

**PRELIMINARY PHYTOCHEMICAL ANALYSIS OF  
ALTERNANTHERA SESSILIS (L) R.BR.EXDC**

**Project submitted**

**TO**

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In partial fulfillment of the requirements in degree of

**BACHELOR OF SCIENCE IN BOTANY**

Submitted by

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## **CERTIFICATE**

This is to certify that this project work entitled “**PREMILINARY PHYTOCHEMICAL ANALYSIS OF ALTERNANTHERA SESSILIS (L) R.BR.EXDC**” is a bonafide piece of project work done by **RADHA KUMARI** (Reg. No: **200021023430**) in the Department of Botany, **Bharata Mata College, Thrikkakara** under my guidance and supervision for the award of Degree of Bachelor of Science in Botany during the academic year **2020-2023**. This work has not previously formed the basis for the award at any other similar title of any other university or board.

**Place: Thrikkakara**

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## DECLARATION

I hereby declare that this project entitled “**PREMILINARY PHYTOCHEMICAL ANALYSIS OF ALTERNANTHERA SESSILIS (L) R.BR.EXDC**” is the result of work carried out by me under the guidance of **Dr. Surya sukumaran** Department of **Botany, Bharata Mata College, Thrikkakara**. This work has not formed on the basis for the award at any other similar title of any other university of board.

**Radha Kumari**

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## **ABSTRACT**

*Alternanthera sessilis* are commonly known as sessile joywood and dwarf copper leaf. It is an aquatic plant, widely used as vegetable and also as herbal medicine as it is used in skin diseases, eye diseases, wound healing and as an antidote for snake bite. This is a preliminary phytochemical analysis of *Alternanthera sessilis*. Here acetone and water extract were used for phytochemical analysis. Alkaloid, saponins, flavonoids present both acetone and water extracts. Cardiac glycosides absent in both extracts. Further studies on these compounds may evoke interesting properties of the compounds. Further investigations on the tribal medicine certainly offer contemporary and alternative medicines for the healthcare of the society. Several secondary metabolites are present in *A. sessilis* such as flavonoids, alkaloids and saponin compounds which exhibits multiple pharmacological activities.

## INTRODUCTION

India is one of the richest countries in the world in terms of biodiversity with 15 agro-climatic zones. Out of the 17,000-18,000 species of flowering plants, more than 7,000 species are estimated to have medicinal usage in folk and documented in the systems of medicine like Ayurveda, Unani, Siddha and Homoeopathy (AYUSH System of Medicine). Medicinal plants play a major resource base for the traditional medicine and herbal industry but also provide livelihood and health security to a large segment of Indian population. In the past, medicinal plants were the first line of treatment known to man and traditional medicinal practice remain an important part of the primary healthcare delivery system in most of the developing world (Akerle, 1998). Generally, plants constitute a major source of orthodox medicines and the presence of plant secondary metabolites has been attributed for most plants' therapeutic activities (Neumann and Hirsch, 2000). Phytomedicines have shown great promise in the treatment of intractable infectious diseases (Timothy *et al.*, 2008).

*Alternanthera* an important representative of the family Amaranthaceae was established by Forsskal in 1775. The genus comprises approximately 80 species which are widespread in the tropical and subtropical regions of New World. These plants are known to attain weed proportions. The genus *Alternanthera* has a wide range of coloured foliage, ranging from red to variegated types and for this reason it has become popular as a ground cover and for border plantation. The genus, *Alternanthera* consists of about 208 spp, distributed in warmer part of America, Tropical Africa, Madagaskar, India, Australia and Europe. In India, 12 species were found (Hooker and Jackson, 1885-1965).

