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RESEARCH ARTICLE

Pharmacognostic characteristics and antimicrobial activity of *Sanchezia oblonga* Ruiz & Pav.

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Abstract

Sanchezia oblonga Ruiz & Pav, Acanthaceae is used as an ornamental plant. It is an ethnomedicinal plant used to treat several diseases such as cancer, rheumatism, cardiovascular problems, immune related problems and headache. In the present investigation, various taxonomic, pharmacognostic and phytochemical standards are used to ensure the identity, purity, safety and efficacy of the medicinal plant, *Sanchezia oblonga* Ruiz & Pav plant. Various observations were recorded, including microscopic, macroscopic, soluble extractive values, moisture content, physicochemical characteristics, fluorescence behavior of the powdered leaf drug and antimicrobial activity analysis. The results indicated that the epidermal shapes were both polygonal on the adaxial and abaxial surfaces. The stomatal distribution was amphistomatic with anisocytic and diacytic stomata on the adaxial and abaxial surfaces, respectively. Stomatal index was 37.69 % on the adaxial surface and 23.26 % on the abaxial surface. The microscopy indicated the presence of xylem elements and anatomical characters of stem and petiole. Fluorescence properties showed different colours under different ultraviolet lights. Glandular unicellular trichomes were found on both the leaf surfaces. E-glandular trichomes with 2 to 7-arms were observed on the epidermal surfaces of the petiole and stem. Moisture content of the leaf sample was 50.56 % ^{w}/w. Out of the five solvent extracts of the leaves, the methanolic extract showed the highest antimicrobial activity and extractive value (5.7 % ^{w}/w). Important groups of phytochemicals, such astannins, alkaloids and flavonoids, have been detected in leaf extracts. The data generated from the present study would help to authenticate *S. oblonga* and affirm its folklore use in traditional medicine which has the potential for further development into drug products.

Keywords: amphistomatic; microscopic; pharmacognostic; phytochemicals; *Sanchezia oblonga*

Introduction

Acanthaceae species of *Sanchezia* are Neotropical shrubs and plant showing to their strikingly vivid and colourful flowers and spectacular leaves. Species of *Sanchezia* such as *S. speciosa, S. parvibracteata* and *S. nobilis*, are grown as ornamentals in botanical gardens and in tropical climates. This genus was last reviewed in a taxonomic synopsis by Leonard and Smith (1). Among the 58 species, more than half were newly described (2). Reports on the chemical composition and pharmacological properties of the *Sanchezia* species are scarce. As such, a thorough characterization of the fundamental chemical components and thorough quality control of this genus are lacking. According to a previous report, *S. speciosa* contains cardiac and flavonoid glycosides and their extracts have anti-inflammatory and antioxidant properties (3). Human epithelial cervical cancer cell lines are cytotoxic to extracts of the same species (4, 5). *Sanchezia oblonga* Ruiz & Pav. (syn. *Sanchezia nobilis* Hook. f.) is a perennial evergreen shrub native to the rainforests of Central and South America (6, 7). In addition to matsutake alcohol glycosides, a previous study found that *S. nobilis* extracts contain flavone glycosides, syringin, benzyl and cinnamonyl alcohol glycosides and neolignan glucoside (6-8). It was recently discovered that the ethylacetate extract of *S. nobilis* leaves contained the phytosterols such as daucosterol and scopoletin, stigmasterol, 3'-O-methyl-3,4-methylenedioxy ellagic acid and flavonol glycosides (4, 9). Another study of n -hexane extracts of *S. nobilis* recovered mangiferin, β-sitosterol, margaric, ursolic and oleanolic acids (10, 11). A study on aqueous leaf extracts, 4',5,7-trihydroxy-3', 5'-dimethoxyflavone and kaempferol glycosides were found. GC-EI-MS and RP-HPLC-ESI-MS / MS were used to examine the ethanolic extracts of the *S. oblonga* leaves and stems. Therefore, this study aimed to investigate the pharmacological and taxonomic parameters to aid in the identification and safe use of this drug.

Materials and Methods

Plant collection and identification

Fresh leaves and flowering branches were collected from *Sanchezia oblonga,* commonly known as Zebra plant from the medicinal plant garden of the Botany Department of Balurghat College, located in Balurghat, Dakshin Dinajpur, West Bengal, India, latitude-25.2301 °N & longitude-88.7782 ° E. The plant species were identified and authenticated by Dr. Monoranjan Chowdhury, Professor of Botany, North Bengal University. The plant herbarium specimen was deposited in the Department of Botany, Balurghat College, for future reference.

Botanical characters

Stem

Stems are herbaceous, erect, perennial, usually up to 2 m tall, but can reach 3 m in height. Solid stem maroonish-yellow colour, rectangular in shape, surface glaucous, branching pattern alternate; differentiated into nodes and internodes, internodal length varies from 7.6 cm to 8.3 cm.

Leaf

Simple leaf, alternate phyllotaxy, dark green in dorsal and light green in ventral surface, exstipulate, petiolate, dorsi ventral, herbaceous, glabrous; petiole sub rounded, greenish brown, glabrous; length 1.5 cm, breadth 0.8 cm; blade shape lanceolate; 40.5 cm - 43.8 cm × 11.3 cm - 12.7 cm; base obtuse; apex acuminate; margin serrate; primary vein 1; secondary vein 17-20; alternate veins are reticulate in pattern.

Petiole

The green, petiolate leaves have very tiny hairs and are almost cylindrical to subcylindrical in shape. The petioles on the upper leaves are often shorter than those on the lower leaves. Their diameter is 2-3 mm and their length is 1-2 cm.

Flower

Vibrant yellow blooms, arranged in tubular spikes around 5 cm in length, encircled by orange or red bracts.

Bracts

They have an acute apex and are green in colour. Its dimensions are 1.2-1.3 cm in length and 0.25-0.5 cm in breadth. It is oblong or oblong lanceolate.

Sepals (calyx)

With four alternate sepals (polysepalous), the calyx has a yellowish-greenish colour and is 1.3-1.5 cm in length and 0.2 -0.4 cm in diameter. It also has vexillary aestivation.

Petals (corolla)

Petals have complete edges and rounded apices, making them oblong-obovate. The corolla is 2.5-3 cm long. Four joined (gamopetalous), tubular, yellowish-orange petals.

Androecium

The androecium is made up of two sets of two didynamous (oblong, two-celled, hairy stamens), two fertile stamens and two staminoides. Fertile stamens extend their filaments past the corolla tubes. Adnate behaviour binds the anther to the filament. A dehiscence occurs as the anthers open.

Gynoecium

It is composed of a bicarpellary and bilocular superior ovary. Two ovules are joined to the axial placenta at each loculus. There are no branches to the stigma.

