composed of radially elongated cells. An arch of distinct primary xylem was present at the center. Transverse section of stem is rounded in outline with trichomes on epidermal layer. Epidermis is composed radially elongated, thin-walled cells covered by thin cuticle. Epidermis is followed by the occurrence of multi layered cortex. Medullary rays are multiseriate. Pith large and is composed of parenchyma cells.

In the present study using dry leaf powder, a preliminary phytochemical screening was carried out to identify the active constituents such as carbohydrate, amino acids, glycosides, terpenoids, steroids, flavonoids, saponins and tannins in the leaves of *Sida acuta*. Secondary metabolites are those chemical substances which are not directly involved in the growth and development of plants. The dried and powdered leaves of the same were dissolved in two different solvent like ethanol and petroleum ether and the extract thus obtained were analyzed for the presence or absence of secondary metabolites and represented in the table I. In *Sida acuta* glycosides, steroids and flavonoids were observed in both the solvent extracts. Carbohydrates and tannins are completely absent in both the extracts of leaves of *Sida acuta,* Burm. F.; Amino acids, terpenoides and saponins were present only in petroleum ether extracts of *Sida acuta*, Burm. F.;

Table 1: Phytochemical Screening of *Sida acuta*, Burm. F.

Phytochemical constituents	Solvent	
	Ethanol	Petroleum ether
Carbohydrate	-	-
Amino acids	-	+
Glycosides	+	+
Terpenoids	-	+
Steroids	+	+
Flavonoids	+	+
Saponins	-	+
Tannins	-	-

+ = Presence; - = Absence

In the present study phytochemical screening of ethanol and petroleum ether leaf extract of *Sida acuta*, Burm. F.; was carried out to identify the secondary metabolites such as carbohydrate, amino acids, glycosides, terpenoids, steroids, flavonoids, saponins and tannins. Secondary metabolites are those chemical substances which are not directly involved in the growth and development of plants. In the present study glycosides, steroids and saponins are present in ethanolic leaf extract of *Sida acuta* and amino acids, glycosides, terpenoids, steroids, flavonoids and saponins are present in petroleum ether leaf extract of *Sida acuta*. Glycosides, steroids and flavonoids were observed in both the solvent extracts,whereas the phytochemical screening carried out by (Perumalsamy Muneeswari *et al*., 2016) [9] in chloroform extract of *Sida acuta* reveals the presence of alkaloid, steroids, flavonoids, tannins and glycosides. Alka Jindal, 2012 [3] revealed the presence of flavonoids which were reported in leaf extracts of *Sida acuta*, Burm. F.; Carbohydrates and tannins were completely absent in both the extracts of leaves of *Sida acuta*. Amino acids, terpenoides and saponins were present only in petroleum ether extracts of *Sida acuta*. The phytochemical screening carried out in hydro-alcoholic extract of *Sida acuta* reveals the presence of alkaloids, carbohydrates, cardiac glycosides, coumarine glycosides, sterols, saponins, tannins, phenolic compounds, flavonoids, proteins, amino acids, terpenoids, gum, mucilage, quinone, coumarin and resins (Krishnaveni *et al*., 2018) [7].

Conclusion

Phytochemistry deals with the analysis of plant chemicals. In ancient times, medicinal plant has played a vital role to prevent various diseases. The medicinal properties of the plants are due to the phytochemicals present in them. The present study discloses the phytochemical compounds of *Sida acuta*, Burm. F.; along with its morphological and anatomical observations. The knowledge of morphology is useful for the identification of the different plant species. The unscientific and skill-less uprooting of the whole plant results in the deterioration of this genus in the near future. Morphological and anatomical knowledge is crucial to meet the challenges to identify the exact plant species that we required. The phytochemical analysis of ethanol leaf extracts of *Sida acuta*, Burm. F; revealed the presence glycosides, steroids and flavonoids. The phytochemical analysis of petroleum ether leaf extracts of *Sida acuta*,

Burm. F; revealed the presence amino acids, glycosides, terpenoids, steroids, flavonoids and saponins. Glycosides, steroid and flavonoids were observed in both the solvent extracts. Carbohydrates and tannins were completely absent in both the extracts of leaves of *Sida acuta*, Burm. F.; Amino acids, terpenoides and saponins were present only in petroleum ether extracts of *Sida acuta*, Burm. F.;

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