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Phytochemical Analysis of Leaf of *Wedeliatrilobata*, *Achyranthesaspera* and *Chrysanthemum* from the Twin – City (Durg & Bhilai), Chhattisgarh, India: A Comparative Study

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Abstract

The phytochemicals present in the plants are responsible for the biological activities and therapeutic properties of the various medicinal plants. They function as antioxidants in health promotion by preventing oxidant-damage which is the main cause of many diseases. The present study deals with the comparative analysis of phytochemicals in the methanolic and chloroformic leaf extracts of three important and commonly growing medicinal plants from 'Twin - City' (Durg & Bhilai), Chhattisgarh, India. These plants are *Wedeliatrilobata*, *Achyranthesaspera* and *Chrysanthemum*. The significant phytochemicals qualitatively analysed were Cardiac glycosides, Steroids, Alkaloids, Flavonoids, Terpenoids, Tannins and Saponins, for which the standard protocol was followed. The leaf extracts in methanol of *Wedeliatrilobata* and *Chrysanthemum* were found to have rich contents of phytoactive compounds as compared to their respective chloroformic extracts. Comparatively the leaf extracts of *Achyranthesaspera* were detected for less presence of phytochemicals. However, Cardiac glycosides, Steroids and Flavonoids were present in sufficed amounts in the leaf of *Achyranthesaspera*.

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Keywords: Phytochemicals, Cardiac glycosides, Alkaloids, Steroids, Flavonoids, Tannins, Saponins, Terpenoids

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1. Introduction

Plants and their derivatives have been the important components of the traditional medicinal system since ages. They are called 'Medicinal Plants' and continue to provide human beings with new remedies in treatment of diseases and maintenance of health. The presence of enormous organic substances in such plants, called 'phytochemicals', are known to be associated with biosynthesis, metabolism and biological functions. Such chemical compounds are synthesised and accumulated by the plants themselves that attribute to the medicinal potentials and biological actions of the plants. The beneficial bioactivities of medicinal plants are known to result from the interactions of phytochemicals or secondary metabolites. Thus, the medicinal plants contribute in reducing the risk of infectious diseases. Hence, these plants are used as the valuable source of many potent and powerful drugs (Uniyal et al., 2006; Cragg and Newmann, 2005).

There are many states in India, well known for their vast treasure of medicinal plants that are explored in traditional folk and herbal medicines. Chhattisgarh is one of the such states, rich in forests and natural sources of plants and herbs of medicinal importance, and hence known as the 'Herbal State'. The medicinal plants from this state mostly are enriched with chemotherapeutic agents in the form of phytochemicals. The most prominent ones are Cardiac glycosides, Flavonoids, Steroids, Terpenoids, Tannins, Saponins and Alkaloids. *Wedeliatrilobata*, *Achyranthesaspera* and *Chrysanthemum* are three well known medicinal plants from the 'Twin - City' (Durg & Bhilai) of Chhattisgarh, selected for the study of comparative phytochemical analysis (Husain and Kumar, 2015).

Wedeliatrilobata, also known as *Sphagneticolatrilobata* is a weed of urban bushland and gardens with attractive small, bright yellow blooms. The whole plant is effectively used for liver and reproductive problems besides being effective for cold, flu, fever and inflammations (Huang et al., 2006). *Achyranthesaspera*, locally known as 'Chirchita' is the 'Wasteland weed' and a popular 'Medicinal herb'. Traditional healers from Chhattisgarh use this plant to treat asthma, piles, gastric disorders, and to hasten the process of delivery. It is grown in home-gardens as the repellent of venomous creatures, and used for snake-bites (Punkaj, 2001, 2003; Nadkarni et al., 2009). Another plant known popularly for its ornamental, culinary environmental, insecticidal and medicinal uses is *Chrysanthemum*, the 'Garden glory' because of its white and colorful flowers. It is effective in treatment of reddened eyes, headache, sore throat jaundice, acne, as well as is helpful to promote menstrual flow in females (Shuniyang et al., 2005). These three medicinal plants exhibit biological activities such as anti-inflammatory, anti-oxidant, anti-microbial, anti-cancer, cardio-protective and wound healing abilities that are more or less the result of phytochemical actions, that attribute to the plants medicinal properties (Govindappa et al., 2011; Maldini et al., 2009; Khare, 2007; Miyazawa and Hisama, 2003).

The present work reveals the comparative analysis of the various important phytoactive compounds present in the leaf extracts of the three selected medicinal plants from Durg and Bhilai, prepared in Methanol and Chloroform solvents separately.

2. Materials and methods

2.1. Collection and preparation of leaf extract

Some of the plants of *Wedeliatrilobata*, *Achyranthesaspera* and *Chrysanthemum* with healthy growth, were collected from the open fields and gardens of Durg and Bhilai cities of Chhattisgarh. The leaves were separated from the plants, and washed with clear water. Thereafter, they were shade-dried for a few days and then grinded into coarse powder. The leaf extract of each plant was then prepared separately using Methanol (59%) and Chloroform as solvents by using Soxhlet Extraction Apparatus.

2.2. Methods for phytochemical screening tests

2.2.1. Test for Cardiac glycosides

0.5 ml of leaf extract was dissolved in the solution prepared by 2 ml glacial acetic acid containing one drop of 1% Ferric Chloride (FeCl_3), which was later under-layered with 1 ml of Sulphuric acid (H_2SO_4). The formation of a brown ring at the interface, indicated the presence of deoxy-sugar, i.e., Cardiac glycosides.

2.2.2. Test for Flavonoids

5 ml of dil. Ammonia (NH₃) solution was added to a portion of aqueous filtrate of leaf extract, to which conc. Sulphuric acid (H₂SO₄) was added. The appearance of yellow color indicated the presence of Flavonoids, which usually disappears on standing.