2.3. Foliar micromorphology

Leaf pieces were removed using the Bokhari technique after cutting from the apical, middle and basal regions of the lamina (12). The samples were washed and a few drops of 1 % aqueous safranin were applied. They were then mounted on a slide using 10 % glycerin so that they could be examined under a compound microscope. The plant cells were measured using a standardized ocular micrometer and photomicrographs of the leaf sections were captured using a mobile camera and microscope.

Vegetative anatomy (stem and petiole)

Under a compound light microscope, transverse sections (T.S.) of the chosen plant stem and petiole were examined after being appropriately stained using a standard staining procedure (13). Appropriate sections were photographed.

Microchemical colour reaction tests of powdered drugs

Preliminary microchemical tests of the powdered drugs were performed using chemical colour reaction tests with various reagents for the detection of phytochemical groups present in the drug following different standard methods (4, 14-18). By using the cold maceration process, methanolic extracts were prepared from powdered plant samples of each chosen plant. These extracts were then used in various chemical colour reaction experiments to identify the distinct phytochemical groups.

Organoleptic study

In accordance with standard procedures, the crude pharmaceuticals of the sample was assessed using sensory organs to assess exterior morphology, colour, odor, taste and other characteristics (19).

Physicochemical analysis

The physical evaluations of the powdered drugs were performed following different methods which include determination of moisture content, extractive value, etc (18, 19).

Determination of moisture content

Fixed amount of crude drug in the leaf sample was weighted accurately and placed in an evaporating dish. 10.32 g of leaf samples were taken for drying at 80 ˚C - 90 ˚C for 1 hr. The samples were then weighted again. The drying and weighting were continued at 1 hr intervals for 3 times. Then final weight was then measured and the percentage of moisture content was calculated (20).

Determination of extractive value

Accurately weighed 5 g of powdered plant samples of each species was placed in a glass-stopper conical flask (100 mL) and macerated separately by shaking frequently with 100 mL of ethanol for 6 hr and then allowed it to stand for 5 days with occasional stirring. To prevent solvent loss, the solvent extracts were quickly filtered. 25 mL of the filtrate were then moved to a tray with a flat bottom and the filtrate was

condensed after the solvent was evaporated on a water bath. The condensed filtrate slur was immediately weighed after being dried in an incubator for 8 hr at 45˚C and cooled for 30 min in a desiccator. The extractable matter concentration in mg g^{-1} of air-dried product was finally determined using the following formula:

$$\text{Extractive value (\%)} = \frac{\text{Weight of the residue obtained}}{\text{Weight of the plant drug taken}} \times 100$$

Antibacterial activity by the agar well diffusion method

The sample extracted from *S. oblonga* showed antibacterial effectiveness against *Escherichia coli* which was evaluated using the agar well diffusion method. Fresh inoculated bacterial plates were cut into 5 mm wells. 10 µL of varying concentrations of the test sample were then placed into each 5 mm well, which were seeded with test bacteria and cultured for 24 hr at 37 ˚C. By evaluating the growth inhibition zone diameter with the common antibiotic, Streptomycin (10 µg/mL), the potency was compared.

Results

Botanical characters and foliar micromorphology

The following lists the botanical characteristics of the plant under investigation, together with the measurements of trichomes, stomata and epidermal cells (Fig. 1, 2).

Epidermis

In the transverse section, the upper epidermis is composed of a row of thin-walled cells that range from isodiametric to sub rectangular in shape. In the surface view, the cells are polygonal, sub-rectangular and occasionally isodiametric with straight anticlinal walls and are covered in a thin layer of a smooth cuticle. The cells measurements are (20-26-28 µm) in length, (7-10-12.5 µm) in width and (11-13-15 µm) in

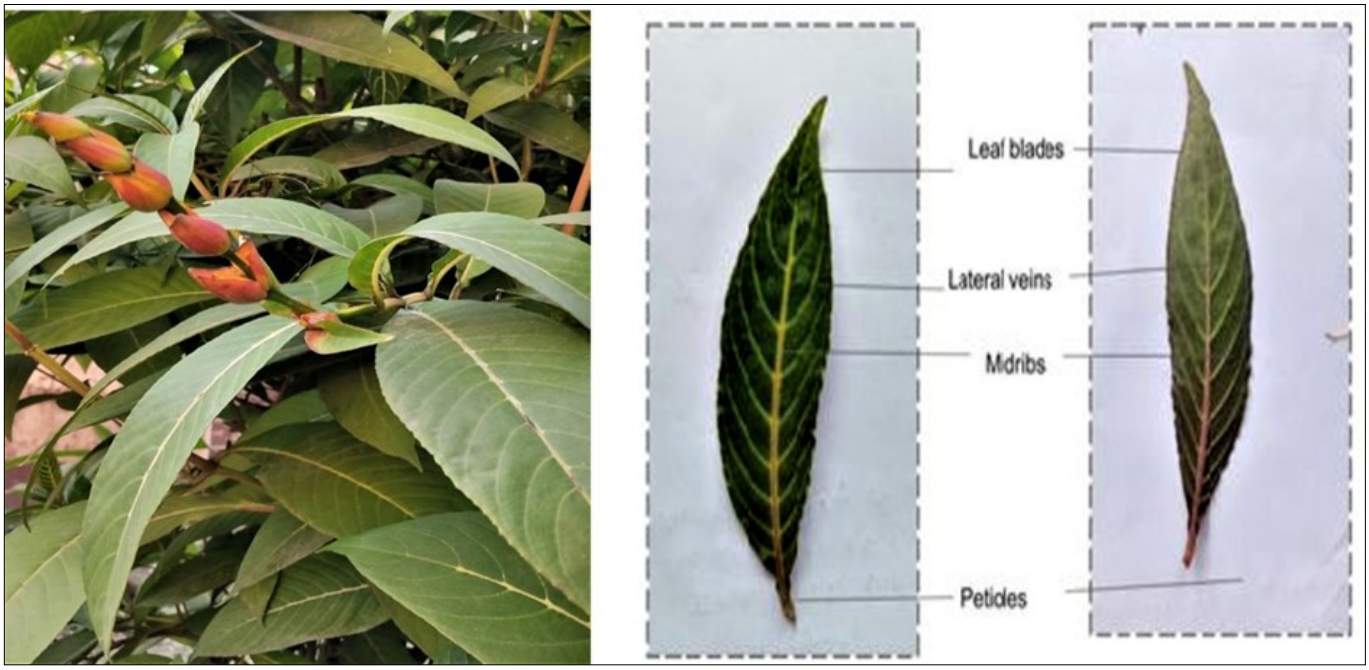

Fig. 1. *S. oblonga*- A plant twig with flowers and leaves.

