

Preliminary Phytochemical Analysis of *Pentapetes phoenicea* L.

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Abstract: *The present study was undertaken to study the phytochemicals present in *Pentapetes phoenicea* from the family Sterculiaceae. In nature the plant grows in moist soil. It can also be grown under the shade of trees as well as in open sunny areas. For preliminary phytochemical analysis different solvents like petroleum ether, chloroform, acetone, methanol and distilled water were used. It revealed the presence of alkaloids, flavonoids, saponins, steroids, phenolics, coumarins and triterpenoids in leaf, stem and root extracts.*

Key words: *Phytochemicals, *Pentapetes phoenicea*, alkaloids, flavonoids, phenolics.*

I. Introduction

Phytoconstituents are the natural bioactive compounds found in plants. These phytoconstituents work with nutrients and fibres to form an integrated part of defence system against various diseases and stress conditions. Medicinal plants are of great importance to the health of individuals and communities. The medicinal value of these plants lies in some chemical substances that produce a definite physiological action on the human body. The most important of these bioactive constituents of plants are alkaloids, tannins, flavonoids and phenolic compounds (Hill, 1952).

Pentapetes is native to a wide region of tropical South Asia from Shrilanka and India to northern Australia and the Philippines. It is naturalised and occurs almost throughout the drier parts of India, along roadsides, wastelands near habitations, dumping grounds and swampy areas. The fruit of *Pentapetes phoenicea* causes constipation, heats the body, and is difficult to digest: removes 'kapha': cures fever, 'vata': and 'pitta' (Ayurveda). The root is employed as an emollient in Annam and in China.

II. Material And Methods

Plant material

The whole plant of *Pentapetes phoenicea* was collected from the field. The different parts of the plant namely: leaves, stem and root were removed from the whole plant and air dried separately at room temperature. The dried parts were ground to powder and stored in polythene bags at room temperature. Chemical tests were carried out on different extracts to identify the constituents as described by Das and Bhattacharjee (1970), Gibbs (1974), Harborne (1984), Chhabra et al. (1984), Treases and Evans (1985), Daniel (1991), David (2000), Kokate et al. (2004).

Preparation of extract: - For preliminary phytochemical analysis, 15 gm of the powdered plant material was taken in thimble of Whatman filter paper No. 1 and Soxhleted with petroleum ether for about 12-16 hours. The petroleum ether extract (1a) was distilled off and the residue (1b) was dried overnight. The petroleum extract (1a) was tested for the presence of alkaloids, carotenoids, coumarins, flavonoids, steroids, phenolics and triterpenoids. The residue (1b) was Soxhleted with chloroform until complete decolourization takes place. The chloroform extract was collected and the residue (2b) was kept overnight for drying. This chloroform extract (2a) was tested for the presence of alkaloids, coumarins, flavonoids, steroids, phenolics and triterpenoids. The residue (2b) was Soxhleted with acetone for 4 - 5 hours and the acetone extract (3a) was collected. The residue (3b) was kept overnight. The acetone extract was tested for the presence of alkaloids, coumarins, flavonoids, steroids, phenolics and triterpenoids. The residue (3b) was Soxhleted with methanol for 10 - 12 hours. The methanol extract (4a) was collected and the residue (4b) was dried till next day. The methanol extract (4a) was tested for the presence of alkaloids, anthocyanins, anthocynidins, anthracene glycosides, cardiac glycosides, coumarins, flavonoids, steroids phenolics, tannins and triterpenoids. The residue (4b) was finally Soxhleted with distilled water for about 10 - 12 hour. The water extract (5a) was tested for the presence of alkaloid, anthocyanins, anthocynidins, anthracene glycosides, carbohydrates, coumarines, flavonoids, steroids, phenolics, tannins, saponins, triterpenoids, gums and mucilage. The residue (5b) was discarded.

Alkaloids: All 5 extracts (1a, 2a, 3a, 4a, and 5a) were tested for the presence of alkaloids with Mayer's, Dragendorff's and Wagner's reagent. 2ml of each extract was taken separately in 5ml of 1.5% v/v aqueous HCl and filtered. The resulting acidic solution was divided into 4 parts. Three parts were tested with Mayer's, Dragendorff's and Wagner's reagent and the fourth part served as blank. A faint turbidity, light opalescence or

yellowish white precipitate on addition of Mayer's reagent was the positive test for alkaloids. Development of orange precipitate on addition of Dragendorff's reagent is a positive test for alkaloids.

