

## Exploring the Bioactive Compounds in *Cissus arnottiana* B.V. Shetty & P. Singh leaf extracts: An In-depth Phytochemical Investigation

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### ABSTRACT

*Cissus arnottiana*, commonly known as "Maranamanni" or "Kattupirandai," is a tropical plant belonging to the grape family, Vitaceae. It is native to India and is often found in regions with a tropical climate. In traditional medicine, Different parts of *Cissus arnottiana* are utilized for their potential medicinal benefits. The plant is often employed in traditional remedies for treating issues related to joints, bones, and digestive problems. Some cultures use it as a natural remedy for fractures and bone-setting. The present study was designed to examine the bioprincipals present in the leaf extracts of *Cissus arnottiana*. In the current investigation, aqueous, diethyl ether, ethyl acetate, acetone, ethanol and benzene of the *Cissus arnottiana* extracts were subjected to qualitative phytochemical screening. The phytochemical analysis showed the presence of a higher number of phytochemicals recorded in aqueous and diethyl ether extracts and the less number were noticed in acetone extract. Documenting this knowledge is crucial for future generations and for scientific purposes.

**Keywords:** *Cissus arnottiana*, phytochemical analysis, Secondary Metabolites, Solvents.

### Introduction

India is home to approximately 45,000 plant species, and among them, several thousand are reported to have medicinal properties that can combat human diseases [1]. The resurgence of medicinal plants as a health aid has been driven by the increasing costs of prescription medications for maintaining personal health and well-being, as well as the exploration for new plant-derived drugs. Medicinal plants have been utilized for centuries worldwide to treat various diseases and are an integral part of daily life in many cultures. The widespread use of herbal remedies and healthcare preparations described in ancient texts such as the Vedas and the Bible can be attributed to the presence of natural products with medicinal properties. Indeed, plants produce a wide variety of bioactive molecules, making them a valuable source of numerous types of medicines [2].

In recent years secondary plant metabolites (Phytochemicals), previously with unknown pharmacological activities have been extensively investigated as a source of

medicinal agent. In recent years, secondary metabolites once unknown for their pharmacological activities, have been thoroughly researched as potential sources of medicinal agents. [3]. Traditional healing systems worldwide, which use herbal remedies, serve as a crucial source for discovering new antibiotics [4]. Some traditional remedies have already led to the discovery of compounds effective against antibiotic-resistant strains of bacteria.[5]. While the therapeutic values of many herbal medicines, derived from natural sources, are considered safe for human use based on screening methodologies, they can still cause adverse effects due to the presence of other active ingredients [6]. Phytochemicals are natural bioactive compounds present in plants. These compounds, in combination with nutrients and fibers, form an integral part of the plant's defense system against various diseases and stress conditions. [7].

*Cissus arnottiana* is part of the family Vitaceae. This plant is found in tropical regions of India, Srilanka, Africa, Arabia and South Asia. It is a climbing or trailing plant, known for its succulent and fleshy stems. The leaves are simple, alternate, and have a cordate (heart-shaped) base with serrated margins. The plant produces small, inconspicuous flowers and small, round berries. *Cissus arnottiana* is adaptable to a variety of soil types but thrives in well-draining soil. It requires a tropical to subtropical climate and is sensitive to frost. The plant holds cultural and ethnobotanical significance in some communities due to its traditional uses and association with local remedies. This species is documented in Ayurvedhic system for its medicinal uses such as diarrhoea, dysentery, Kapham and Breast cancer. The bruised roots of this plant were applied for rheumatic swellings.



**Fig. 1** *Cissus arnottiana* B.V. Shetty & P. Singh

### Materials and Methods

Fresh leaves of *Cissus arnottiana* (**Fig. 1**) were collected from different location of Veeyanoor, Kanniyakumari district. These plants were identified taxonomically and preliminary phytochemical test have been carried out.