India has been practicing various systems of medicine like Ancient Ayurveda, Unani, Siddha, and Homeopathic, Chinese and Tibetan systems of medicine. Other alternative systems of medicine recognized by Indian systems of medicine are acronyms of AYUSH also includes Yoga and Naturopathy not only in India most of these systems are recognized worldwide for treatment and prevention of disease for Global health maintenance (Lalitha and Vimala, 2016). In (ISM) Indian systems of Medicine Ayurveda medicine is one of the oldest medical systems and it has taken part in India's traditional health care systems.

Phytoconstituents are the natural bioactive compounds present in plants. These phytoconstituents work with nutrients and fibres to form an integrated part of defence system against various diseases and stress conditions (Koche *et al.*, 2010). These phytochemicals, often secondary metabolites present in smaller quantities in higher plants, include the alkaloids, steroids, flavonoids, terpenoids, tannins, and many others (Nonita *et al.*, 2010). Phytoconstituents are naturally occurring in the medicinal plants. leaves, vegetables and roots that have defence mechanism to protect themselves from various diseases. Phytochemicals are primary and secondary phytoconstituents depending on their role in plant metabolism. Chlorophyll, proteins and common sugars are included in primary constituents and secondary constituents have terpenoid, alkaloids and phenolic compounds (Krishnaiah *et al.*, 2007). These secondary metabolites contribute significantly towards the biological activities of medicinal plants such as hypoglycaemic, antidiabetic, antioxidant, antimicrobial, anti inflammatory, anticarcinogenic, antimalarial, anticholinergic, antileprosy activities etc. (Negi *et al.*, 2011).

World health organization states that world 70% population depends on unconventional medicines from plant sources in their healthcare systems (Sivakumar, 2018). Not only India, Chinese traditional system of medicine had a greater history. Chinese pharmacopeia contains around 5,700 traditional medicines from plant origin. According to WHO around 80% of the people depends on traditional medicine in developing countries and most of the drugs are from plant origin (Nikam and Namdas, 2022). Since from the time dated back Human being had to distinguish the edible and non-edible plants since the times occurring of drugs from natural sources developed gradually (Alok and Abhishek, 2015).

Weeds are unwanted plants that are found in both Kharif and Rabbi Season. The genus *Alternanthera* is an important representative of the family Amaranthaceae which consists of 64 genera and 800 species, which were abundantly found in tropical regions of America, Africa and India. It is an annual or perennial herb and also has strong taproots. Leaves are simple, opposite, sessile or spatulate. The length of the leaf is 0.6-5cm long and the width is 0.3-1cm wide. They are reduced at the base and the apex is acute blunt with entire margins. Inflorescence seen in the Genera is spikes. Bracts are ovate, concave and persistent. Bracteoles are oblong- ovate. Sepals are white or purplish with long hairs and a strong midrib. Fruits are indehiscent, enclosing the seed. Seeds are dark brown to black, disc shaped and shiny (picture-1). They are light sensitive. It can be used as a local medicine to treat hepatitis, tight chest, bronchitis, asthma, etc.



Most of the drugs from the herbal source in the market are supplement like dietary products or nutraceuticals (Cardellina, *et al.*, 2002). The secondary metabolite production from plant biogenetic pathways like alkaloids, glycosides etc., leads to new drug discovery from the herbal medicinal plants. E.g., drugs like morphine, codeine, reserpine etc., (Balandin, 1993). The trade of Herbal drugs is about 40 billion in the present market and it may have a drastic raise in percentage in next couple of years (Ephub, 2019). Higher growth can be observed in the usage of medicinal plants, isolation and identification of the compounds became easier with advanced versions of NMR, X-Ray Crystallography (Elridge, 2002; Pellecchia, 2002; Glish, 2003 and Blundell, 2003).

Herbal medicines are one of the causes for the origin of conventional medicines, these phytopharmaceuticals are herbal preparations which contain a single active ingredient or a combination of ingredients (Sunil, 2006). Herbal Products are free from side effects with higher therapeutic values and minimal drug resistance whereas synthetic formulations develop drug resistance. Eg. *Artemisia annuala* Chinese medicinal plant used as an alternative source for the control of malarial parasite.

