



STUDIES ON THE PHYTOCHEMISTRY, SPECTROSCOPIC CHARACTERIZATION AND SCREENING FOR ANTI-MITOTIC EFFICACY OF SALICORNIA BRACHIATA ROXB

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ABSTRACT

Salicorniabrachiata is a euhalopytic plant belonging to the family Chenopodiaceae. The present study investigates the phytochemistry, characterization and antimitotic activity of ethanolic extract of S.brachiata.Plants popularly known as Sea asparagus are cooked and eaten or pickled. It is also a good fodder for cattle, sheep and goat. Plant material is also used as raw material in paper and board factories. Its seeds yield high quality edible oil which is highly polyunsaturated and similar to safflower oil in fatty acid.S.brachiata was collected from the back waters of Bapatla,Guntur district. The collected plant material was shade dried and pulverized. The plant material Was studied for phytochemistry,spectroscopic analysis i.e.,UV- Visible, FT-IR and anti mitotic activity.S. brachiata has been prescribed in traditional medicines for the treatment of intestinal ailments, nephropathy, and hepatitis in Oriental countries. In addition, S.brachiata has recently reported to be effective on the atherosclerosis, hyperlipidemia, and diabetes. A variety of pharmacological experiments have revealed that solvent-extracted fractions of S.brachiata exhibited anti-oxidative, anti-microbial, anti-proliferative, and anti-inflammatory activities,supporting rationale behind its several traditional uses.The phytochemical analysis indicates the presence of Tannins and Flavonoids in the plant. UV-Vis Spectrum, used for the quantitative analysis of the plant extract showed peaks at 280 and 290 nm. Identification of the functional groups was performed by FT-IR spectroscopy which confirmed the presence of phenolic, alcoholic and aromatic compounds.

Keywords: Salicornia brachiata, Halophyte, Phytochemistry, UV-Vis, FT- IR, Antimitotic activity.

INTRODUCTION

India is one of the Nations with the oldest, richest and most diverse cultural traditions associated with the use of medicinal plants [1]. Plants have been identified to contain curative constituents which have potentially significant therapeutic applications against bacteria, fungi and viruses [2]. The use of phytochemicals as natural antimicrobial agents, commonly called 'biocides' is gaining popularity [3]. The most essential of these bioactive constituents of plants are alkaloids, tannins, flavonoids and phenolic compounds. Many of the indigenous medicinal plants are used as spices and food [4]. Phytoconstituents have found applications as naturally occurring antimicrobial agents in the field of preservation, pharmaceuticals, phytopathology, etc. Increasing failure of chemotherapeutics and the resistance exhibited by pathogenic microbial infectious agents against antibiotics have led to the screening of medicinal plants for their potential antimicrobial activities. There are several reports regarding the antimicrobial activity of crude extracts prepared from plants [5]. Some of the active principles of the bioactive compounds are preferred for their therapeutic purposes either as a single entity or in combination, so as to inhibit the life processes of microbes [6-7]. Of recent times, most of the industries are focusing on the use of natural materials for preservation.

S.brachiata is a highly salt tolerant plant [8] that can grow in marshy lands. This halophytic shrub of coastal mud lands is a potentially high biomass producing marine ecosystem, recently innovated as a source of high valued vegetable salt known as saloni, making it suitable for patients with high blood pressure, besides the usage of its oil in industries [9]. Several species of Salicornia possess antibacterial and antihypertensive properties and are quoted in folk medicine for relief of toothache and chronic rheumatism [10], constipation, obesity, diabetes and cancer [11-12]. The present study focuses on screening the plant for phytoconstituents, its characterization using UV- Visible spectrum, FT-IR and evaluation of its antimitotic activity.

MATERIALS AND METHODS

Collection of Plant material

The halophytic plant, *S. brachiata* of Chenopodiaceae family was collected from the back waters of Bapatla, Guntur, district.The plant material was shade dried and made to coarse powder using mixer grinder.

Preparation of plant extract

The plant powder (50g) was extracted with 500 mL of ethanol. The sample was stirred in temperature-controlled shaker at 30 ± 2 °C for 48 h. After incubation, the solution was filtered using Whatmann No.1 filter paper and concentrated, which was used for further experiments [13].

Materials required

Mung beans, Cisplatin (standard drug), plant extract with different concentrations (100mg, 200mg, 300mg,400mg,500mg), Distilled water

PHYTOCHEMICAL ANALYSIS

The qualitative analysis for the phytoconstituents such as Tannins, Flavonoids, Saponins, Cardiac glycosides, Steroids, Phlobatannins and Terpenoids was performed by the method described by Evans, 1996 and UdayaPrakash et al., 2013 [14-15].

