

PHARMACOGNOSTIC STUDIES AND ANTIMICROBIAL ACTIVITY OF *SYNEDRELLA NODIFLORA* (L.) GAERTN

Bhogaonkar P Y, Dagawal M J¹ and Ghorpade D S²

Department of Botany, G.V.I.S.H. Amravati

¹Department of Botany, Smt.Radhabai Sarda College, Anjangaon Surji.

²Govt. College of Pharmacy, Amravati.

mdagawal@gmail.com

ABSTRACT

Synedrella nodiflora (L.) Gaertn is a less known medicinal plant. It is a small annual weed native to America, found in the plains of India and occasionally in Amravati district (M.S.). The leaves are used as poultice for sore rheumatism. Juice of leaves also used for earache. In Ghana an infusion of leaves is drunk as laxative. Leaf sap is used for mouth affection in Congo. Anatomically the leaf is characterized by anomocytic stomata, dorsiventral mesophyll and simple as well as glandular trichomes. Present investigation showed the presence of alkaloids, flavonoids, flavonols saponins triterpenes and polysaccharides. Leaves were extracted with petroleum ether, chloroform, acetone, methanol and distilled water. TLC fingerprinting of all extracts was done for drug characterization. Antimicrobial activity was tested using these extracts against three bacteria and two fungi. Petroleum ether extract showed maximum activity against all the microbes tested except *E. coli*. *C. albicans* is most susceptible to all extracts except methanol.

Key words: *Synedrella nodiflora*, Pharmacognosy, Anatomy, Phytochemistry, TLC fingerprinting.

INTRODUCTION

Synedrella nodiflora (L.) Gaertn (Asteraceae) is a less known medicinal plant. It is a small, annual weed of cultivation native to America, found in the plains of India and in the Andamans also. Occasionally it is found in Amravati district (M.S.). The leaves are used as poultice for sore rheumatism and juice of the leaves is used for earache. (Rathi and Gopalkrishnan 2005). In Ghana infusion of leaves is taken as laxative; leaf sap is used in Congo for mouth affections and is rubbed on gums for tightening. In Malaya it is used for poulticing sore legs and for headache after confinement and the sap is put in to ear for earache in Indonesia, leaf sap is used for stomachache and rheumatism, roots are pounded and cooked and decoction is given as cough mixture in Tanganyika (Burkil 1985). Insecticidal activity of aerial parts of *Synedrella nodiflora* on *Sapoteptera latura* has been reported by Rathi and Gopalkrishnan (2005).

Study was carried out to characterize the herb anatomically and chemically. The herb was tested for its antimicrobial potential as Asteraceae are a successful family with several defense chemicals.

MATERIALS AND METHODS

Plants were collected from area around Amravati city; for identification standard floras were referred (Cook 1967 and Naik 1988). For anatomical studies hand sections of fresh material were taken and diagrams drawn with the help of camera lucida. Anatomy of plant part used i.e. leaf was studied. Mature leaves were shade dried, powdered and stored at 4 °C in zip lock bag for further studies. Material was screened for presence of bioactive

molecules following standard methods. (Evans 1997, Gibbs 1974, Herborne 1973.)

For antimicrobial activity leaves were extracted with petroleum ether, chloroform, acetone, methanol and distilled water by Soxhlet for about eight hours. Extracts were run in Chloroform: Benzene (4:1) phase for TLC fingerprinting characterization. Extracts were dried and extractive values were calculated in terms of percentage considering the weight of plant material as 100%. The antimicrobial activity of extracts was tested by cup plate method (Collins 1976) using Muller Hinton nutritive agar medium and Sabarof dextrose agar medium. Tetracycline was used as standard for comparative study. Strains used are *Bacillus subtilis* NCIM 2063, *Staphylococcus aureus* NCIM 2079, *Escherichia coli* NCIM 2065, *Candida albicans* NCIM 3100 and *Aspergillus flavus* NCIM 519. (Culture was procured from NCLPune). Oven dried leaf extract dissolved in DMSO taken for antimicrobial study. Zone of inhibition recorded in mm after 24 hours of incubation.

RESULTS AND DISCUSSION

The biological and therapeutical application of the plants of Asteraceae is the result of systematically conducted chemical and pharmacological research rather than simply of tradition. Cytotoxic sesquiterpene lactones of certain species may act as pointers for development of cancer drugs (Lee et al. 1975). The species are particularly rich in sesquiterpene lactones, polyacetylenes, steroids, terpenoids, alkaloids, saponins and various heterocyclic compounds.