These secondary metabolites usually have pharmacological activities such as anti-inflammatory, antioxidant, anti-cancer, wound healing, antibacterial and liver protection. In the view of varied medicinal properties and chemical diversity of plants, the author selected above four plant species to isolate secondary metabolites for their biological activities.

The phytochemical study helps to understand the relationships of internal characters and level of structural organization in plants. The World Health Organization (WHO) has emphasized the need to ensure the quality of medicinal plant products by using modern techniques and applying suitable standards (Chaudhay, 1992 and WHO, 1998). So many plants are rich sources of a wide variety of secondary metabolites such as tannins, terpenoids, alkaloids, flavonoids etc. which are widely used in medical industry and have been found to have several biological properties (Uma *et al.*, 2009).

Phytochemicals are chemical compounds that occur naturally in plants these may have certain biological significance. There may be as many as 4,000 different phytochemicals in different taxa, having potential to cure diseases such as cancer, stroke and other metabolic

syndromes. They are non- nutritive plant chemicals that have protective or disease-preventing properties (Sreedhar and Christy, 2015).

Phytochemical analysis of plants as mentioned in folklore, has yielded a number of compounds with various pharmacological properties. Plants are rich in a wide variety of secondary metabolites. The modern methods describing the identification and quantification of active constituents in the plant material, may be useful for proper standardization of herbs and its formulations.

### **Significance of the study**

So many plants are rich sources of a wide variety of secondary metabolites such as tannins, terpenoids, alkaloids, flavonoids etc. Which are widely used in medical industry and have been found to have several biological properties. Thus, this study laid sufficient background for the further research on extracts from leaves of *A. sessilis* for identification, subsequent purification and isolation of compounds.

### **Objective of the study**

- Detection of secondary metabolites from the leaf extracts of *Alternanthera sessilis*.



Picture: -1. Habit of *Alternanthera sessilis* (L.) R. Br. ex DC

## REVIEW OF LITERATURE

According to (Rathinam *et al.*, 2017), the study was conducted about the phytochemical characterization of *Alternanthera sessilis* and assessment of its growth promoting potential on the freshwater prawn *Macrobrachium rosenbergii*. The main purpose of this study is to understand the primary and secondary phytochemical analysis of *A. sessilis* and its influence on growth promotion of *Macrobrachium rosenbergii*. *A. sessilis* using petroleum ether, acetone and ethanol were performed. It contains alkaloids, terpenoids, flavonoids, tannins, cardiac glycosides and quinones.

The study about proximate and phytochemical screening of *Alternanthera sessilis* (L.) R. BR. Ex DC. (Amaranthaceae) - An under utilized leafy vegetable was conducted by (Umate and Marathe, 2017). This genera belonging to family Amaranthaceae provides nutritive value, which nourishes human population. Its leaves can be eaten as vegetables and this plant can be used as medicines for vitiated blood, skin diseases and ulcers. Phytochemical studies showed positive result for alkaloids, steroids, phenolics, flavonoids, tannins, coumarins, etc. It helps in standardization and detection of adulterants. For finding nutraceutical properties, more investigation and evaluation are needed

According to (Saswotika and Kalpita, 2020), study was conducted about the preliminary phytochemical analysis of methanol and chloroform leaf extracts of *A. sessilis*. The genera *A. sessilis* is rich in nutrition. It is also known as sessile joyweed. This plant is used for treating ulcer, skin diseases, night blindness, etc. The aim of the study is phytochemical analysis of leaf extract of *A. sessilis*. Phytochemicals play vital role in antimicrobial activity. Phytochemical analysis shows the presence of alkaloids, terpenoids, glycosides, carbohydrates, phenolic compounds and saponins in the methanol extract while in chloroform extract shows the presence of alkaloids, terpenoids and phenolic compounds. This helps to plan the strong antimicrobial medications.