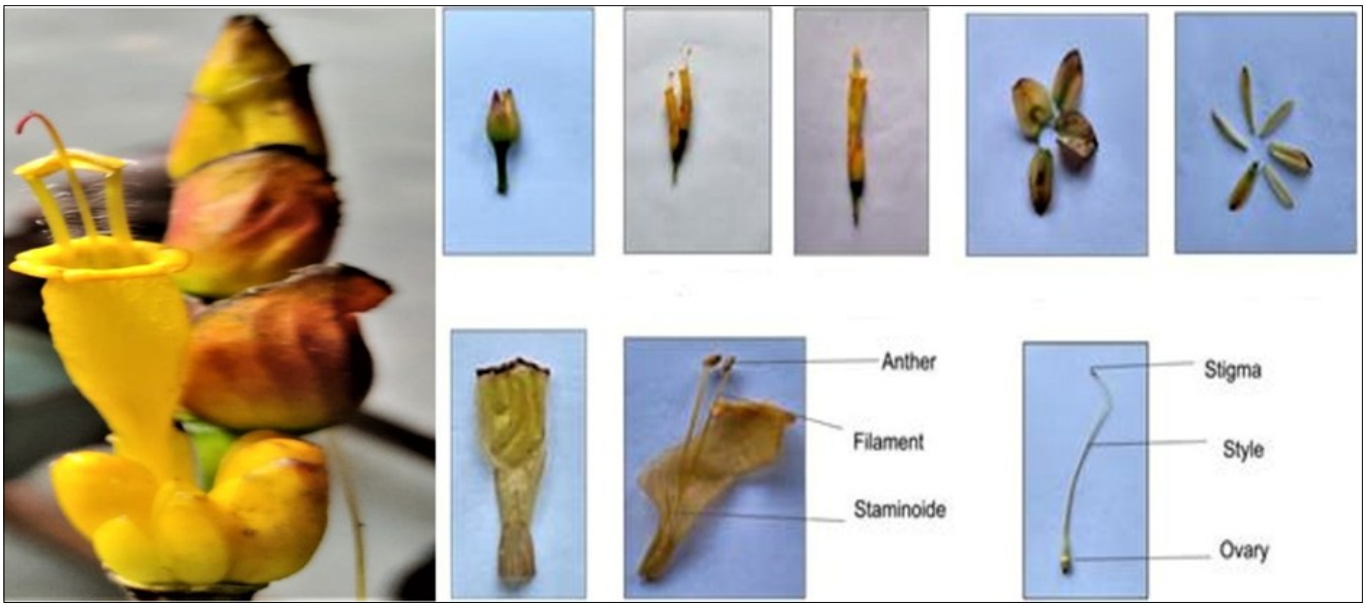

Fig. 2. Sectional view of parts of a flower of *S. oblonga*.

height. Their hair comes from two different sources. The commonly observed non-glandular, uniseriate, unicellular and multicellular hairs are among them. The other is the rarely seen glandular hairs, which are of 50, 60 and 68 µm in length and 7, 10, 12µm in diameter. They have a small, short, one-cell stalk and a multicellular head composed mainly of 4 to 6 cells placed on the upper neural epidermis and adjacent cells of the intercostal regions. They have a thin, smooth cuticle covering them which is 52, 58 and 62 µm in thickness. The diacytic stomata had diameters of 45-52-58 µm. The first row of hypodermis, which measures 28, 34 and 40 µm in length, 15, 22 and 35 µm in breadth and 12, 18 and 24 µm in height. The transverse section of lower epidermis is made up of only one row of cells in polygons with a thick layer of smooth cuticle covering them.

Stomatal complex

The diacytic stomata are present resembling in both epidermal layers, but they are of greater number in lower epidermis (Table 1, Fig. 3).

Trichomes

Unicellular glandular trichomes adorn the upper and lower epidermal surfaces of leaves. The glandular trichomes in the upper epidermis measured 32.042 mm in diameter, where as those in the lower epidermis measured 29.078 mm. Trichomes occurred at a frequency of 5.38/mm^2 on the upper surface and 11.24/mm^2 on the lower surface. On the upper and lower surfaces, trichome indices on the upper and lower surfaces are 4.46 % and 3.14 % respectively (Table 2, Fig. 4).

Xylem elements

The xylem elements, pit size, vessel element perforation plates, tracheid sidewall thickening, fiber size and type and other characteristics of the plant under investigation are described and measured (Table 3). Long and cylindrical, the vessel's components include a straight forward circular perforated plate at the end wall that is obliquely angled. The lateral walls have pits on either side; long, pointed tails are commonly found at one or both ends of the vessel components. Its dimensions were 493.974 × 52.102 µm^2 and its frequency was 1.326/mm^2 (Fig. 5A). Tracheids have spiral side wall thickening and are very long. The frequency was 17/mm^2 with a diameter of 32.6 µm. Usually, libriform in shape, with fibers having narrow, tapering and pointed ends (Fig. 5B). Simple pits can be found all the way along the fiber. The frequency of the fiber was 10.608/mm^2 and its dimensions were 749.193 × 23.748 µm^2 (Fig. 5C).

Table 1. Stomatal features of *S. oblonga*

Leaf surface	Type	Length (µm)	Width (µm)	Stomatal index (%)	Stomatal frequency (mm^2/ leaf area)
Upper	diacytic	44-58	14-22	30.63	42.29
Lower	diacytic	23-30	8-15	11.48	53.38