**Phytochemical analysis**

Preliminary phytochemical tests for the identification of alkaloids, flavonoids, phenols, saponins, steroids, terpenoids, tannins, glycosides, reducing sugar, Protein, sulphates and carbonates were carried out for all the extracts by the methods [8, 9].

**Test for alkaloids**

With 2 ml of the extract, add 2, 3 drops of Mayer's reagent. Presence of turbidity or yellow precipitate indicates the presence of alkaloids.

**Test for flavonoids**

2 ml of the extract was added to 1ml 1% HCl and add few drops of NaOH. Formation of yellow colour indicates the presence of flavonoids.

**Test for phenols**

2 ml of the extract was added with few drops of 10% lead acetate solution. Formation of white precipitates indicates the presence of phenols.

**Test for saponins**

2 ml of the extract was added to 2 ml of distilled water and shake well. Formation of foam indicates the presence of saponins.

**Test for steroids**

2 ml of the extract was added to 0.5 ml acetic anhydride and add 0.5 ml of chloroform and 1ml conc. H<sub>2</sub>SO<sub>4</sub> slowly. Formation of red colour indicates the presence of steroid.

**Test for terpenoids**

2 ml of the extract was added to 0.5 ml acetic anhydride and add 0.5 ml of chloroform and 1ml conc. H<sub>2</sub>SO<sub>4</sub> slowly. Formation of violet colour indicates the presence of terpenoids.

**Test for tannins**

2 ml of the extract was added to 1ml H<sub>2</sub>SO<sub>4</sub> followed by 2 drops of ferric chloride solution. Formation of blue or greenish black indicates the presence of tannins.

**Test for glycosides**

2 ml of the extract was added with glacial acetic acid and add few drops of FeCl<sub>2</sub> solution. Then add 1 ml of conc. H<sub>2</sub>SO<sub>4</sub> slowly on its sides. Formation of reddish brown or bluish green precipitate indicates the presence of glycosides.

**Test for reducing sugars**

2 ml of the extract was added to 1 ml of distilled water and add 5-8 drops of Fehling's solution. Formation of brick red precipitate indicates the presence of reducing sugar.

### Test for proteins

2 ml of the extract was added with 4% NaOH and few drops of 1% CuSO<sub>4</sub> solution was added. Formation of violet colour indicates the presence of protein.

### Results and Discussion

The investigation focussed on analysing the phytochemicals in *Cissus arnottiana* using various solvents and the findings were subsequently presented in table 1 and Figure 1. Aqueous, ethyl acetate, ethanol, benzene, diethyl ether and acetone were the solvents used for the investigation. All the solvents showed better results in phytochemical screening except acetone which showed least number of phytochemicals in the study (Table 1).

The maximum number of phytoconstituents were present in aqueous extract (9/12) followed by eight compounds in diethyl ether extracts; seven in ethyl acetate and benzene extracts and three compounds were noticed in acetone extracts. In aqueous extracts, flavonoids, phenols, saponins, alkaloids, tannins, glycosides, steroids, and sulphates were noticed. The extracts of diethyl ether revealed the presence of, flavonoids, saponins, terpenoids, phenols, glycosides, alkaloids, tannins, and sulphates. Reducing sugar, protein and carbonates were entirely absent in all solvent extracts. The phytoconstituents such as flavonoids, tannins, alkaloids, and glycosides were found predominantly in all the solvent extracts (Table 1).