According to (Anita and Cynthia, 2016) phytochemical and anti-microbial analysis of “Lupo” *A. sessilis* was revealed phytochemical from the aqueous, acetone and ethanolic extracts was screened and the anti-microbial and anti-fungal potentials of the expressed

juice of Lupo (*A. sessilis*). The extract was subjected to test for alkaloids, steroids, anthraquinones, flavonoids and tannin. The result showed alkaloids, flavonoids, steroids and anthraquinones were present in all extracts of *Alternanthera sessilis*, while tannins is only present in aqueous extract. *A. sessilis* when extracted using water contains all the five phytochemical tested. And is beneficial when mixed in food products. Because it can supply alkaloids and steroids that exhibit physiological effect on the heart muscles. It can also supply natural purgatives or cathartics due to the presences of anthraquinones. flavonoids have anti-viral, anti-fungal, anti-inflammatory and cytotoxic activities. Tannins present in aqueous extract have potential value as anti-cancer and as astringents.

According to (Rajeev *et al.*, 2022) conducted study on ‘the genus *Alternanthera* about phytochemical and ethano pharmacological perspectives. This study was conducted the genus *Alternanthera* was used traditionally for the treatment of hypertension, pain, inflammation, diabetes, cancer, microbial and mental disorders. Phytochemical analysis shows the isolation of alkaloids, saponins, steroids, flavonoids, triterpenoids, glycosides, and phenolic compounds from 9 species. This study was mainly conducted for identifying *Alternanthera* species with therapeutic potential for future investigation.

The study about the phytochemical screening and quantitative analysis of bioactive components in various extracts of *A. sessilis* leaves. was conducted by (Lalitha and Vijayalakshmi, 2006). The plant kingdom is a treasure house of structurally diverse phytochemical compounds. *A. sessilis* is an aquatic plant belonging to Amaranthaceae family. *A. sessilis* is widely used as vegetable in Asia, and occasionally cultivated for its use in herbal medicine. Traditionally, the leaves of *A. sessilis* are used in skin diseases, eye diseases, wound healing and as an antidote for snake bite. Leaf extracts in ethanol, ethyl acetate, aqueous extracts of indigenous medicinally important vegetable *A. sessilis* was investigated the phytochemical examination revealed the presence of alkaloids, flavonoids, tannins, saponins, terpenoids, phenol and carbohydrates. In quantitative analysis, the important bio-constituents such as alkaloids, flavonoids, phenolic compounds, tannins and saponins were tested in all three extracts. The ethanolic extract showed highest amount of phytochemicals when compared with other extracts. This study provides the basis of the plant usage in traditional medicine.

According to (Vimala and Krishnan 2016), study was conducted about the 'qualitative and quantitative estimation of phytochemicals of *A. sessilis* and *A. philoxeroids* (mart). griseb. This study aims to evaluate the phytochemicals of *A. sessilis* and *A. philoxeroids*. This study revealed the presence of alkaloids, flavonoids, tannins, saponins, phenolic compounds, steroids, glycosides, quinone in both the plant extracts. The extracts of both these plants showed phytochemicals which have bioactivity and are the source of herbal drugs.

The study about phytochemical screening and antimicrobial activity of ethanolic leaf extract of *A. sessilis* and *A. philoxeroids* was conducted by (Sivakumar and Sunmathi, 2016). In this study they evaluate the phytochemical screening and microbial activity of ethanolic leaf extract of *A. sessilis* and *A. philoxeroids*. They tested four gram positive bacterial species, four gram negative bacterial species and one fungi with ethanolic extracts of both plants using well diffusion method. In both plant extracts, the studies revealed the presence of alkaloids, flavonoids, aminoacids, carbohydrates, phenols, steroids, terpenoids, saponins and glycosides in both plant extracts and the bacterial strains and fungi were more sensitive to *A. sessilis* than *A. philoxeroids*. The leaf extract of *A. sessilis* and *A. philoxeroids* showed significant antimicrobial activity.