Table 1: Phytochemical Profile of *Synedrella nodiflora*

S.N.	Test	Response	Intensity	Inference
1	Iridoids a) Acubin Type b) Harpagide	White Yellow White Yellow	– –	Absent Absent
2	Alkaloids a) Mayer's Reagent b) Dragendorff's Reagent c) Wagner's Reagent	Light Brown ppt Brown ppt Brown ppt	+ ++ +++	Present Present Present
3	Anthraquinones Test – a Test – b Test – c	Light Green Orange	– –	Absent Absent
4	Cardenolide Test – a Test - b	Orange Reddish Yellow	– –	Absent Absent
5	Flavonoids a) Shinoda Test b) Flavonol Test c) Flavanol Test d) Flavone, Flavonol, Flavanone Test e) Rao & Sheshadri Test (Flavanone)	Orange Colour Yellowish Yellowish Green Orange No Change	++ – ++ +++ –	Present Absent Present Present Absent
6	Simple Phenolics Test a) With FeCl ₃ Test b) with addition of NaOH Test c) Excess FeCl ₃	Green Red No Change	+++ +++ –	Napthol
7	Leucoanthocyanin Test	Brown Colour	–	Absent
8	Steroids/Triterpenoid Test Test a Test b	Light Green Brown	+ –	Present Absent
9	Tannin Test a) Tannin Test b) Pseudo Tannin	No ppt Greenish Yellow	– –	Absent Absent
10	Saponins Test a) Test b) Fatty and Organic Acids	Stable Froth –	+++ –	Present Absent
11	Juglone	Light Green	–	Absent
12	Emodins	Yellow	–	Absent
13	Polyoses	Red	++	Present
14	Polyuronoides	Brown	–	Absent
15	Anthracene glycosides	Colourless ring	–	Absent

Morphology

Annual herb. Stem terete, glabrous. Leaves opposite, petiolate, toothed, ovate to elliptic, 5 – 12 x 2 – 3.5 cm, hairy on both sides at base, acute. Heads small, heterogamous, rayed; ray florets 1 – 2 seriate, fertile; ligule short, broad, 2-3 toothed, yellow; disk florets, fertile, tubular, limb 4-toothed. Involucre multicarinate; bracts few, 1-2 outer usually foliaceous, inner membranous; pappus 2–3, bristly, awned and shorter than tube; receptacle small; paleae scarious, flat. Anthers exerted, epiculate, base subentire. Style exerted; stylar arms papillate for about half the

length, acute. Achenes of ray florets dorsally compressed, 2 winged, smooth, wings lacerate; those of disk florets few, narrower, compressed or triquetrous often muciculate, black, ribbed.

Anatomy

Leaf base shallowly concave on upper side, winged laterally; wings short, ciliate; cilia long. Epidermis single layered, covered with comparatively thin cuticle. Hypodermis 2-3 layered, collenchymatous, on upper as well as lower side.

Table 2: *Synedrella nodiflora* TLC fingerprinting of extracts in mobile phase- Chloroform : Benzene (4 :1)

Name of extract	Developers	Number of spot	Rf value	Colour
Petroleum ether	H ₂ SO ₄	Nil	-	-
	Iodine	Nil	-	-
Chloroform	H ₂ SO ₄	05	0.100	Yellow
			0.207	Light Green
			0.242	Light Yellow
			0.307	Light Green
			0.457	Dark Green
			0.213	Green
	Iodine	04	0.546	Light Green
			0.733	Dark Green
			0.933	Brown
			0.933	Brown
Acetone	H ₂ SO ₄	03	0.080	Light Green
			0.260	Yellow
			0.400	Green
	Iodine	03	0.533	Light Green
			0.200	Light Green
			0.093	Dark Green
Methanol	H ₂ SO ₄	03	0.092	Light Yellow
			0.171	Light Green
			0.250	Dark Green
	Iodine	04	0.700	Yellow
			0.200	Green
			0.100	Light Green
			0.066	Dark Brown
Water	H ₂ SO ₄	Nil	-	-
	Iodine	Nil	-	-

Table 3: Extractive Value *Synedrella nodiflora*

Extractive Value %				
Petroleum Ether	Chloroform	Acetone	Methanol	Aqueous
6.09	6.44	14.56	1.86	13.02

Table- 4 : Antimicrobial activity *Synedrella nodiflora*

Sr. No.	Test Microorganism	Zone of Inhibition after 24 Hrs (in mm and %)					
		Petroleum Ether	<i>Chloroform</i>	Acetone	Methanol	Aqueous	Standard
1.	<i>Bacillus subtilis</i>	6.5 (52%)	3.75 (30%)	3.5 (28%)	Nil	Nil	12.5 (100%)
2.	<i>Staphylococcus aureus</i>	7 (58%)	4.5 (37%)	6.5 (54%)	5.75 (48%)	5 (42%)	12 (100%)
3.	<i>Escherichia coli</i>	7 (41%)	5.5 (32%)	4 (24%)	4.5 (26%)	8.5 (50%)	17 (100%)
4.	<i>Candida albicans</i>	6.5 (108%)	5 (83%)	6.5 (108%)	2.5 (42%)	5.5 (92%)	6 (100%)
5.	<i>Aspergillus flavus</i>	12.5 (46%)	9.5 (35%)	11.5 (43%)	5 (19%)	5.5 (20%)	27 (100%)