Anthocyanins and Anthocynidins: The methanol and water extracts (4a and 5a) were tested for the presence of anthocyanins and anthocynidins. Red colour in acidic aqueous solution of extracts at pH 3-4 indicated the presence of anthocyanins and change of colour with pH modification (pH 8-9) indicated the presence of anthocyanidins.

Anthracene Glycosides: Anthracene glycosides were screened in methanol and water extracts (4a and 5a). Residue of 4a and 5a mixed with 5ml ethanol. These ethereal solutions of extracts were treated with 25% ammonium hydroxide. The development of red colour indicated the presence of anthracene glycosides.

Coumarins: All the extracts (1a, 2a, 3a, 4a and 5a) were dried and the residues were dissolved in petroleum ether. The resulting extracts were taken in test tubes covered with filter paper moistened with dilute sodium hydroxide solution. They were then placed in boiling water bath for 20 to 30 minutes. The filter paper was removed and test tube was exposed to U.V.light. A yellowish fluorescence shows the presence of coumarins.

Flavonoids: All the extracts were dried and the residue was dissolved in ethanol. On addition of magnesium powder and conc. HCl, the development of yellow or red colour indicated the presence of Flavonoids.

Steroids: All 5 extracts (1a, 2a, 3a, 4a and 5a) were screened for the presence of steroids. The test was carried out by Salkowski reaction and Libermann-Burchard reaction (Maiti, 1968).

Salkowski reaction- A few mg of the residue was taken in 2ml of the chloroform. To this, 2ml of conc. H₂SO₄ was added by the side of the test tube. The test tube was shaken for few minutes. Red colour developed in chloroform layer and lower layer of acid gave greenish yellow fluorescence. This colorization and fluorescence is due to presence of steroids.

Libermann-Burchard reaction- A few mg of the residue was dissolved in chloroform. To this few ml of acetic anhydride and two drops of conc. H₂SO₄ were added from the side of the test tube. The transient greenish colour indicates the presence of steroids.

Saponins: Saponins were tested with water extracts (Cambie et al. 1961 and Harborne, 1998). 2ml of the extract (5a) was shaken vigorously for 10 sec. and allowed to stand. The formation of persistent honeycomb like froth is the positive test for the presence of saponins.

Phenolics: The dried residue of each extract (1a, 2a, 3a, 4a and 5a) was dissolved in methanol. This methanolic extract was tested for the presence of phenolics by the method given by Harborne (1998). A few drops of 1% alcoholic ferric chloride solution were added to the extract. The appearance of intense green, purple, blue or black colouration indicated the presence of phenolic compound in the sample.

Triterpenoids: All 5 extracts (1a, 2a, 3a, 4a and 5a) were tested for the presence of triterpenoids by Libermann Burchard reaction. A few mg of the residue was dissolved in chloroform. To this was added few ml of acetic anhydride and two drops of conc. H₂SO₄ from the side of the test tube. The red or violet colour indicated the presence of triterpenoids.

Tannins: Presence of tannins was tested in methanol and water extracts (4a and 5a). 0.5 ml of extract was diluted with 1ml of water and 2-3 drops of dilute ferric chloride solution. The development of blue or green black colour indicated the presence of tannins.

Cardiac glycosides: The methanol extract (4a) was tested for the presence of cardiac glycosides by Keller-Kiliani tests. 1ml of glacial acetic acid was added to 2ml of the extract in a test tube. In this mixture, few ml of ferric chloride followed by two drops of conc. H₂SO₄ were added. Green-blue colour indicated the presence of cardiac glycosides.

Carbohydrates: Water extract (5a) was tested for the presence of sugars by Molish's tests. Few ml of extract was placed in a test tube containing 0.5 ml of water and mixed with 2 drops of 10% solution of 1-naphthol in alcohol. 1ml of conc. H₂SO₄ was added from the side of the test tube. Appearance of red-violet ring at the junction of two layers indicated the presence of carbohydrates.