The study about preliminary phytochemical analysis of *A. sessilis* leaves was conducted by (Nikam and Namdas 2022). In this study they evaluate the qualitatively primary phytochemical analysis of *A. sessilis*. The leaves of *A. sessilis* were screened to understand the phytochemical potential with aqueous, acetone, methanolic and ethanolic extracts. The study revealed that the plant contains secondary metabolites such as alkaloids, carbohydrates, cardiac glycosides, flavonoids, phenols, saponins, tannins, terpenoids, quinones, coumarins etc. The plant contains bioactive components specifically in the ethanolic extract of the leaves. This investigation may focus research field to develop clinical studies which might be of great scientific contribution for the society.

Alok Kumar *et al.*, 2015, reported the preliminary phytochemical investigation and pharmacognostic evaluation of *A. sessilis*, widely used to treat the diabetics and skin diseases. They were considered to be used in ethnomedical and therapeutic. Vegetative parts

that were collected is used to study macroscopical, anatomical, and preliminary phytochemical studies.

Abbott (1886) reported that, the distribution of saponins (triterpenoids or steroids) in plants and made several useful general assertions about the role of chemical data in evolutionary studies.

Medicinal plants and plant derived drugs are the alternative medicine and extensively used for centuries to cure various ailments. Around the world about 80,000 plant species have been identified and used as medicinal plant (Joy et al., 1998). Medicinal plants are the first line of treatment and about 75- 80% of people of developing countries and 25% of developed countries depend on plant source for treatment of diseases (Hajiaghaee and Akhondzadeh, 2012). India is the richest, oldest most diverse and versatile in cultural tradition associated with the use of medicinal herbal plants. Herbal plants are the chemical factories as it contain multitude of chemical compounds like alkaloids, flavonoids, glycosides, terpenoids, tannins and saponins etc. Medicinal plants have diverse use in society from medicine to herbal foods, drinks, cosmetics and other daily use articles. In modern times plants play significant role and belief is that they have vast potential for treatment of diseases. Moreover the importance and use of medicinal plants were stated in different religious books. About 176 medicinal plants are mentioned in the Holy Quran (Urbii *et al.*, 2014) and 19 plants in the Holy Bible (Duke, 2007). Among several medicinal plants *A. sessilis* is one of them and widely used since ancient times by traditional healers and also in Homeopathic, Ayurvedic, Chinese and Unani medicinal systems. It is a multipurpose medicinal plant and due to its vast pharmacological property it was used in traditional and modern medicinal treatment so we have selected this plant for study with the aim to understand the pharmacological properties of plant.



## MATERIALS AND METHODS

### 1.4 Selection of plants in the present work

The plant species *Alternanthera sessilis* (L.) R. Br. ex DC belongs to Amaranthaceae family, collected from Thrikkakkara. The study was undertaken to systematically examine pharmacological and chemical properties. These plants are rich sources of many secondary metabolites like Alkaloids, Terpenoids, Flavonoids etc.

#### Phytochemical analysis (Qualitative)

The plant material was collected from the mother plant (attain the normal growth of flowering and fruiting). The mature leaves were detached and dried in shade at ambient temperature for a period of three weeks. The well dried samples were powdered separately by using an electric blender.

The samples were prepared in 100 ml of 70% methanol separately, in conical flask and kept overnight in an orbital shaker for solvent extraction and the extracts were centrifuged at 10,000 rpm for 10 minutes. The supernatant thus obtained was kept in a water bath to evaporate to dryness for removing the methanol. After evaporation the residue was subjected to phytochemical analysis for detecting the presence of total alkaloids, total quinine, total total tannins and total terpenoids.

