RESEARCH ARTICLE

PHYTOCHEMICAL SCREENING OF CERTAIN PLANT SPECIES OF AGRA CITY

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ABSTRACT

Plant kingdom harbours an inexhaustible source of active ingredients invaluable in the management of many intractable diseases. Phytochemical techniques played a significant role in searching raw materials and resources for pharmaceutical industry. Preliminary Phytochemical tests are helpful in finding and locating chemical constituents which are source of pharmacologically active principles. Hence during the present study. Phytochemical screening of six native plants of Agra city i.e. *Achyranthus aspera, Acalypha indica, Euphorbia hirta, Lindenbergia indica, Parthenium hysterophorus* and *Peristrophe bicalyculata* were carried out by employing standard methods for conducting Qualitative phytochemical analysis for studying the presence of active compounds like Alkaloids, Tannins, Saponins, Glycosides, Phenols, Flavonoids, Anthroquinone, Terpenoids and Steroids. Ethanolic extract of *Achyranthus aspera* showed all of these phytocompounds except Tannins in comparison to other extracts. However ethanolic extracts of all plant species revealed the presence of most of the phytocompounds in comparison to other extracts tested. Successive isolation of phytocompounds from plant materials depended on the type of solvent used in extraction procedure. The qualitative changes in the Phytochemical analysis of tested plant species are correlated to methods of preparation. The plants tested are found to be potential due to the presence of various active principles among which *Achyranthus aspera* is found to be constituted of various primary & secondary metabolites which can be quantified for application in pharmaceutical industry.

Key Words: Active ingredients, Phytochemical screening, Qualitative changes & Pharmaceutical industry.

INTRODUCTION

Phytochemical studies have attracted the attention of plant scientists due to the development of new and sophisticated techniques. These techniques played a significant role in giving the solution to systematic problems on the one hand and in the search for additional resources of raw materials for pharmaceutical industry on the other hand. Plant synthesizes a wide variety of chemical compounds, which can be sorted by their chemical class, bio synthetic origin and functional groups into primary & secondary metabolites. Knowledge of the chemical constituents of plants is desirable, not only for the discovery of therapeutic agents, but also because such information be of value in disclosing new resources of such chemical substances. [1].

Among the 120 active compounds currently isolated from the higher plants are widely used in modern medicine, today 80 percent show a positive correlation between their modern therapeutic use and the traditional use of the plants from which they are derived[2]. The phytochemical interaction and trace components may alter the drug response in ways that can not currently be replicated with a combination of few purative active ingredients. Pharmaceutical researchers recognize the concept of drug synergism but note that clinical trails may be used to investigate the efficacy of a particular herbal preparation, provided the formulation of that herb is consistent [3].

There is evidence that using some alternative medicines especially those evolving herbs, metals, minerals or other materials involves potentially serious risks including toxicity [4]. With the development of natural product chemistry, the potential of chemotaxonomy is now being increasingly obvious. The application of chemical data to systematics has received serious attention of a large number of biochemists & botanists [5]. The screening of plant extracts of plant products for antimicrobial activity has shown that higher plants represent a potential source of novel antibiotic prototypes[6]. Hence during the present investigations phytochemical screening of certain native plants of Agra city is carried on with a view to analyse the presence of chemical constituents that included primary & secondary metabolites, with a view to recommend their application in pharmaceutical industry.

MATERIALS AND METHODS

Collection of plant materials

The whole plant parts in this investigations were collected from different localities of Agra city during the flowering period and the voucher specimens of the following plants like *Achyranthus aspera (Amaramthaceae), Acalypha indica (Euphorbiaceae), Euphorbia hirta (Euphorbiaceae), Lindenbergia indica (Scrophulariaceae), Parthenium hysterophorus (Compositae)* and *Peristrophe bicalyculata (Acanthaceae)* were preserved. Fresh plant materials were washed under running tap water and then with distilled water, air dried and then homogenized to fine powder and stored in airtight bottles.

Preparation of Extracts

For both aqueous (crude) & solvent extractions, 25 g of air-dried powder of the medicinal plants were taken separately with 150 ml of organic solvents (Ethanol and Acetone) and were taken into the soxhlet apparatus which was run upto 48 hrs till the green colour of the plant material disappeared. After which the extracts were collected and stored at 4^{o}C in airtight bottles and were qualitatively tested for the presence of various phytocompounds.

Preliminary phytochemical analysis [7,8]

1. **Alkaloids:** The solvent extract (corresponding to 2.5 g of plant material) was evaporated to dryness and the residue was heated on a boiling water bath with 2N HCl (5ml). After cooling, the mixture was filtered and treated with few drops of Mayer's reagent. The sample was then observed for the presence of turbidity or precipitation.