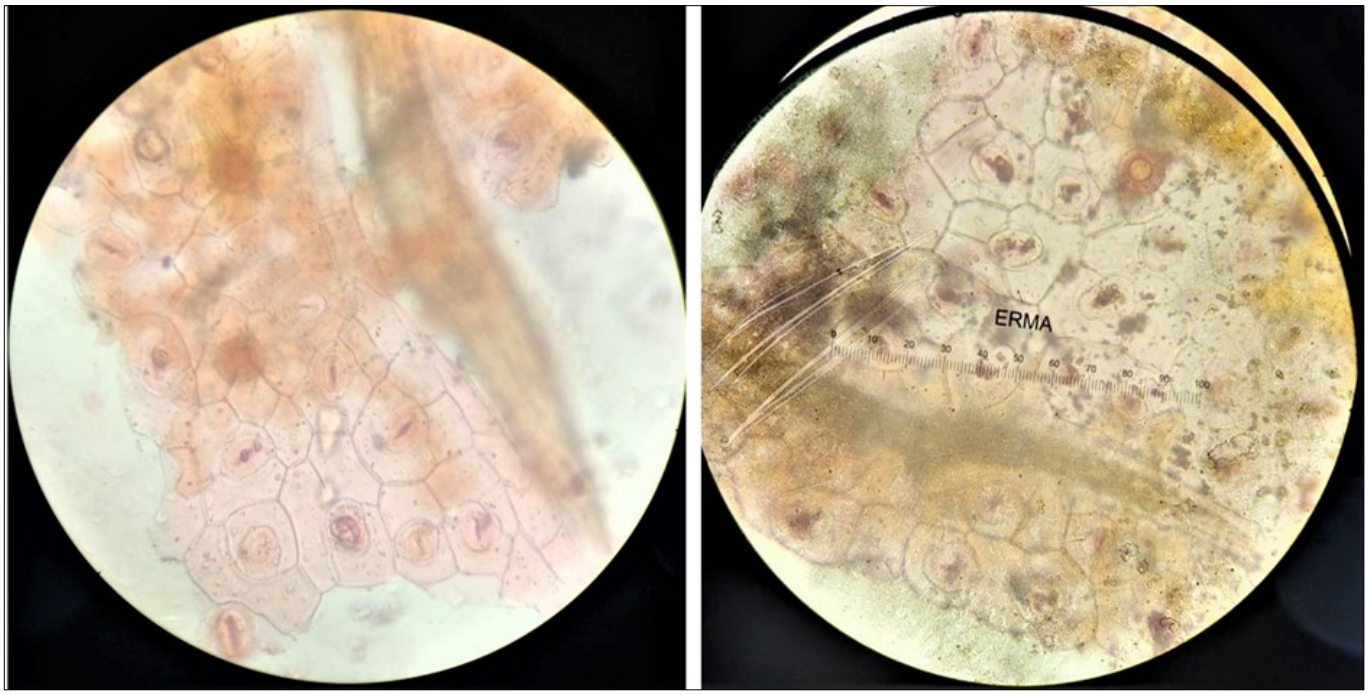

Fig. 3. (A) Upper epidermis of the leaf of *S. oblonga* with diacytic stomata; (B) Lower epidermis of the leaf of *S. oblonga* with diacytic stomata.

Table 2. Trichome characters of *S. oblonga*

Leaf surface	Trichome type	Trichome size (µm)	Trichome Index (%)	Trichome frequency (No./mm^2)
Upper	Non-glandular	32.042	4.46	5.38
Lower	Non-glandular	29.078	3.14	11.24

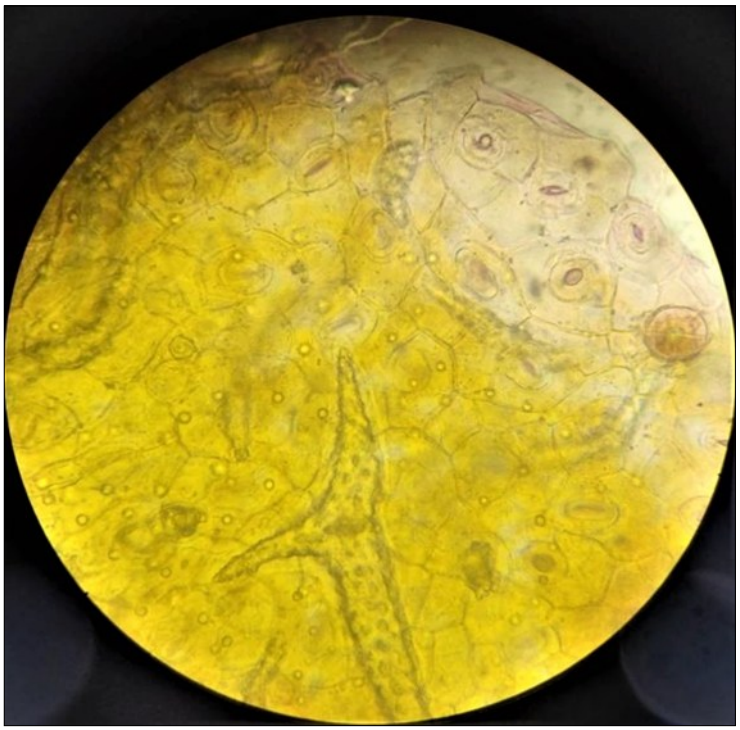

Fig. 4. Types of trichomes in *S. oblonga.*

Fig. 5. *S. oblonga*-xylem elements. (A) A vessel element; (B) A portion of tracheid; (C) A portion of fibre.

Table 3. Xylem element characters of *S. oblonga*

Structure	Character	Type/ measurement
Vessel elements	Type of perforation plate	Simple
	Arrangement of perforation plate	Oblique
	Pits	Bordered
	Tail	Present
	Length (µm)	493.974
	Breadth (µm)	52.102
	Frequency (No./mm^2)	1.326
Tracheids	Wall thickening	Spiral
	Diameter (µm)	32.6
	Frequency (No./mm^2)	17
Fibres	Ends	Pointed
	Pits	Present
	Length (µm)	749.193
	Diameter (µm)	23.748
	Frequency (No./mm^2)	10.754

Table 4. Microchemical tests of the methanolic leaf extract of *S. oblonga*

Test/Reagent	Test for	Nature of change	Degree of change
Dragendroff's reagent	Alkaloids	Orange brown ppt.	++
Mayer's reagent		White/ Cream ppt.	+++
Shinoda test	Flavonoids	Magenta colour	-
Alkaline reagent test		Yellow ppt.	+++
Salkowski test	Steroids and Triterpenoids	Reddish-blue and green fluorescence	++
Keller-Killiani test	Cardiac Glycosides	Reddish-brown at junction of two liquids	++
Borntrager's test	Anthraquinone glycosides	Rose pink colour in ammonia layer	+
Benedict's reagent	Reducing Sugars	Brick red ppt.	+++
Fehling's reagent		Brick red ppt.	+++
Molish's test	Carbohydrate (Gums)	Red-violet ring	+++
Ferric chloride test	Tannins & phenolic compounds	Green or blue colour	+++
Nitric acid test		Yellow	+
Bontrager's test	Anthraquinones	Pink colour	+++
Ninhydrin test	Amino acids & proteins	Purple colour	-
Millon's reagent	Proteins	White ppt.	+
Biuret test	Proteins	Purple violet	-
Froth test	Saponin glycosides	Appearance of froth	+++

+++ sign indicates most significant result of colour reaction test and high concentration of the biomolecule whereas - sign indicates negative result and absence of particular biomolecule in the specific extract

Anatomical characters of stem

The transverse section of the juvenile stem showed round outline and few hairs (Fig. 6).

One of the features of the family Acanthaceae is the alternating sectors of the collenchyma and parenchyma in the outer section of the cortex in the very young stem. It has few hairs on the outer epidermis, one layer of hypodermis, six to eight rows of collenchyma and a rather narrow five to seven rows of parenchyma. An almost full ring of pericyclic fibers, broken up by a few parenchyma cells, represents the pericycle. A broad parenchymatous core pith and ring of vascular tissue around pericycle. Sclerenchyma cells were observed in irregular patches only on the edge of the phloem. A continuous vascular cylinder is formed by conjoint, collateral and open-type vascular bundles accompanied by a phloem through the xylem layer. There were three to five levels of sclerenchyma in the phloem zone and endarch xylem. The Cambium occupies the central portion of the stem and is large, although it is not distinct pith. It is composed of cells called parenchyma.

Anatomical features of Petiole

The transverse section of petiole has a virtually cup-shaped contour and resembles the leaf in most respects, with the exception of an endodermis layer that has a starch covering and a Casparian thickening that stained safranin (Fig. 7).