PLATE - I
Synedrella nodiflora (L.) Gaertn

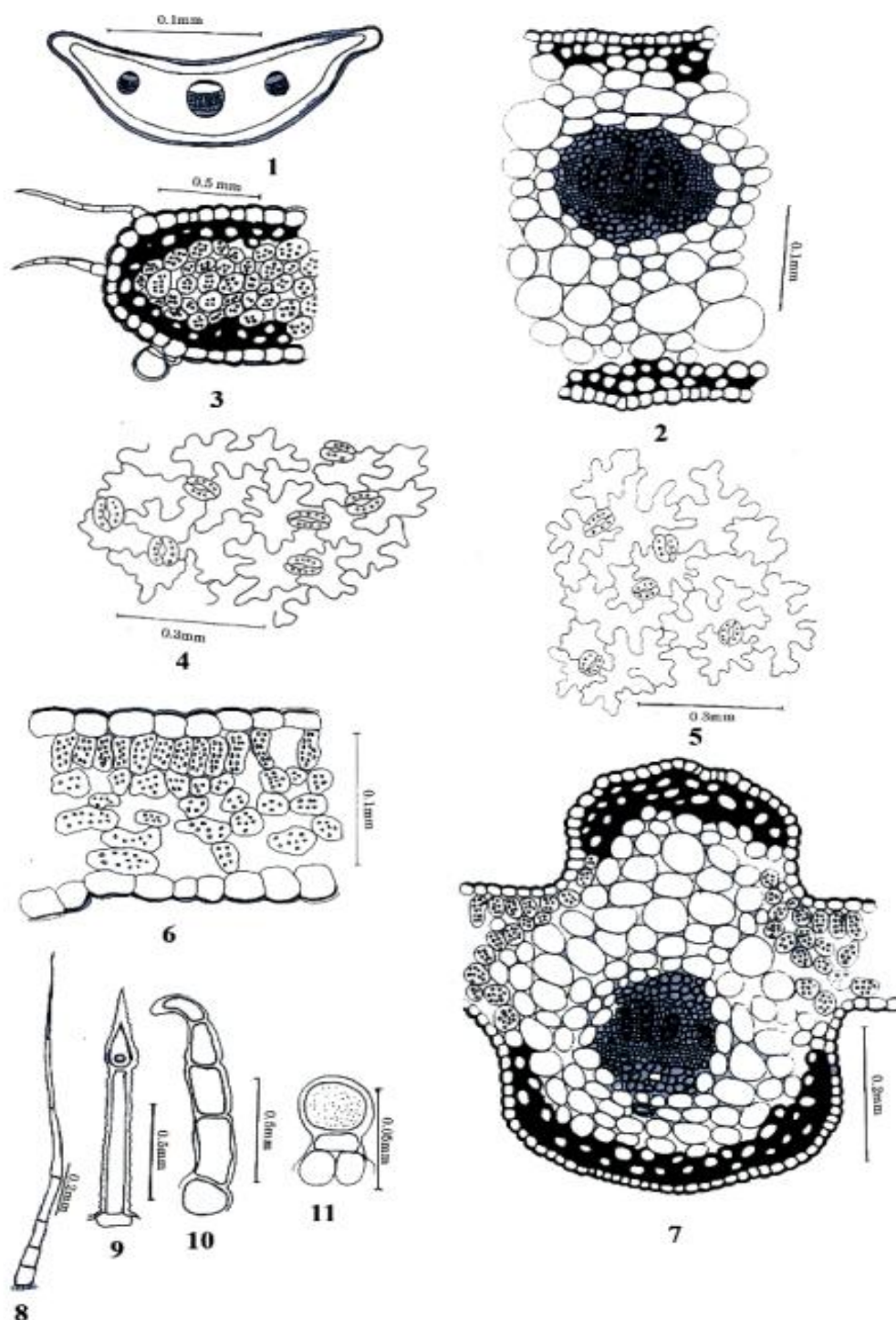


Fig: 1-2 T.S. Leaf base. 3. T.S. Leaf base wing. 4. Upper epidermis.
 5. Lower epidermis. 6. V.S. Lamina. 7. T.S. Midrib. 8-11. Trichomes.