2.2.3. Test for Steroids

0.5 ml of the leaf extract was dissolved in 3 ml of Chloroform (CHCl₃) and this was filtered. A few drops of conc. Sulphuric acid (H₂SO₄) was added to the filtrate which formed a lower layer. Appearance of reddish brown colored ring confirmed the presence of Steroids.

2.2.4. Test for Saponins

'Frothing test' was applied for the detection of Saponins. 0.5 ml of leaf extract was added to 5 ml of distilled water in a test-tube. The solution was shaken vigorously, and the stable persistent appearance of 'froth' indicated the presence of Saponins.

2.2.5. Test for Tannins

0.5 ml of leaf extract was boiled in 10 ml of distilled water and then filtered. On adding a few drops of 1% Ferric Chloride (FeCl₃), appearance of brownish green or blue black coloration confirmed the presence of Tannins.

2.2.6. Test for Terpenoids

'Salkowski test' was applied for the detection of Terpenoids. 0.5 ml of leaf extract was mixed with 2 ml of Chloroform (CHCl₃), to which was added 3 ml of conc. Sulphuric acid (H₂SO₄). A reddish brown color at the interface confirmed the presence of Terpenoids.

2.2.7. Test for Alkaloids

4 ml Methanol and 400 ml of Glacial acetic acid, along with a few drops of Ammonia was added to the small quantity of dry leaf extract. The precipitation indicated the presence of Alkaloids, and this test is called 'Dry extract' precipitation test. The phytochemical screening was followed by a comparative study for the presence of significant phytochemical compounds in separate leaf extracts prepared in two solvents, i.e., Methanol and Chloroform.

3. Results and discussion

The presence of phyto compounds was detected in the phytochemical analysis of Methanol and Chloroform leaf extracts of *Wedeliatrilobata*, *Achyranthesaspera* and *Chrysanthemum*. The methanolic leaf extracts of *Wedeliatrilobata* and *Chrysanthemum* showed prominent presence of important phytochemicals. The methanolic extract of *Achyranthesaspera*, however, showed absence or presence in less amounts of such organic compounds, with the exception of Cardiac glycosides and Flavonoids only. The Alkaloid content in the methanolic extracts of three of the selected plants showed almost no or very less presence of Flavonoids. Whereas, in the leaf extract in methanol of *Chrysanthemum*, Flavonoids were found to be present in bulk. The chloroformic leaf extracts of *Wedeliatrilobata* and *Chrysanthemum*, comparatively showed weak presence of bioactive compounds. However, Cardiac glycosides, Steroids and Terpenoids in chloroform extract of these two plants were present in sufficient amounts. The presence of Steroids in the chloroform extract of leaf of *Achyranthesaspera* was detected (Table PC-1). In a nutshell, the leaf of *Wedeliatrilobata* and *Chrysanthemum* possess rich contents of Cardiac glycosides, Steroids, Flavonoids, Saponins, Tanins and Terpenoids. The leaf of *Achyranthesaspera* showed presence of little amounts of Cardiac glycosides, Steroids and Flavonoids.

Phytochemicals present in the plants are best known for their unique role in growth, photosynthesis and reproduction in plants. As in human beings, they actively function in strengthening the immunity and antioxidant defense, thereby preventing many diseases and promoting human health (Herrera et al., 2001; Nisreen, 2015). These phyto-compounds have no nutritional values as minerals and vitamins have; despite this, the phytochemicals influence various body processes. Their functioning is based on their interactions with nutrients

and fibrous contents of dietary plants. This makes them exhibit pharmacological actions and thus reduce the risk of dreadful diseases (Taiz and Zeiger, 2006; Sharma et al., 2011; Apak et al., 2007).

Cardiac glycosides and Steroids were found in good amounts in leaf extracts of three of the plants, viz., *Wedeliatrilobata*, *Achyranthesaspera* and *Chrysanthemum*. Cardiac glycosides are quite toxic, but also known to possess many pharmacological activity, especially as their name imply, i.e., mostly related to heart. They regulate cholesterol levels, and accelerate defense mechanisms against various pathogens. Steroids are present in plants as 'phytosterols', and in animals are in the form of sex-hormones and bile acids, attributing to their role in bioactivity. Saponins, besides Cardiac glycosides and Steroids, is another major group of Triterpenoids. Saponins are surface active compound of plants, with beneficiary effects serving as antioxidants and immunity stimulators. They have unique property of haemolyzing red blood cells, and in reducing the cholesterol levels. Leaf extract of *Achyranthesaspera* showed less or almost absence of Saponins (Ramavat, 2007; Tiwari, 2001; Husain and Kumar, 2015).

Table PC-1

Comparative study of phytochemical constituents in leaf of *Wedeliatrilobata*, *Achyranthesaspera* and *Chrysanthemum* from Twin - City (Durg & Bhillai), Chhattisgarh, India.

Phytochemicals	Lf. E of <i>Wedeliatrilobata</i>		Lf. E of <i>Achyranthesaspera</i>		Lf. E of <i>Chrysanthemum</i>	
	Methanol	Chloroform	Methanol	Chloroform	Methanol	Chloroform
Cardiac glycosides	+	+	+	-	+	+
Steroids	+	+	-	+	+	+ ⁺
Flavonoids	+	-	+	-	++	-
Saponins	+	-	-	-	+	+
Tanins	+	-	-	-	+	-
Terpenoids	+	+	-	-	+	+
Alkaloids	-	-	-	-	-	-

Note: Lf.E = Leaf Extract; + = Present; ++ = Present in bulk; +⁺ = Present but viscous; - = Absent.

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