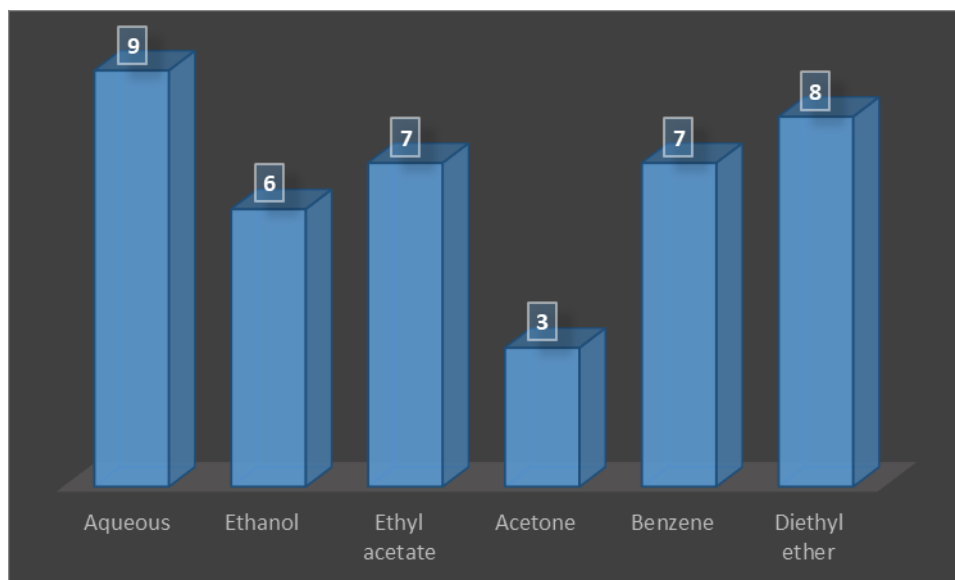
Phytochemicals are produced by plants that fight with microorganisms in their environment [12]. Even if an active principle is present in high quantities, other constituents might exert antagonistic effects on the bioactive compounds [13]. The majority of alkaloids play a role in plant defense against herbivores and pathogens, and are therefore utilized as pharmaceuticals, stimulants, and narcotics due to their potent biological activities. Flavonoids, a major class of phenolic compounds, are noted for their antiviral and antimicrobial properties. [14]. Tannins are most important secondary metabolite which reduces the coronary heart diseases [15]. Glycosides are used as astringents and to reduce thyroxin levels and metabolism, while saponins exhibit hypolipidemic and anticancer activities. Plant steroids, or steroid glycosides, also known as cardiac glycosides, are among the most significant naturally occurring plant phytoconstituents with therapeutic applications, including their use as arrow poisons and cardiac drugs.

**Table 1. Phytochemical Constituents present in *Cissus arnottiana* B.V. Shetty & P. Singh using different solvent extracts.**

Phytochemicals	Solvent Extracts					
	Aqueous	Ethanol	Ethyl Acetate	Acetone	Benzene	Diethyl ether
<b>Alkaloids</b>	+	+++	++	-	+	++
<b>Flavonoids</b>	++	++	+	++	+	++

<b>Phenols</b>	+	-	++	-	++	++
<b>Saponins</b>	+	+	+	-	+	+
<b>Steroids</b>	+	-	-	-	-	-
<b>Terpenoids</b>	+	+	-	-	-	+++
<b>Tannins</b>	+++	+++	+++	+++	+++	++
<b>Glycosides</b>	+	+++	+++	+++	+	+++
<b>Reducing Sugar</b>	-	-	-	-	-	-
<b>Protein</b>	-	-	-	-	-	-
<b>Sulphates</b>	+++	-	-	-	++	++
<b>Carbonates</b>	-	-	-	-	-	-

+ → Low Intensity ++ →Moderate Intensity +++ →High Intensity \_→No Intensity



**Fig. 2 Phytochemical Constituents in *Cissus arnottiana* using different solvent extracts**

### Conclusion

Plants and plant products were used by human being from ancient times. They are having high medicinal values owing to the presence of bioactive compounds such as secondary metabolites. The present study in phytochemical analysis indicates the existence of tannins, alkaloids, steroids, flavonoids, phenols, saponins, glycosides and proteins. The study revealed that the aqueous and diethyl ether extracts of *Cissus arnottiana* demonstrated a higher presence of bioactive compounds. Researchers in the pharmaceutical and health care sector have shown significant interest in the phytochemicals extracted from plant extracts particularly those obtained through traditional methods.

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