Microchemical colour reaction tests

Alkaloids, flavonoids, tannins, saponins and other significant phytochemical groups were detected during preliminary chemical screening of the methanol extract of the plant. These groups are present in the leaves, indicating that the Plant may be enhanced using a variety of significant types of phytochemicals that are primarily responsible for their medicinal qualities (Table 4, Fig .8).

Histochemical study

Through histochemical localization analysis of the leaf portion, several phytochemical groups, including alkaloids, tannins, flavonoids, proteins, lignin, glycosides etc. have been identified in different tissue zones, including the vascular bundles, cortex and pith, (Table 5, Fig. 9).

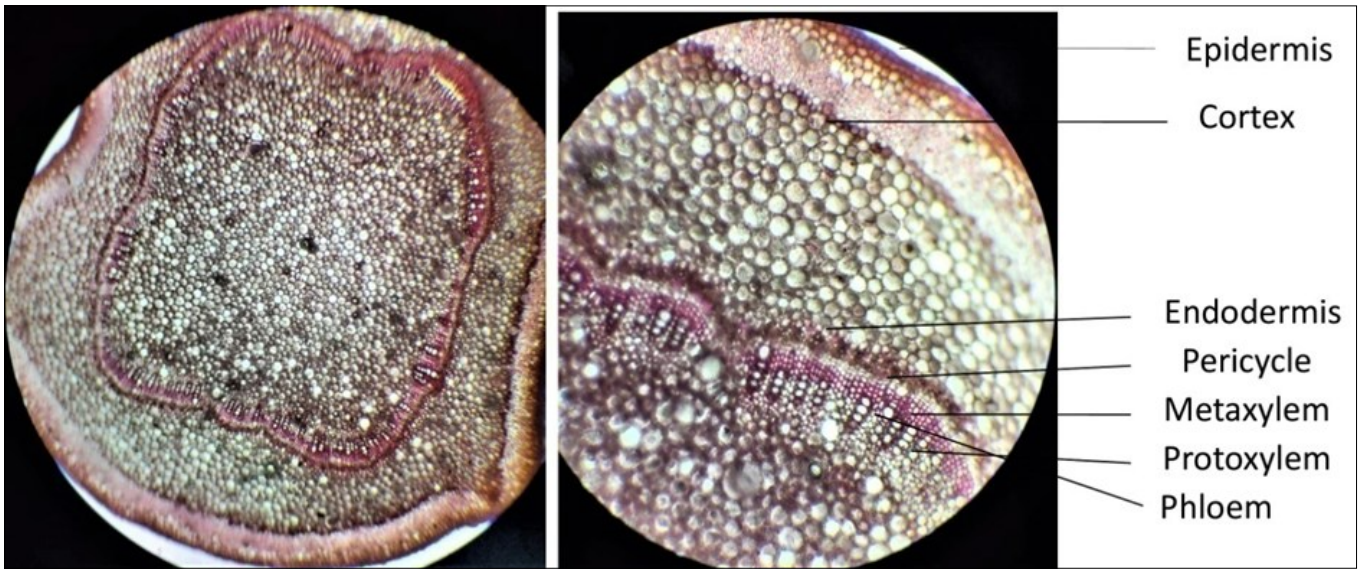

Fig. 6. T.S of stem of *S. oblonga* (Compound microscopic photograph under 4x and 10x).

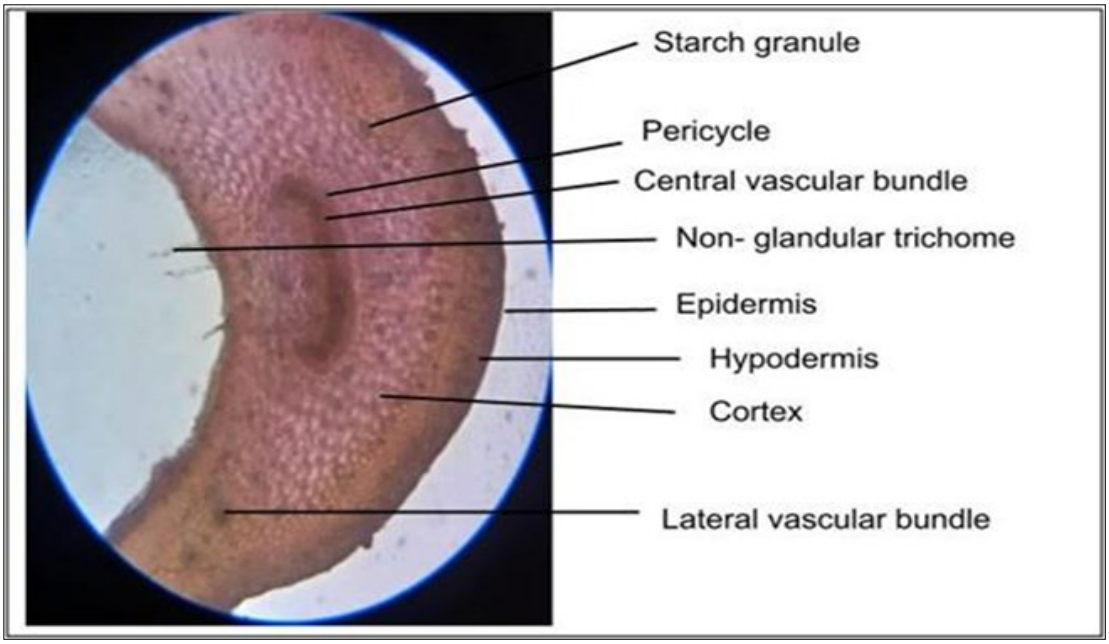

Fig. 7. T. S. of petiole of *S. oblonga*.