ULTRAVIOLET -VISIBLE SPECTROSCOPY

One g of plant powder was boiled with 10 mL of distilled water and then filtered. An aliquot of the filtered sample was scanned using UV- Visible Spectrophotometer (PG,England,Model No:T-60) at a range of 200 - 800 nm, to detect the characteristic wavelength of the plant extract.

FOURIER TRANSFORM INFRA RED SPECTROSCOPY

The plant sample was dried at 40°C and ground to fine powder through mortar and pestle. The sample was mixed with KBr (FT-IR grade) at a ratio of 1:100 and pressed to a pellet. The pellet was immediately put into the sample holder of Perkin Elmer Spectrophotometer (Spectrum RX1, FT-IR V.2.0) and operated in the range 4000 – 480 cm⁻¹. From the spectral data obtained, the functional groups were detected.

ANTIMITOTIC ACTIVITY

Cytotoxic properties of plant extracts and drugs being developed for cancer treatment are usually evaluated by a variety of *in vivo* and *in vitro* tests carried out in animal or plant based models. In the present study we have evaluated the possibility of using the germinating mung beans (*Vignaradiata*), for rapid and inexpensive screening of drugs exhibiting antimitotic properties.[16-17]. Mung

beans used in this study were obtained from the local market. plant extract with different concentrations (100mg, 200mg, 300mg, 400mg, 500mg) were prepared and mung beans of equal weight are weighed and soaked in each concentration respectively for 6 hrs. Standard is prepared with the same concentrations, with the anti cancer agent Cisplatin 10mg. Control is prepared with mung beans soaked in tap water for 6hrs. The water or the drug solution (test/ standard) was drained and the seedlings were kept moist (either with tap water or the drug solutions in a covered Petri dish) until the radicles in the control group had grown to 1.0 - 3 cm (time 0, T_0). At T_0 , the weight of seedlings and length of radicle were recorded both in the control and test groups. The seedlings were maintained at room temperature under moist conditions for an additional period of 48 h (T_{48}). The weight of the seedlings was measured again at T_{48} . Percentage inhibition is calculated using the formula:

$$\% \text{ Inhibition} = \frac{\text{Wet weight of seeds in control group} - \text{Wet weight of seeds in sample group}}{\text{Wet weight of seeds in control group} - \text{Wet weight of seeds in sample group}} \times 100$$

The stalk length could not be measured since it is bent. The change in weight and gain in radical length between T_0 and T_{48} were calculated. The seeds that did not germinate were simply weighed and no other parameters could be measured on these seeds.

RESULTS AND DISCUSSION

Phytochemical analysis of *S.brachiata*

The active constituents of plants are the major source for the development of new chemotherapeutic agents. The ethanolic extract of *S. brachiata* was subjected to phytochemical screening for various phytoconstituents, which revealed the presence of tannins and flavonoids (Table 1). Phytomedicine has been used for the treatment of chronic diseases. Phenolic compounds have been reported to be potential free radical scavengers [18]. The plants rich in tannins have significant activity in cancer prevention and are used in treating intestinal disorders [19-21]. Flavonoids are known to possess a wide range of biological activities such as antioxidant, antimicrobial, anti-inflammatory and anticancer activities [18; 22-26]. The presence of tannins and flavonoids in ethanolic extract of *S. brachiata* suggests the potential isolation of the phytochemicals and their use in industries.

Table 1: Phytochemical analysis of methanolic extract of *S. brachiata*

Tannins	+
Phloba-tannins	-
Saponins	-
Terpenoids	-
Steroids	-
Cardiac glycosides	-
Flavonoids	+

Uv-vis spectroscopic analysis

The UV-VIS profile (Fig.1) of the plant extract was studied at a wavelength range of 200 to 800 nm. Two major bands were recorded at 280 and 290 nm with absorbance values of 0.28 and 4 respectively. The spectra for phenolic compounds (tannins) and flavonoids typically lie in the range of 230-290 nm [27]. The result of UV-VIS spectroscopic analysis confirms the presence of tannins and flavonoids in the methanolic extract of *S. brachiata*.

FT- IR Spectroscopic analysis

The FT-IR spectrum was performed to identify the functional groups present in *S. brachiata* based on the peak values in the region of infrared radiation. FTIR studies enable the identification of the chemical constituents and elucidation of the structures of compounds [28]. The major bands were observed at 3438.6, 1637.4, 1404 and 1319.59 cm^{-1} (Fig 2). The peak at 3448.4 cm^{-1} indicates the O-H stretch that might be due to the presence of

phenols and alcohols. The bands at 1637.4 cm^{-1} and 1404 cm^{-1} corresponds to the C-C stretch, confirming the presence of aromatic compounds. The peak at 1319.59 cm^{-1} represents C-O stretch which shows the presence of alcohols, carboxylic acids, esters and ethers. In addition, some weak absorption bands were also recorded in the spectra.