Gums and mucilage: To 5 ml of water extract (5a), 15 ml of alcohol was added and stirred; formation of mucilaginous texture of precipitation was the test of gums and mucilage.

III. Results

Table 1: Distribution of various phytochemicals in different plant parts

Solvent	Species	Pentapetes phoenicea		
		Leaves	Stem	Root
Petroleum ether	Compounds			
	Alkaloids	+	-	-
	Carotenoids	+	+	-
	Coumarins	+	+	+
	Flavonoids	-	-	-
	Steroids	+	+	+
	Phenolics	+	+	+
	Triterpenoids	-	-	-
Chloroform	Alkaloids	+	+	+

	Coumarins	+	+	+
	Flavonoids	-	-	-
	Steroids	+	+	+
	Phenolics	+	+	+
	Triterpenoids	-	-	-
Acetone	Alkaloids	+	-	-
	Coumarins	+	+	+
	Flavonoids	-	+	+
	Steroids	+	+	+
	Phenolics	+	+	+
	Triterpenoids	-	+	+
Methanol	Alkaloids	+	-	-
	Anthocyanins	-	-	-
	Anthocyanidins	-	+	+
	Anthracene glycosides	-	-	-
	Cardiac glycosides	-	-	-
	Coumarins	+	+	+
	Flavonoids	+	+	+
	Steroids	+	+	+
	Phenolics	+	+	+
	Tannins	+	+	+
	Triterpenoids	-	+	+
Distilled water	Alkaloids	-	-	-
	Anthocyanins	-	+	+
	Anthocyanidins	+	-	-
	Anthracene glycosides	-	-	-
	Carbohydrates	+	+	+
	Coumarins	+	+	+
	Flavonoids	-	-	-
	Steroids	+	+	+
	Phenolics	+	+	+
	Tannins	+	-	-
	Saponins	+	+	+
	Triterpenoids	+	+	+
	Gums & mucilage	-	-	-

Pentapetes phoenicea is rich in phytochemical constituents as shown in Table 1. The phytochemical analysis shows the presence of alkaloids in chloroform extract of leaf, stem and root. Also the petroleum ether, acetone and methanol extracts of leaf show the presence of alkaloids. Coumarins, steroids and phenolics are present in all the five extracts. Methanolic extract shows the presence of flavonoids and distilled water extract shows the presence of saponins. Triterpenoids are present in all the extracts except petroleum ether and chloroform. Anthracene glycosides and cardiac glycosides are absent in all the plant parts.

IV. Discussion

The present investigation was carried out to study the presence of medicinally active phytochemicals in leaves, stem and root of *Pentapetes phoenicea*. Different types of solvent plays an important role in the extraction of different phytochemicals. In the present investigation alkaloids are found to be better extracted by chloroform while alkaloids are absent in distilled water extract.

Flavonoids are also one of the largest classes of plant phenol; perform very different functions in plant system including pigmentation and defence. Methanolic extract of this plant showed the presence of flavonoids in all the parts. Extract of leaf and stem of *Waltheria indica* (Sterculiaceae) showed the presence of flavonoids (Zailani, 2010). Sonibare (2009) investigated the phytochemical screening in the ethanolic extract of the leaf sample of four *Cola* species (Sterculiaceae) and showed the presence of alkaloids, saponins and tannins.

Plants produce a large variety of secondary products that contain a phenol group. They could be an important part of the plants defense system against pests, diseases including root parasitic nematodes (Wuyts et al., 2006). In the present study, phenolics were detected in all the parts of this plant. Phenolic compounds were detected from the *Theobroma cacao* hulls (Arlorio et al., 2005).

Saponins are also present in all the parts of this plant. Coumarins are simple phenolic compounds, widespread in vascular plants and appear to function in different capacities in various plant defense mechanisms against herbivores and fungi. The present investigation also shows the presence of coumarins.

V. Conclusion:

The present investigation was carried out to study the presence of medicinally active phytochemicals like alkaloids, flavonoids, phenols, saponins and coumarins in leaves, stem and root of *Pentapetes phoenicea*. These phytochemicals play important role in various plant defense mechanisms against herbivores, fungi and

bacteria. In future, these secondary metabolites can be extracted from this plant and may be used as medicine. Studies on quantitative analysis, antibacterial and antioxidant activity can also be conducted for future references.

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