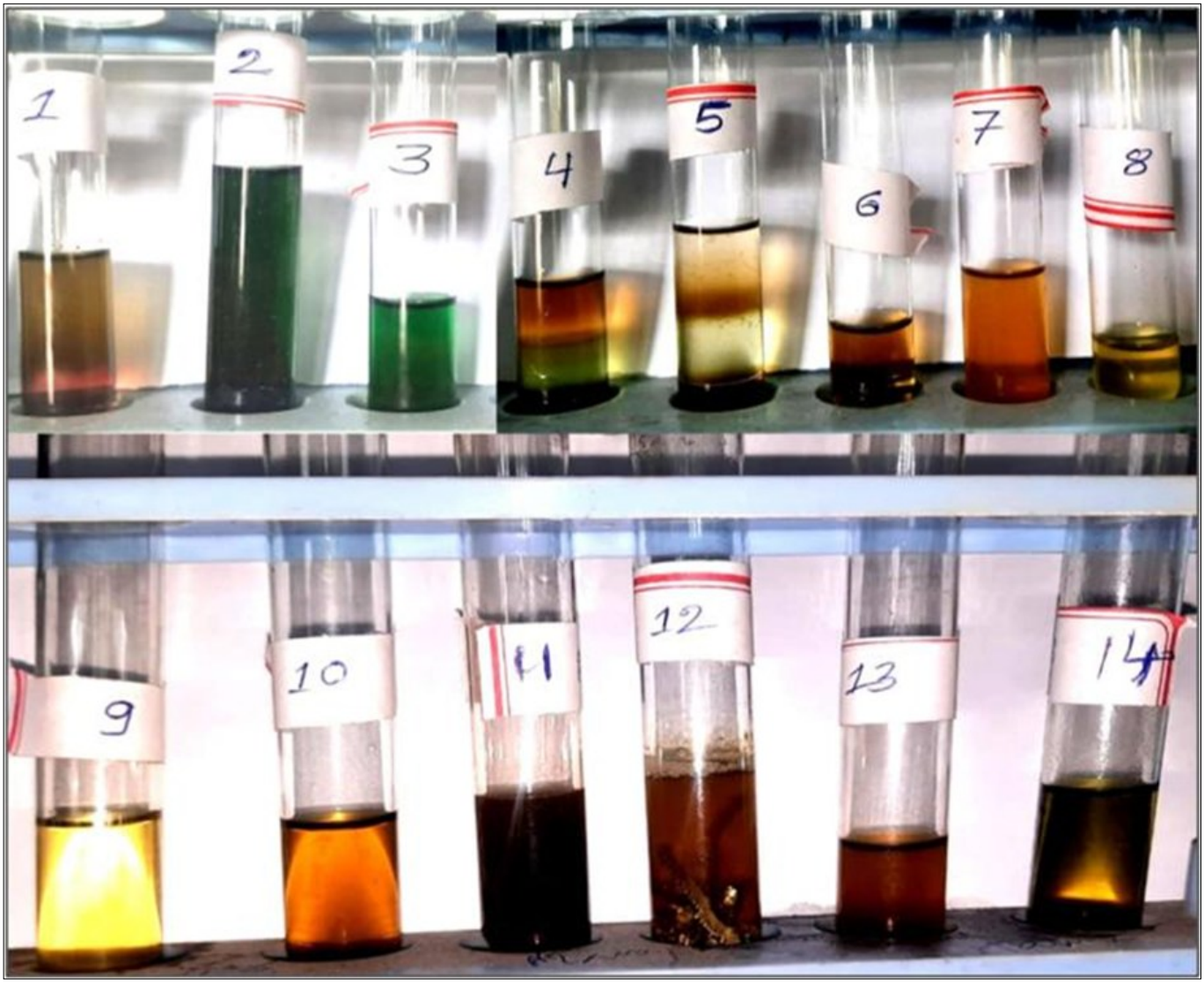

Fig. 8. Microchemical colour reaction test of the leaf extract of *S. oblonga*.

Table 5. Histochemical localization test of the leaf of *S. oblonga*

Test for	Test/ reagents	Histological location
Alkaloids	Mayer's reagent	Vascular bundles
	Wagner's reagent	Vascular bundle, pith
	Dragendroff's reagent	Epidermis, vascular bundle
Flavonoids	10 % NaOH	Phloem, cortex
Reducing sugars	Fehling's reagent	Epidermis, hypodermis, some cells of cortex, xylem and phloem
	Benedict's reagent	No tissue zone detected
Proteins	Millon's reagent	Phloem, cortex including hypodermis
	Lugol's reagent	Few cells of cortex
Tannins	10 % Lead acetate solution	Vascular bundles
	5 %Ferric chloride solution	Hypodermis
	10 % Potassium di-chromate	Epidermis, chlorenchyma, cortex and some cells of pith
Lignin	Phloroglucinol	Sclerenchyma tissue including xylem and phloem fibres
Glycosides	Keede reagent	Xylem
Carbohydrates	Molish' s test	Xylem, phloem and pith

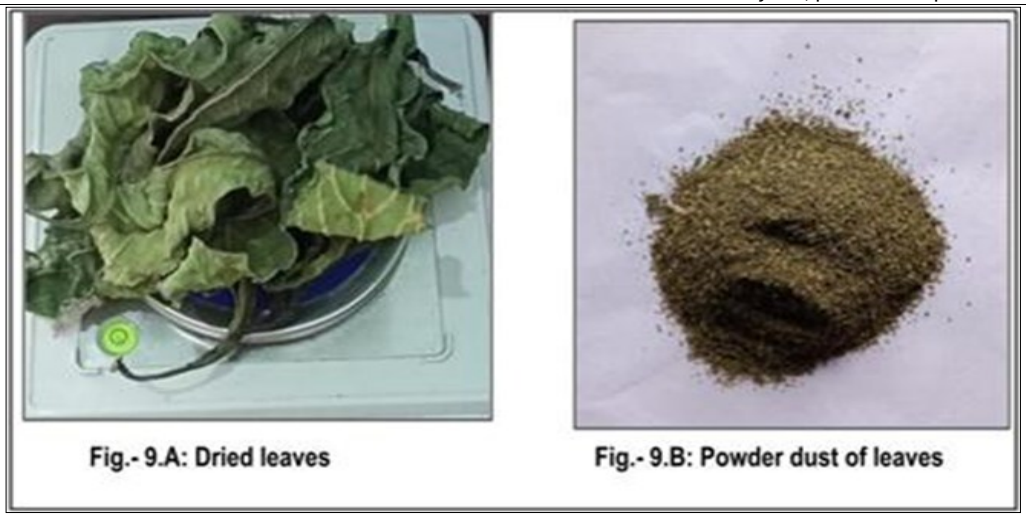

Fig. 9. Preparation of powder from dried leaves. (A) Dried leaves; (B) Powder dust of dried leaves.

Organoleptic study

The results for appearance, colour, odour, taste, texture and nature are shown in Table 6. From the analysis, it is clear found that the colour, texture and nature are different.

Physicochemical analysis of the leaf powder

Moisture content, overall ash material, acid insoluble ash, water soluble ash and extractive value were measured for physicochemical characterization of the powdered plant samples (Table 7).

Moisture content

The results of the moisture content of the leaves and petiole was 50.56 %.

Extractive value

The solvent type affects the extractive value of the drug sample. It is discovered that, out of all the solvents, methanol has the highest soluble extractive value 5.2 %. Benzene had the lowest soluble extractive value of 0.8 %. Water, petroleum ether and chloroform had extractive values of 7 %, 4.56 % and 1.85 %, respectively (Fig. 10).

Fluorescence analysis

When the leaf powder was exposed to 366 nm UV light, the drug powder without any chemical treatment and the powder that had been treated with various chemical reagents gave characteristic colour. The colour shifts in certain instances were notably different from those observed under normal lighting. (Table 8, Fig.11).

Antimicrobial activity

The results of antimicrobial activity of all crude extracts were shown positive against *E. coli* (Fig. 12).

