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# Preliminary Phytochemical Screening and in Vitro Antifungal Activity of Ethanolic Leaf Extract of Synedrella Nodiflora (L.) Gaertn

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## ABSTRACT

The present study was carried out to evaluate the, phytochemical constituents, and in vitro antifungal activity of ethanolic leaf extract of Synedrella nodiflora (L.) Gaertn. The plant leaves were collected, authenticated,.shade dried, powdered, and extracted using ethanol by Soxhlet extraction method. physicochemical evaluations were performed to determine the identity, purity, and quality of the crude drug material .Preliminary phytochemical screening of the ethanolic extract revealed the presence of important secondary metabolites such as alkaloids, flavonoids, tannins, saponins, phenolic compounds, an terpenoids, which are known to possess antimicrobial and antifungal properties. The invitro antifungal activity of the extract was evaluated by agar well diffusion method against fungal strains including Candida albicans The ethanolic extract exhibited noticeable antifungal activity against the tested organisms, and the activity increased with increasing concentration of the extract. The antifungal effect may be attributed to the presence of bioactive phytoconstituents present in the plant extract.The results of the present investigation support the traditional medicinal use of Synedrella nodifloraand suggest that the plant possesses potential as a natural source for development of plant-based antifungal agents. Further studies are required for isolation and characterization of active compounds responsible for antifungal activity.

**Keywords:** Synedrella nodiflora, Ethanolic extract, Antifungal activity, Phytochemical screening, Agar well diffusion method, Candida albicans.

## 1. Introduction

Synedrella nodiflora (L.) Gaertn., belonging to the family Asteraceae, is a medicinal herb widely distributed in tropical and subtropical regions. The plant has traditionally been used for the treatment of wounds, inflammation, infections, and various microbial diseases due to its therapeutic properties [1]. Medicinal plants are considered important sources of bioactive compounds such as flavonoids, tannins, alkaloids, phenolics, saponins, and terpenoids which exhibit antimicrobial and antifungal activities [2].Fungal infections caused by pathogenic fungi such as Candida albicans, Aspergillus Niger, and Aspergillus flavus have become a major public health concern because of increasing resistance to synthetic antifungaldrugs. Therefore, there is growing interest in the search for natural antifungal agents from plant sources with fewer side effects and better safety profiles [2].Previous phytochemical investigations on Synedrella Nodiflora revealed the presence of several secondary metabolites responsible for antimicrobial activity [3]. Studies have also reported that extracts of

Synedrella nodiflora possess antimicrobial effects against different pathogenic microorganisms [4]. Ethanol is commonly used as an extraction solvent because it efficiently extracts polar and moderately polar phytoconstituents from plant materials [5].Therefore, the present study was undertaken to evaluate the in vitro antifungal activity of ethanolic extract of Synedrella nodiflora against selected fungal strains using agar well diffusion. The study may help inidentifying potential natural antifungal compounds and scientifically validating the traditional use of the plant.

**Macroscopical Characteristick:**

Habit: An annual or short-lived perennial herb, typically growing to heights of 30–100 cm, occasionally reaching 150 cm in fertile soils. The plant exhibits an erect to procumbent growth form with dichotomously branched stems.

Leaves: Simple, opposite, and ovate to elliptic in shape, measuring 2–12cm in length and1–5cm in width. The leaf base is cuneate and decurrent, with margins that are crenulate-serrate or rarely subentire. The leaf surface is scabridulous (rough)on both sides, and the petioleis winged,upto3cm long.

Stem: Erect, branched, and scabridulous (rough-textured),with aglabrescent (becoming hairless)surface.

Flowers: Small, yellow, and grouped into small heads at the base of terminal leaves.The inflorescences are composed of both ray florets (female)and disk florets (bisexual),arranged in a capitulum(flower head).

Fruit: Achenes that are dimorphic ray achenes are oblong-ovoid, flattened,winged,and3–5mm long, while disk achenes are obconic, slightly compressed, and about 3 mm long.