2. **Tannins:** The solvent extract (corresponding to 1 g of plant material) was evaporated and the residue was extracted by 10ml of hot 0.9% NaCl solution, filtered and divided into 3 equal portions, sodium chloride solution was added to one portion of the test extract, 1% gelatin solution to a second portion and the gelatin-salt reagent to a third portion. Precipitation with the latter reagent or with both the second and third reagent is indicative of the presence of tannins. Positive tests are confirmed by the addition of $FeCl_3$ solution to the extract and that resulted in a characteristic blue – black, green or blue green colour and precipitate.

3. **Saponins:** About 2.5 g of the plant material was extracted with boiling water. After cooling, the extract was shaken vigorously to froth and was then allowed to stand for 15-20 min and classified for saponin content as follows: no froth = negative; froth less than 1 cm = weakly positive; froth 1.2 cm high = positive; and froth greater than 2 cm high = strongly positive.

4. **Glycosides:** 0.5 g of solvent extract was dissolved in 2.0 ml of glacial acetic acid containing one drop of $FeCl_3$ Solution. This was then under laid with 1.0 ml of concentrated H_2So_4. A brown ring obtained at the interface indicated the presence of glycosides.

5. **Phenols:** The Solvent plant extract was treated with few drops of neutral ferric chloride solution 5%, intense colour developed indicates the presence of phenols.

6. **Flavonoids:** The solvent extract (5 ml, corresponding to 1 g of plant material) was treated with a few drops of concentrated HCl and magnesium turnings (0.5 g). The presence of flavonoids was indicative if pink or magenta – red colour developed within 3 min.

7. **Anthroquinones:** Borntreger's test was used for the detection of anthroquinones. 5 g of plant extract was shaken with 10 ml of Benzene. This was filtered and 5.0 ml of 10% ammonia solution was added to the filtrate. The mixture was shaken and the presence of violet colour in the ammonical (lower) phase indicated the presence of free hydroxyl anthroquinones .

8. **Terpenoids:** The Solvent extract of plant material was taken in a test tube and then added few pieces of tin plus 3 drops of thionyl chloride, violet or purple colour developed indicated the presence of terpenoids.

9. **Steriods:** (Liebermann Burchard reaction: 200 mg plant extract in 10 ml chloroform, filtered), 2 ml filtrate + 2 ml acetic anhydride + conc. H_2SO_4. Blue green ring indicated the presence of steroids.

RESULTS AND DISCUSSION

The results of preliminary phytochemical analysis are tabulated in Table 1. The phytochemical study revealed the presence of various phytocompounds both aqueous and Solvent extracts.

In the Ethanolic solvent extract various phytocompounds like Alkaloids, Flavonoids, Saponins, Glycosides, Phenols, Anthroquinones, Terpenoids & Steroids were present in *Achyranthus aspera* except Tannins. However in Acetonic solvent extract, Saponins & Tannins were absent and other compounds were found to be present. Where as in Aqueous extract only Glycosides, Terpenoids, Anthroquinones and Steroids were found to be present, while the rest of the compounds were found to be absent (Table 1).

In the ethonalic solvent extract of *Acalypha indica* Alkaloids, Tannins,Saponins, Flavonoids, Terpenoids and Steroids were present, where as Glycosides, Phenols and Anthroquinones were tested absent. Acetonic extract showed the presence of only Alkaloids, Saponins, Terpenoids and Steroids whereas Tannins, Glycosides, Phenols, Flavonoids and Anthroquinones were absent. In aqueous extract none of the Phytocompound was tested positive.

Ethanolic extract of *Euphorbia hirta* showed the presence of all Phytocompounds analysed except Phenols. However in the Acetonic extract Glycosides, Phenols, Flavonoids and Steroids were present rest of the Phytocompounds were absent. In the aqueous extract Tannins, Saponins, Glycosides, Flavonoids, Terpenoids and Steroids were present, whereas Alkaloids, Phenols and Anthroquinones were found to be absent.

Ethanolic extract of *Lindenbergia indica* showed the presence of Phytocompounds like Alkaloids, Saponins, Phenols and Flavonoids, other compounds such as Tannins, Glycosides, Anthroquinones, Terpenoids and Steroids were found to be absent. Acetonic extract showed the presence of Glycosides, Phenols, Flavonoids, Anthroquinons and Terpenoids, whereas Alkaloids, Tannins, Saponins and Steroids were absent. The aqueous extract showed the presence of Alkaloids, Saponins, Glycosides and Flavonoids whereas Tannins, Phenols, Anthroquinones, Terpenoids and Steroids were found to be absent.