Table 6. Organoleptic characters of the leaf powder dust of *S. oblonga*

Plant part	Colour	Odour	Taste	Texture
Leaf	Olive-green	Not specific	Pungent	Smooth

Table 7. Physicochemical properties of powdered leaf dust of *S. oblonga*

SL. No.	Physico-chemical parameters	Value (%)
1	Moisture content (w/w)	50.56
2	Extractive value (w/w)	
	a. Water soluble extract	20.25
	b. Methanol soluble extract	9.15
	c. Chloroform soluble extract	4.56
	d. Benzene soluble extract	0.8
	e. Petroleum ether soluble extract	1.856

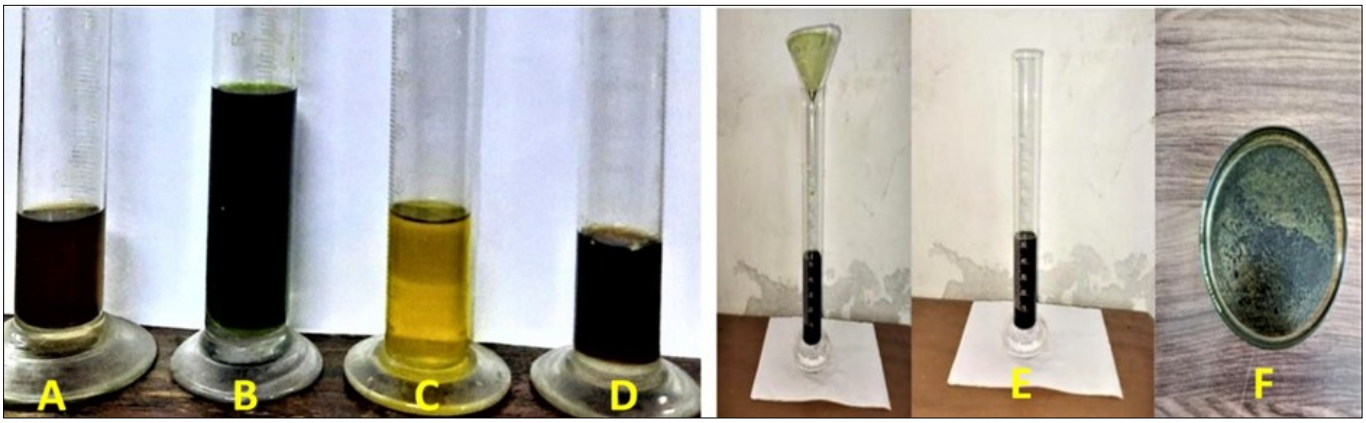

Fig. 10. *S. oblonga leaf extract.* A) Ethanolic extract of the leaf powder; B) Methanolic extract of the leaf powder; C) n-Hexane extract of the leaf powder; D) Water extract of the leaf powder; E) Glycerol extract of the leaf powder.

Table. 8. UV- Fluorescence study of leaf powder of *S. oblonga*

Material and treatment	Under UV 366 nm	Under visible light
Powder as such	Green with tinge of white fluorescence	Olive green
Water	Bluish black	Deep brownish green
Ethyl acetate	Red fluorescence	Deep brownish green
Conc. HNO_3	Deep green	Magenta colour
Chloroform	Dark blue	Olive green
2 % $FeCl_3$	Dark bluish black	Black
Conc. HCl	Black	Black
Methanol	Reddish black	Greenish black
Pet Ether	Blue with tinge of white fluorescence	Olive green
Conc. H_2SO_4	Black	Black
Acetone	Orange-reddish fluorescence	Deep green
Acetic acid	Faint creamy orange fluorescence	Chocolaty brown colour

Fig. 11. UV- Fluorescence study of leaf powder of *S. oblonga*. A) Under visible light; B) Under UV light (355 nm).

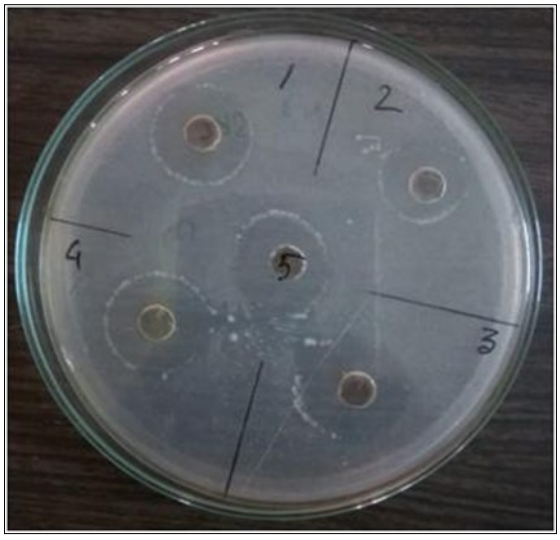

Fig. 12. Antimicrobial activity of the crude extract of leaf of *S. oblonga* against *E.coli.*