Odor & Taste: The plant emits a faint aromatic odor, and the taste is mild or slightly bitter.[6,7]

**GEOGRAPHICAL DISTRIBUTION:** Synedrella nodiflora(L.) Gaertn.,commonly known as Cinderella weed or Nodeweed, is a widely distributed pantropical species. Althoughnative to tropical Pacific islands due to its high adaptability and rapid growth in varied environments It typically inhabits disturbed areas such as agricultural fields ,roadsides, gardens, wastelands, and moist open spaces. The species flourishes in warm, humid climates, growing well in loamyand well-drained soils, though it can tolerate a range of soil types.In India ,Synedrella nodiflora occurs through out the plains and lower hilly regions ,particularly in Maharashtra, Tamil Nadu, Kerala, Karnataka, West Bengal, and the Northeastern states. Beyond India,it is also wide spread in Srilanka, Malaysia ,Indonesia ,the Philippines, and several African countries including Nigeria and Ghanam.[8,9]

**Chemical constituents:**

Flavonoids: Quercetin, Kaempferol, Luteolin ,and their glycosides These compounds are known for their antioxidant, anti-inflammatory, and antimicrobial effects.

Terpenoids and Steroids: β -Sitosterol, Stigma sterol,Lupeol, and α-Amyrin Contribute to anti-inflammatory, hepatoprotective ,and analgesic activities.

Phenolic Compounds: Gallicacid ,Caffeic acid, and Chlorogenic acid Exhibit strong antioxidant and free radical scavenging properties.

Alkaloids: Some nitrogen-containing alkaloids have been reported, which may contribute to antimicrobial and antimalarial activities.

Saponinsand Tannins: Responsible for the plant's anti-inflammatory, antidiabetic ,and wound-properties.

Fatty Acids and Volatile Compounds: Palmitic acid, Linoleic acid, and other hydrocarbons have been identified in the essential oil fraction.[10,11,12]

**Materials and Methods:**

Collection and authentication of plant:

Collection of plant:

The plant material of Synedrella nodiflora was collected from Sangali, Maharashtra, India. The collected plant was healthy, disease-free, and in the flowering stage. After collection, it was properly washed and shade dried at room temperature.[13

**(Fig no.1) collection of plant**

**Authentication of plant:**

The plant was authenticated by [Mr. S. M. Sabale], Department of Botany, [P. V. P. College, Kavthe Mahankal], Sangali, Maharashtra, India. The authenticated specimen was confirmed as Synedrella nodiflora (L.) Gaertn.[14]

**Drying of Plant Material:**

Drying of plant material is an important step in pharmacognostic and phytochemical studies, as it helps to remove moisture and prevent microbial growth, enzymatic degradation, and decomposition of active constituents. Proper drying ensures preservation of bioactive compounds present in the plant material[13].The freshly collected plant material of Synedrella nodiflora is first washed with running water to remove dirt, dust, and other impurities. After cleaning, excess surface water is removed and the plant material is subjected to shade drying at room temperature. Shade drying is preferred over direct sunlight because direct exposure may lead to degradation of heat-sensitive and light-sensitive phytochemicals[16].The plant material is spread in at thin layer on clean trays or paper sheets to ensure uniform drying and proper air circulation. It is periodically turned to avoid fungal contamination and uneven drying.The drying process is continued for7–10 days or until the material becomes completely brittle [15].After complete drying, the plant material is checked for moisture content. Properly dried material should break easily when pressed. The dried material is then stored in airtight containers or polythene bags to protect it from moisture and contamination until further use [13,15].

**(Fig no2): Drying of leaves**

**(Fig no 3): powder of leaves**

**Extraction of Plant Material:**

Method of extraction: Extraction of Leaf Powder of Synedrella nodiflora by Soxhlet Method (Using Ethanol)

Soxhlet extraction is a continuous hot extraction technique used to obtain bioactive compounds from plant materials using suitable solvents, ensuring efficient and repeated extraction of phytochemicals [5].