1. Test for Saponins (Foam test): 1 ml of extract was taken and added to water and shaken well. vigorously. Observed for the formation of honey comb like foam for 10 – 15 min. indicated the presence of saponins.
2. Test for Flavonoids (Alkaline reagent test): 1 ml of extract was taken and treated it with 3 – 5 drops of 20 % NaOH solution. It was observed for the formation of intense yellow color which becomes colorless on addition of 0.5 ml Dil. HCL indicated the presence of flavonoids.
3. Test for Alkaloids (Wagner's test): 1 ml of plant extract was taken and added 3 – 5 drops of Wagner's reagent [1.27g of iodine and 2g of potassium iodide in 100 ml of water] and

observed for the formation of reddish-brown precipitate or coloration indicated the presence of alkaloids.

4. Test for Cardiac glycosides (Keller Killiani Test): 1 ml extracts was taken and treated it with 1 ml of glacial acetic acid and 2 – 3 drops of 5 % ferric chloride solution. This was under layered with 1 ml. of conc. sulphuric acid. Observed a brown ring at the interface shows the presence of deoxy sugar characteristics of cardenolides. A violet ring was appeared below the ring while in the acetic acid layer, resulted information of greenish ring.

## RESULT AND DISCUSSION

Phytochemical analysis was performed qualitatively to analyse the presence of various phytoconstituents in the leaf extract of *A. sessilis*. In the present study alkaloid, saponins, flavonoids present both acetone and water extracts. Cardiac glycosides absent in both extracts.

The observation made during investigation are in close agreement with the earlier works carried out. The phytochemical screening and quantitative analysis of bioactive components in various extract of *A. sessilis* Linn leaves studied by Lalitha & Vijayalakshmi. In the below table ‘++’ indicate the presence while ‘-’ indicates the absence (Table-1, Figure1-4).

Generally, drugs from natural sources are considered as safe and free from side effects. This statement is emphasized by the aspect considering the unsafe characters and side effects of synthetic drugs on individuals and environment. There are many naturally derived compounds available in the market used for treating many diseases. Herbal medicines used in traditional therapy are safe, so researchers in worldwide had greater attention towards the natural products. Secondary metabolites play important role as they are non essential to growth and development of plant but contribute plant survival under adverse condition

TEST	ACETONE EXTRACT	WATER EXTRACT
SAPONIN	++	++
FLAVONOIDS	++	++
ALKALOIDS	++	++
CARDIAC GLYCOSIDES	-	-

Table:-1. Phytochemical screening of Petroleum ether and water extract of *Alternanthera sessilis* indicate strong presence of ++ve and weak presence \_\_ve.

### TEST FOR SAPONIN



**Figure 1: Test tubes with acetone and water extract respectively.**

### TEST FOR FLAVONOID



**Figure 2: Test tubes with acetone and water extracts respectively.**

### TEST FOR ALKALOIDS



**Figure 3: Test tubes with acetone and water extracts respectively.**

### TEST FOR CARDIAC GLYCOSIDE



**Figure 4: Test tubes with acetone and water extracts respectively.**

## CONCLUSION

The phytochemical analysis of acetone and water extract showed the presence of various phytoconstituents in the leaf extract of *A. sessilis*. In the present study alkaloid, saponins, flavonoids present both acetone and water extracts. Cardiac glycosides absent in both extracts. *A. sessilis* plant is highly nutritive and contain medicinal properties, it can be used for future investigation in pharmaceutical application. Generally, drugs from natural sources are considered as safe and free from side effects. This statement is emphasized by the aspect considering the unsafe characters and side effects of synthetic drugs on individuals and environment. There are many naturally derived compounds available in the market used for treating many diseases. Eg Quinine from *Cinchona* used as antimalarial, Diosgenin from *Dioscorea* as natural alternative to estrogen therapy, Vincristine & vinblastine used as anticancer from *Catharanthus roseus*. Herbal medicines used in traditional therapy are safe, so researchers in worldwide had greater attention towards the natural products. Hence author has selected and worked on four medicinal plants which are being used as traditional medicines in Kerala.

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