Discussion

Certain characteristics derived from foliar micromorphology, petiole and stem anatomy, preliminary phytochemical screening and physicochemical evaluation were found to be distinctive in the present study and can be utilized as markers to identify *Sanchezia oblonga* in both its fresh and dried forms. Since this plant has not previously been the subject of any pharmacognostic research, the study provides direct information. The first and most fundamental criterion for verifying the identity and purity of a medication is the macroscopic and microscopic characterization of plants, according to WHO (21). An uneven form of epidermal cells of *S. oblonga* was noted in this investigation. The cells of the lower and upper epidermis of the leaf exhibited different types of cell wall outlining. This includes the dorsal mesophyll-enclosed top and bottom epidermis, the main vascular bundles, the cortex in the midrib region, a few tiny tissues, a lateral vascular central bundle and a small vein. The analysis of stomata is crucial for taxonomy and pharmacognosy to identify therapeutic plants. In the present study, the foliar micromorphology of *S. oblonga* revealed diacytic stomata, which is consistent with the stomatal type documented in previous research in the genus *Sanchezia* (17). The stomatal index (SI) of *S. oblonga* was 11.48 for the lower leaf surface and 30.63 for the upper leaf surface. This makes it uncommon in the rest of the same family and is specific to this species of the genus (22-25). The foliar trichome characteristics are also regarded as important taxonomic marker (25-28). In the case of *S. oblonga,* leaf trichomes are multicellular and non- glandular trichomes. Therefore, trichomes with many arms will serve as markers for the identification of the shoot part of this investigated plant. Petiole anatomy is employed as an efficient tool for plant species identification as well as leaf drugs. Anatomy of the petiole of this plant was found to be very distinct among the other taxa of the family Acanthaceae so far studied. In our investigation, the petiole showed a semi-lunar outline in its transverse section and it contains three vascular bundles, of which the central one is semi-lunar in shape and larger than the other two. Chemical analysis and biological assays are two important aspects that are employed in Pharmacognosy for proper evaluation of crude drugs obtained from medicinal plants (29). A preliminary phytochemical examination revealed the chemical makeup of the crude drug and its important phyto-constituents. Among the significant phytochemical groups found in the leaves of the plant under investigation are alkaloids, anthraquinones, tannins, glycosides, steroids and saponins. A scientific impression of the locations of alkaloids, saponins and tannins in the bundles of vascular tissue, sclerenchyma and the cortical zone of the stem portion was provided by histochemical analysis. The knowledge of anatomical components of the leaf which include cork, cortex and phloem tissues, the components of the vascular bundles, demonstrates the medicinal value of the shoot leaf of this medicinal climber. The phloem, cortex, cork layers, pith zone and unquestionably the leaf tissues are where compounds of different phytochemical groups are often stored and generated. This scientific fact is also demonstrated in the histochemical analysis of the leaf, where the cortex, pith, vascular bundles and cork zone have been identified as active locations for numerous phytochemical groups. Different phytochemicals from a few medicinal plants that have been traditionally used to treat rheumatic pain, diabetes, diarrhea, malaria, tumors, inflammation, sexual illnesses and other conditions have already been investigated and their therapeutic qualities have been extensively documented (30-34). Several phytochemical groups, including alkaloids, flavonoids, saponins, steroids, triterpenoids and tannins, were confirmed to be present in our study by microchemical colour reaction assays. The existence of such significant phytochemical groups in *S. oblonga* demonstrates its potential for scientific confirmation of various ethnomedical applications as well as its therapeutic qualities. Physicochemical characteristics are essential for creating a crude drug fingerprint for certain standards and for identifying adulterants. The percentage of moisture, ash value, extractive value and UV-fluorescence characteristics are among the pharmacognostic indicators frequently used in the evaluation of crude drugs (35, 36). Ash value, a physical constant, is regarded as a fixed characteristic that differs among species. It is one of the most important diagnostic instruments used in crude drug research. The value is sometimes seen as a sign that crude medications contain inorganic materials (37). The leaf portion of this medicinal plant has been shown to have a 9 % ash value and is distinct, indicating that it contains an appropriate number of inorganic minerals such as carbonate, oxalate, phosphate, silica and siliceous earthy matter. The crude drug extracted from the leaves of the *S. oblonga* plant has different and distinct values for several parameters, such as acid insoluble and hand water-soluble ash, which can be used as an identifying marker for quality control and authentication. Fluorescence analysis of the medication powder is a very helpful tool for detecting the adulterants in samples (37, 38).Certain compounds included in plant medication powders exhibited varying fluorescence when exposed to varying UV light wave lengths.

In the present study, a powdered leaf with a creamy white appearance displayed green fluorescence when exposed to UV radiation. The same powder showed a reddish orange colour under normal lighting and black fluorescence in ultraviolet light after treatment with 50 % nitric acid. These noticeable colour shifts are thought to be highly convincing for identifying the leaves in their powdered state. The total quantity of extractive material released from crude medication in a specific solvent is indicated by the extractive value. This number is crucial when choosing a standard extractive solvent to estimate the maximum number of phytochemicals in a powdered medication (39). Among the other solvents employed in our investigation, such as benzene, petroleum ether and chloroform, methanol showed the highest extraction yield (8.672 %). The plant medication had the lowest extraction value (0.8 %) for benzene. This suggests that the compounds found in the leaf and petiole drug samples dissolve more readily in polar organic solvents such as methanol than in non-polar solvents such as petroleum ether and benzene respectively. According to this study, most chemical components were extracted from the

Sanchezia sp. leaf using methanol, a highly polar solvent. A clear pattern emerged from the extraction values for each of the four solvents used here, which will be crucial for the leaf drug's quality control. The existence of antibacterial compounds in the plant extract is further supported by reports that the crude extract of *S. oblonga* is efficient against certain gram positive and gram-negative bacteria that are pathogenic (15). Cyclopropane dodecanoic acid, 2-octyl-methyl ester is another fatty acid ester molecule that has been shown to possess anti-inflammatory and anti-microbial properties (16). Since many microbes are responsible for cholera, fever and diarrhea, reports on the biological activities of the compounds found in the leaf extract support the conventional use of the root and leaf decoction of this plant by the Orissan people to treat these illnesses (14-16). When it comes to a number of illnesses and conditions such as cancer, rheumatism, cardiovascular issues, immune related problems, etc. (16, 40, 41).The presence of these anti-inflammatory compounds in this plant is linked to its ethnomedical applications in headaches (during the menstrual cycle). This investigation identified two distinct coumarin derivatives: scopoletin and scoparone. Scopoletin exhibits strong antileishmanial and antispasmodic properties (43). The maximum quantity of scopoletin (peak area=31.788 %) was found in the crude leaf extracts scopoletin, another coumarin molecule, has been shown to be effective in treating a variety of illnesses, including scrotal dermatitis, mental retardation, cretinism, nerve deafness and various inflammatory problems such as painful mouth sores and tongue swelling. The application of scoparone (peak area=8.864 %) serves to mobilize calcium in muscle and minimize skeletal muscular issues, such as muscular pain and spasm, by stimulating the inhibition of synaptic impulses during muscular pain (16, 43, 44). The conventional use of the leaves of this plant to treat headaches, menstrual pain and muscular spasms are clearly justified by the higher concentrations of scopoletine and scoparone found in the leaves. Both coumarin chemicals actively inhibit synaptic transmission in these health issues (14, 16). It is noteworthy that the crude drug (leaf dust) of *Sanchezia* contains various phytochemical compounds, including 2-Hexadecanol (peak area = 3.995 %) and 2-Propenoic acid, 3-(3, 4, 5-trimethoxyphenyl), methyl ester (peak area = 5.102 %), which belong to the phenol and benzene carboxylic acid ester groups. Thus, this plant is a very promising candidate for additional chemical and biological activity studies. In order to scientifically validate the ethno-medical claims associated with this significant medicinal plant, systematic research of portions other than the leaf must also be conducted.

Conclusion

In the pharmacological investigation of *S. oblonga*, the diagnostic features of foliar epidermal micromorphology and chemical Pre-examined here will be helpful in correctly identifying the crude pharmaceuticals extracted from its various portions. The pharmacognostic study findings will also be useful for ensuring that the medications obtained from this ethnomedicinal plant are of high quality. Methanolic preparations of this medicinal climber leaf powder have revealed a wide range of therapeutically significant phytochemical groups, including alkaloids, flavonoids, fatty acids, phenolics, glycosides, etc., which essentially underlines its numerous therapeutic qualities. The promising areas of chemical compounds and pharmacological research on the currently studied plants are clearly highlighted by this information. The current study also demonstrates the scientific foundation for the traditional applications of the mentioned plant for a range of therapeutic out comes. Ultimately, it can be said that *S. oblonga* need more research in the fields of pharmacology and phytochemistry in order to identify the lead compounds and create powerful bioactive natural products.

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Authors' contributions

TM carried out the experimental work and drafted the manuscript. MB did the data analysis and modified the manuscript. SKC designed the experimental work, conducted biochemical analysis and wrote the manuscript.

Compliance with ethical standards

Conflict of interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Ethical issues: None

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