Preparation of Leaf Powder: Fresh leaves of Synedrella nodiflora are collected, washed thoroughly with running water to remove dust and impurities, and then shade dried at room temperature to prevent degradation of heat-sensitive compounds. The dried leaves are ground into a fine powder using a mechanical grinder and passed through a sieve to obtain uniform particle size. The powdered material is stored in an airtight container for further use [16].

Loading of Sample: About 50g of dried leaf powder is placed in a filter paper thimble and inserted into the Soxhlet apparatus for extraction [16].

Selection of Solvent: Ethanol(70%) is used as the extraction solvent because it efficiently extracts a wide range of phytochemicals such as flavonoids, tannins, phenols, alkaloids, and terpenoids, which are responsible for biological activities including antifungal effects [13].

Soxhlet Extraction Procedure: The Soxhlet apparatus is assembled with a round-bottom flask containing ethanol and connected to a condenser. On heating, ethanol vapours rise, condense, and drip into the thimble containing plant powder. The chamber fill stand siphons repeatedly, allowing continuous extraction of phytoconstituents. The process is carried out for 6–8 hours or until the solvent in the siphon tube becomes colorless, indicating complete extraction [5,13].

Concentration of Extract: After extraction, the solvent is removed using water bath at controlled temperature, yielding a semi-solid or dry crude extract [16].

Storage: The concentrated extract is stored in airtight containers at 4°C for further phytochemical and antifungal studies [5].

Importance Soxhlet extraction ensures maximum yield of active constituents from Synedrella nodiflora, making it suitable for pharmacological evaluation such as antifungal activity studies [13].

Percentage (%)yield:

Weight of extract/ total weight ofsampleX100

**(Fig no 4): Soxhlet extraction**

**Phytochemical Screening:**

Preliminary phytochemical analysis of ethanolic leaf extract showed the presence of various secondary metabolites such as alkaloids, flavonoids, tannins, saponins, phenolic compounds, and terpenoids. These compounds are known to possess antimicrobial and antifungal activities [4].

**Table: Preliminary Phytochemical Screening**

**Table no. 01**

| **Phytochemical** | **Result** |
|---|---|
| Flavonoids | Present |
| Tannins | Present |
| Reducing sugar | Present |
| Cardiac glycoside | Present |
| Alkaloids | Trace amount |
| Carbohydrates | Trace amount |

**Activity Check By in Vitro Study:**

**Antifungal activity:**

Sample description : extraction of synedrella nodiflora.

Activity: Antifungal activity by agar well diffusion method.

Experimental procedure

**Introduction**: The antifungal activity is estimated by comparing the inhibition growth of sensitive fugus produced by known concentration of the isolated extract to be examined against a reference substance.[19]

METHOD OF ANALYSIS: Two general methods usually employed; One is the cup plate method [Agar diffusion method]-the agar cup plate method depends upon diffusion of antibiotic from a vertical agar [well] cylinder through a solidified agar layer on a petri dish. sterile agar is inoculate by suspension of the microbial inoculum. then well with diameter of 6 to 8 mm is punched aseptically, and then of the antifungal solution at desired concentration is introduced into the well. then, agar plates are incubated under suitable conditions depending upon the test fungus. the antifungal agent diffuses in the agar medium and inhibit the growth of the fungus strain entirely in a zone around the cylinder containing a solution of the substance to be tested.[20]

**Table no. 02**
**Method:**

| Test | Antifungal activity |
|---|---|
| Method | The agar well plate method |

**Table no. 03**
**Description of Equipment/ Instruments:**

| | |
|---|---|
| Analytical balance | Vernier caliper |
| Water bath | Incubator-20 to 25 $^0$c |
| Laminar air flow | Incubator-30 to 35 $^0$c |
| colorimeter | Refrigerator-2 to 8 $^0$c |
| Zone reader | Cyclomixer |
| Sonicator | Micro-pipettes |

**MEDIA AND REAGENTS PREPARATION:**
**Antibiotic Assay Medium No. 19: (pH is 6.1 ± 0.2):**

**Table no. 04**

| Ingredient | Weight |
|---|---|
| Peptone | 9.4g |
| Yeast Extract | 4.7 g |
| Beef Extract | 2.4 g |
| Sodium Chloride | 10.0 g |
| Dextrose | 10.0 g |
| Agar | 23.5 g |
| Water | 1000 mL |