In the Ethanolic extract of *Parthenium hysterophorus* Alkaloids, Tannins and Flavonoids were present, rest of the compounds like Saponins, Glycosides, Phenols, Anthroquinons, Terpenoids and Steroids were absent. Acetonic solvent extract showed the presence of Alkaloids, Glycosides, Flavonoids, Terpenoids and Steroids whereas Tannins, Saponins, Phenols and Anthroquinons were absent. The aqueous extract showed the presence of only Glycosides, Terpenoids and Steroids, rest of the compounds were found to be absent.

The Ethanolic extract of *Peristrophe bicalyculata* showed the presence of Alkaloids, Tannins, Phenols, Flavonoids, Terpenoids and Steroids whereas Saponins, Glycosides and Anthroquinones were absent. In the Acetonic extract only Alkaloids, Terpenoids and Steroids were present, rest of the Phytocompounds were absent. In the aqueous extract Alkaloids, Flavonoids, Terpenoids and Steroids were present, rest of the compounds were found to be absent.

All plants produce chemical compounds as part of their

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normal metabolic activities. These include primary metabolites found in smaller range of plants, some useful ones found only in a particular genus or species [9]. Herbalists tend to use extracts from parts of plants, such as the roots or leaves but not isolate particular phytochemicals. Pharmaceutial medicine prefers single ingredients on the grounds that dosage can be easily quantified [10]. Plant synthesizes a wide variety of chemical compounds, which can be sorted by their chemical class, bio synthetic origin and functional groups into primary & secondary metabolites [11].

Successive isolation of botanical compounds from plant material is largely dependent on the type of solvent used in the extraction procedure. The traditional healers use primarily water as the solvent but in the present investigations the plant extract by Ethanol provided more phytocompounds followed by Acetone in comparison to the aqueous extraction which are in agreement with previous researchers [12;13]. The qualitative changes in the phytochemical analysis of tested plant species are correlated to methods of preparation. The preliminary phytochemical tests are therefore significant and helpful in finding chemical constituents in the plant material that may lead to their quantitative estimation and also in locating the source of pharmacologically active chemical compounds [11].

The preliminary phytochemical studies during the present investigations revealed that the genus *Achyranthus aspera* is mainly constituted of various primary & secondary metabolites which can be quantified for application in pharmaceutical industry, while other plant species also showed promising results, which can also be quantified.

CONCLUSION

This study of the preliminary phytochemical analysis revealed that these phytocompounds are mainly present in the Ethanolic extract as compared to Acetonic or Aqueous extract as shown in Table 1. So the Ethanolic extract of the samples of plant material were found to contain the required major phytocompounds and other nutritive compounds needed by the pharamaceutical companies as well as in food supplements. The quantitative analysis of these phytocompounds will be an interesting area for further study.

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Table 1: Preliminary Phytochemical analysis for the presence of various phytocompounds

Plant Name	Solvent type	Alkaloids	Tannins	Saponins	Glycosides	Phenols	Flavonoids	Anthroquinone	Terpenoids	Steroids
Achyranthus aspera	Ethanolic	+	-	+	+	+	+	+	+	+
	Acetonic	+	-	-	+	+	+	+	+	+
	Aqueous	-	-	-	+	-	-	-	+	+
Acalypha indica	Ethanolic	+	+	+	-	-	+	-	+	+
	Acetonic	+	-	+	-	-	-	-	+	+
	Aqueous	-	-	-	-	-	-	-	-	-
Euphorbia hirta	Ethanolic	+	+	+	+	-	+	+	+	+
	Acetonic	-	-	-	+	+	+	-	-	+
	Aqueous	-	+	+	+	-	+	-	+	+
Lindenbergia indica	Ethanolic	+	-	+	-	+	+	-	-	-
	Acetonic	-	-	-	+	+	+	+	+	-
	Aqueous	+	-	+	+	-	+	-	-	-
Parthenium hysterophorus	Ethanolic	+	+	-	-	-	+	-	-	-
	Acetonic	+	-	-	+	-	+	-	+	+
	Aqueous	-	-	-	+	-	-	-	+	+
Peristrophe bicalyculata	Ethanolic	+	+	-	-	+	+	-	+	+
	Acetonic	+	-	-	-	-	-	-	+	+
	Aqueous	+	-	-	-	-	+	-	+	+

Note: Each datum is the average of two Independent Determinations.

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