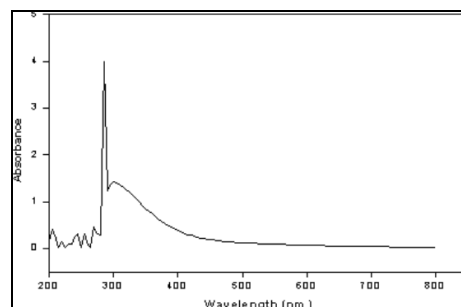


Fig. 1: UV-Vis Spectra of ethanolic extract of *S.brachiata*

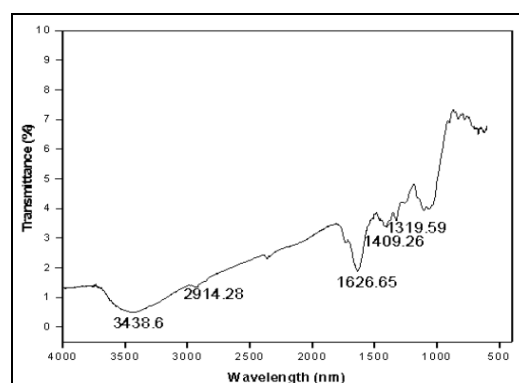


Fig. 2: FT-IR Spectra of methanolic extract of *S.brachiata*

Antimitotic activity

The antimitotic activity of ethanolic extract of *S.brachiata* against the mung beans is found to be very significant, when compared with the standard cisplatin. The plant extract has inhibited the weight of seedlings and length of radicle growth of the at high concentrations (500mg) which shows the antimitotic ability of the plant against cytotoxic cells. The results imply that the halophyte



Fig.3: control



Fig.4: Standard.

studied is a better antimutagenic agent. However, different solvent systems may enable characterisation of other phytoconstituents which might contribute to better activities of the plant.

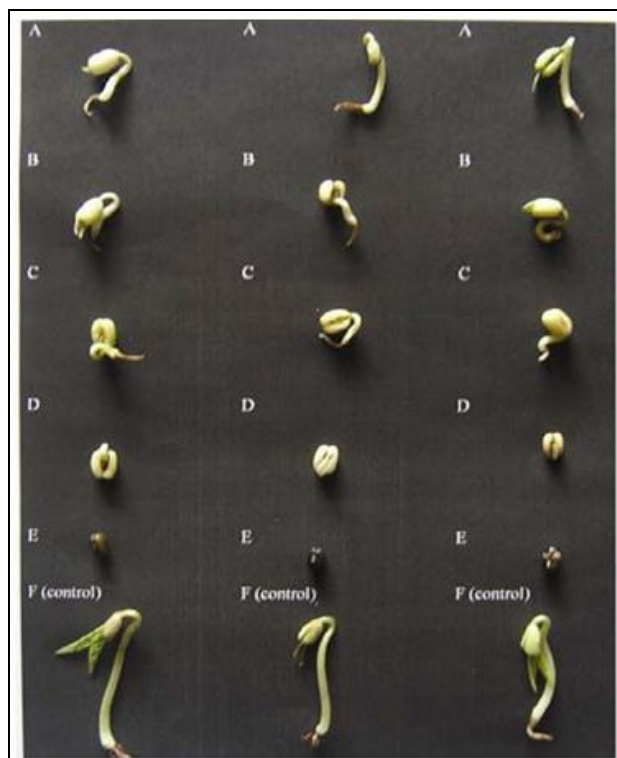


Fig.5: Extract Treated Mung Beans (A-100µ/ml, B-200µ/ml, C-300µ/ml, D-400µ/ml, E-500µ/ml).

CONCLUSION

The present study was carried to detect the phytoconstituents, followed by the spectroscopic characterization and the antimutagenic efficacy of the ethanolic extract of *S. brachiata*. The qualitative analysis of the phytochemicals showed the presence of tannins and flavonoids in the ethanolic extract of *S. brachiata*. The peaks obtained in UV-Vis spectra confirm the presence of the same. FT-IR spectra represented the existence of phenolic compounds, alcohols and aromatic compounds in the plant. The ethanolic extract of the plant was found to be active when tested with the antimutagenic activity. Further studies are crucial towards isolation, identification and characterization of bioactive compounds.

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