Prepared of medium Antibiotic Assay Medium No. 19 in 600 ml of purified water, heat boiling to dissolve the medium completely check the pH of media. If required add sufficient 1 M sodium hydroxide or I M hydrochloric acid, distributed in 200 ml flasks as required so that after sterilization as quantity as per required for analysis., sterilized by autoclaving it at 15 lbs pressure (121°C) for 15 min.[20]

**Preparation of the sample solution Prepare** 10mg/ml to inoculate into well

**Preparation of the STD solutionuse** directly 100 µl to inoculate

**Preparation of Test organism and suspension:**
Test organisms Candida albicans

**Stock culture Candida albicans:**
Streak a loopful of suspension ATCC. 10231 and ATCC-11827 on two slants of preincubated Nutrient agar. Incubate the slants at 30-35°C for 24 hours in an incubator After incubation pick up the growth from incubated slant and inoculate in 3 ml of saline solution and vortex to prepare the uniform suspension. Adjust the O.D. of culture to approx. 60-70 % OD at 530 nm using sterile saline and calorimeter. After adjusting O.D. store the test organism in refrigeration at 2-80C Note: Approximately viable count is 10° to 10 cfu /ml against 60-70 %OD at 530 nm

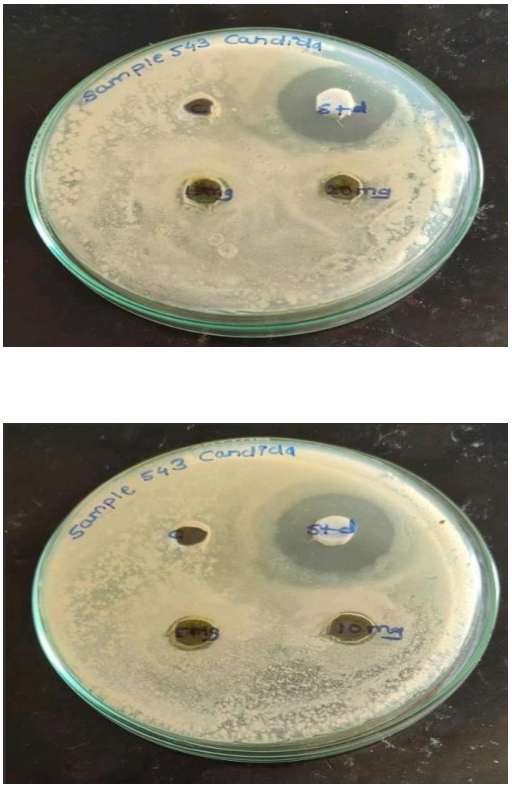
**Plate Preparation for analysis:**
**After the suspension is prepared, use each 2 ml of culture suspension of Candida albicans is to inoculate separately** in 200 ml of sterile molten and cooled medium at 40°C - 45°C Antibiotic Assay Medium No. 19.15-20 ml of Sterilized agar medium is poured into a sterile Petri plate with the help of sterile measuring cylinder give a depth of 3 to 4 mm. Allow to cool at room temperature by placing the dishes or plates on a level surface. uniform in thickness. Make 4-5 agar cups on each plate using 6 mm SS borer. Label the plates for sample, standard and negative control samples and analysis details.

**Analysis:**
The volume of solution added to each cylinder or cavity must be uniform and sufficient almost to fill the holes when these are used.
Add 100 µl 1mg/ml Solution A to agar cup labeled as STD.

Add 100 µl 1 mg /ml = Solution B to agar cup labeled for each compound ID labeled on plate. Add 100 µl DMSO to agar cup labeled as N (Negative)
.Leave the dishes or plates standing for 15-20 min. at 2-8°C or as appropriate, as a period of pre- incubation diffusion to minimize the effects of variation in time between the applications of the different solutions. Incubate them for about 24-48 hours at the temperature 30-35°C for bacteria and 20-25°C for yeast and mould .