Ground tissue parenchymatous; cells thin-walled, large, enclosing small intercellular spaces. Vasculature of three separate strands forming an arc. Vascular bundles conjoint, collateral with prosenchymatous cap on either side;

parenchymatous sheath around bundles present. Wings filled with chlorenchyma. Epidermal cells of wing larger (Fig. 1-3). Lamina dorsiventral, amphistomatous. Epidermis single layered, cutinized and cuticularized,

cells deeply sinuate; stomata anomocytic. Mesophyll differentiated into palisade and spongy parenchyma; palisade single layered, densely filled with chloroplasts. Spongy parenchyma 2-3 layered; cells irregular, loosely placed and densely filled with chloroplasts. (Fig. 4-6) Midrib ridged on upper side. Epidermis single layered, cuticle comparatively thin; hypodermis collenchymatous completely filling the ridge and one to two layered below epidermis. Ground tissue parenchymatous; cells large, thin walled enclosing small intercellular spaces. Vascular bundle single accompanied by prosenchymatous cap on either side. (Fig. 7) Resin canals present in ground tissue of leaf base and mid rib just below the vascular bundles.

Trichomes simple as well as glandular. Simple trichomes uniseriate, multicellular, of three types- 1. short, about four celled; cells short broad, uppermost cell hooked, walls thick, smooth, 2. long, cilia like, basal cell shortest gradually higher above cells become narrower and longer, apical cell longest with pointed long tip, walls thin, smooth, 3. two celled; lower cell long, apical cell short, conical, acute, walls warty, rough; this type of trichomes are numerous on leaves imparting them rough texture. Glandular trichomes with single, short basal cell and unicellular glandular head. (Fig. 8-11)

Vascular supply of three traces, anomocytic stomata dorsiventral mesophyll and presence of resin canals are in confirmation with general features of Asteraceae. (Metcalf and Chalk 1965). However, these features combined with characteristics trichomes i.e. ciliate, hooked, warty

and glandular make the anatomical identity of the leaf drug.

Phytochemistry

In present investigation plant material was screened for 15 biomolecules of these six were found to be present in the material studied. (Table 1). Presence of steroids. Triterpene, alkaloids, phenol and saponins is in confirmation with earlier report (Rathi and Balkrishnan 2005). Flavonoids and polyoses are reported here in addition. Naphthol represents the simple phenolics.

Plant extracted in petroleum ether, chloroform, acetone, methanol, and water were subjected to TLC finger printing for characterization (Table 2). It was also found that maximum contents are soluble in water while minimum in petroleum ether (Table 3).

Antimicrobial activity

Various extracts were tested for two gram -ve bacteria and one gram +ve bacteria and two fungi. The results obtained are presented in Table 4. It is apparent from the results that *C.albicans* is most susceptible to all extracts, the petroleum ether and acetone extracts being more effective even than standard. Petroleum ether extract showed maximum activity against all the microbes tested except *E. coli*. *B. subtilis* was found to be most resistant to methanol and aqueous extracts showing no inhibition.

It is thus concluded that *Synedrella nodiflora* possess good antibacterial and antifungal activity. It can be exploited for preparation of drug especially against *C. albican*.

LITERATURE CITED

- Burkill HM. 1985.** The useful plants of West Tropical Africa., Vol.1 NHBS Ltd Kew England.
- Collins CH and Lyen PM. 1976.** Microbiological methods, London, Butterworths and Co.Pub. 288.
- Cooke T. 1967.** The Flora of the Presidency of Bombay. Vol. II. Botanical Survey of India. Calcutta.
- Evans WC. 1997.** Trease and Evans Pharmacognosy. W. B. Saunders Company Limited, Singapore, Fourteenth edition.
- Gibbs RD.1974.** Chemotaxonomy of flowering plants, Mc. Gill Queen's University Press, Montreal.
- Harborne JB.1973.** Phytochemical Methods. Chapman and Hall Ltd. London.
- Lee K H, Ibuka T, Huang HC and Harris DL. 1975.** Antitumour agents XIV: Molephantinin, a new potent antitumor sesquiterpene lactone from *Elephantopus mollis*. *Pharmac.Sci.* **64**: 1077.
- Metcalf CR and Chalk L. 1965.** Anatomy of the Dicotyledons Vol II. Clarendon Press, Oxford.782-804.
- Naik VN. 1998.** Flora of Marathwada Vol. I. Amrut Prakashan, Aurangabad.
- Rathi MJ and Gopalkrishnan S. 2005.** Insecticidal activity of aerial parts of *Synedrella nodiflora* (L.) Gartn (Compositae) on *Sapodoptera latura* (FAB). *J.cent.Eur.Agric.* **6**: 323-328.