After completion of incubation accurately measure the diameters or areas of the circular inhibition [19]

**Observation:**
**standard: 1 mg/mL**
**Compound: 5mg/mL and 10mg/mL**
**Control – DMSO**
**Candida albicans ATCC no- 10231**




**(Fig no.05) zone of inhibition**

**Observation table:**
**Table no. 05**

| **Sr. No** | **Sample** | **Concentration** | **Zone of inhibition(mm)** ***Candida albicans*** |
|---|---|---|---|
| 1 | Control | – | – |
| 2 | Standard (Fluconazole) | 1mg/ml | 29 |
| 3 | Sample (*Synedrella Nodiflora*) | 5mg/ml | 01 |
| | | 10mg/ml | 02 |
| | | 15mg/ml | 04 |

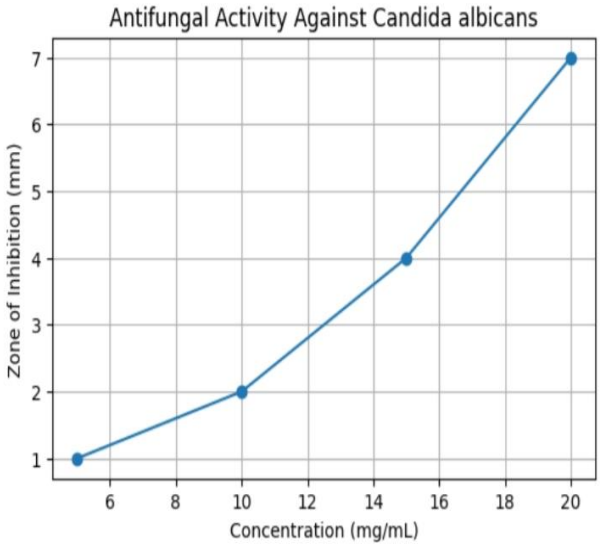
| | | | |
|---|---|---|---|
| | | 20mg/ml | 07 |

**Result:**

**Collection:** The whole plant synedrella nodiflora was collected in month of March 2026 from sangali, India.

Authentication: After collection the plant was identified, conformed and authenticated by Mr. S. M. Sabale Head of department of botany PVP college Kavthemahankal, sangali.

Antifungal activity: The antifungal activity of ethanolic leaf extract of Synedrella nodiflora was evaluated by agar well diffusion method against selected fungal strain Candida albicans. The extract exhibited noticeable zones of inhibition against tested fungal organisms, indicating significant antifungal potential




**Conclusion:**

The present study was carried out to evaluate the phytochemical constituents, and in vitro antifungal activity of ethanolic leaf extract of Synedrella nodiflora (L.) Gaertn..

Preliminary phytochemical screening revealed the presence of important secondary metabolites such as alkaloids, flavonoids, tannins, saponins, phenolic compounds, and terpenoids, which are known to possess antimicrobial and antifungal properties. The antifungal activity study demonstrated that Sample exhibited concentration-dependent

antifungal activity against fungus Candida albicans. The standard Fluconazole showed strong antifungal activity with a zone of inhibition of 29 mm. In comparison Synedrella nodiflora produced inhibition zones ranging from 1 mm at 5 mg/mL to 7 mm at 20 mg/mL, indicating gradual enhancement of antifungal activity with increasing concentration. Although the activity was lower than the standard drug, the observed inhibition suggests the presence of bioactive compounds with antifungal potential. These findings indicate that Sample possesses mild to moderate antifungal activity against Candida albicans.

The observed antifungal activity may be attributed to the presence of bioactive phytoconstituents present in the extract. The findings of the present investigation support the traditional medicinal use of Synedrella nodiflora and indicate its potential as a natural source for development of plant-based antifungal agents.

Further studies involving isolation, purification, and characterization of active constituents along with advanced pharmacological and toxicological investigations are necessary to establish its therapeutic potential and safety.

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