Research Article

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COMPARATIVE PHYTOCHEMICAL SCREENING OF TWO VALUABLE MEDICINAL PLANTS OF FAMILY APOCYNACEAE (*CATHARANTHUS ROSEUS* (L.) G.DON. AND *ALSTONIA SCHOLARIS* (L.) R.BR.)

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ABSTRACT

Medicinal plants are the significant sources of bioactive compounds worldwide. This study is aimed at qualitative phytochemical screening of leaves constituents of *Catharanthus roseus* (L.) G. Don. and *Alstonia scholaris* (L.) R. Br. This analysis of both extracts of plant leaves was done using different solvents such as water, methanol and ethanol using standard methods. The presence of alkaloids, steroids, phenolic compounds, saponins, tannins, terpenoids, flavonoids, cardiac glycosides, anthraquinones, iridoids, carbohydrates, proteins, lipids and vitamins were examined in qualitative study of *Catharanthus roseus* and *Alstonia scholaris*. Only ethanol extract contains flavonoids. Steroids are found exclusively in aqueous extracts. This screening gave negative results for the presence of anthraquinones in all the extracts of both the leaves tested. The aqueous extract contains a substantially higher number of phytochemicals in both the leaves' constituents. Extensive study and research on the phytochemical analysis of the plant *Catharanthus roseus* and *Alstonia scholaris* will provide wide range information for scientists and researchers regarding apocynaceae family. This can be used to develop new therapies for society's health.

Keywords: *Alstonia scholaris*, *Catharanthus roseus*, anti-cancer, anti-oxidant, Medicinal plant, Leaf extracts, Phytochemicals

INTRODUCTION

Plants have been the well-known source of crucial pharmaceuticals of considerable economic importance since time immemorial. More than 50 per cent of the drugs currently used for health care are derived from plants¹. Medicinal plants do offer enormous possibilities for herbal therapies². Owing to the existence of some phytochemical constituents, these medicinal plants are important in both healing and curing of human diseases³. Phytochemicals are biologically active, naturally occurring chemical compounds synthesised in plants. They occur in distinct parts of the plants, for example in underground parts such as roots, stems and in aerial parts such as leaves, buds, fruits or seeds. Many phytochemicals are often found to be concentrated in the outer layers of the many plant tissues, especially the pigment molecules⁴. Medicinal properties are unique to individual plant species or classes and are consistent with the idea that the mixture of secondary products is taxonomically distinct in a particular plant. The emphasis has currently increased when the phytochemical components of a medicinal plant are compared to their pharmacological activities⁵. *Catharanthus roseus* (L.) G. Don. (apocynaceae) is an evergreen herb native to Indian Ocean Island of Madagascar and common in many tropical and sub-tropical regions⁶. It has remarkable amounts of phenolic compounds and alkaloids. The anticancer alkaloids like vinblastine and vincristine are derived from stems and leaves. These alkaloids possess growth inhibition effect to some human tumours. The plant's ethanolic leaf extracts exhibit anti-diarrheal activity. Reduction in the serum levels of triglycerides, LDL-c, VLDLc and total cholesterol is observed

with its leaf juice⁷. Another evergreen tree *Alstonia scholaris* (L.) R.Br. of the same family is native to Indian sub - continent and South East Asia, especially rich in alkaloids⁸. The alkaloids alstonamine and rhazimanine present in its leaves exhibit antimalarial property⁹. Its leaf extracts are also used against congestion of liver, beri-beri, dropsy and ulcers¹⁰. *Alstonia scholaris* shows antibacterial activity in the crude methanolic extracts of the leaves. Antiasthmatic activity has been also reported in the ethanolic extracts of its leaves¹¹. Currently, there is no study comparing these two described Apocynaceae family plants. The use of their leaf extract will not hamper the food industry, since their leaves are not edible. Thus, the effort has been carried out to examine whether variations are found in the phytochemical constituents of leaves of different categories of plants of the same family.

MATERIALS AND METHODS

The Universe of study

The research was carried out at Ravenshaw University, Cuttack, Odisha.

Collection of plant materials

Young green leaves of *Catharanthus roseus* and *Alstonia scholaris* were collected from the Department of Botany and Biotechnology garden, Ravenshaw University, Cuttack, Odisha (Figure 1 and 2).

Treatment of the collected plant materials

The collected leaves of two plants were first rinsed with tap water, then by distilled water thoroughly to take out all the dirt and air dried on brown paper in shade separately for 2-3 weeks (Figure 3 and 4). Leaves were properly dried followed by coarsely powdered, weighed and preserved in a sealed container for the experiments at room temperature (Figure 5).

Experimental design for screening of phytochemicals in samples

7 g of powdered leaf samples of both *Catharanthus roseus* and *Alstonia scholaris* were separately dispensed in 100 ml conical flasks (Borosil, India) containing 70 ml each of distilled water, methanol and ethanol at a 40% (w/v) concentration (Figure 6). The flasks were sealed with aluminium foil and were kept at a

refrigerator at 4°C overnight to minimise the possibility of contamination. Then, the extracts were filtered through Whatman No.1 filter paper. Those filtrates were used for the screening of phytochemicals by methods used by Harborne (1973)¹². Dry yield was processed for further use in a refrigerator at 4°C.

Qualitative phytochemical analysis

Qualitative analysis of phytochemicals like alkaloids (tannic acid test, mayer's test, wagner's test and hager's test), steroids (salkowski test and liebermann burchard test), proteins and amino acids (ninhydrin test, xanthoproteic test and biuret test) and carbohydrate (molisch's test, fehling's test), lipids and fats, vitamins, phenolic compounds, saponins, tannins, terpenoids, cardiac glycosides, flavonoids, anthraquinones, iridoids of leaf extracts were performed following the standard protocol of Harborne and Baxter (1993)¹³ and Bisht et al. (2016)¹⁴.

(a)

(b)

Figure 1: *C. roseus* (a) Plant and (b) Flower; photo: SP Mohanty, Ravenshaw University, Cuttack (20.46° N, 85.89° E)

(a)

(b)

Figure 2: *A. scholaris* (a) Plant and (b) Flower; Photo: SP Mohanty, Ravenshaw University, Cuttack (20.46° N, 85.89° E)

Figure 3: Leaves of *C. roseus*

Figure 4: Leaves of *A. Scholaris*

Figure 5: Step wise preparation of powder from the dried sample leaves

Figure 6: Aqueous leaf extracts of (A) *A. scholaris* and (B) *C. roseus*

Table 1: Phytochemical screening of leaf extracts of *C. roseus*

Phytochemicals (Primary and Secondary Metabolites)	Solvents		
	Aqueous	Methanol	Ethanol
Alkaloids			
Tannic Acid Test	+ve	+ve	+ve
Mayer's Test	+ve	+ve	+ve
Wagner's Test	-ve	+ve	-ve
Hager's Test	-ve	-ve	-ve
Steroids			
Salkowski Test	+ve	-ve	-ve
Liebermann burchard Test (By green approach)	+ve	-ve	-ve
Proteins and Amino Acids			
Ninhydrin Test	-ve	+ve	-ve
Xanthoproteic Test	+ve	+ve	+ve
Biuret Test	+ve	-ve	-ve
Carbohydrates			
Molisch's Test	+ve	-ve	-ve
Fehling's Test	+ve	-ve	-ve
Lipids and Fats	+ve	+ve	-ve
Vitamins	+ve	-ve	-ve
Phenolic Compounds	+ve	+ve	+ve
Saponins	+ve	+ve	+ve
Tannins	+ve	+ve	+ve
Terpenoids	+ve	-ve	+ve
Cardiac Glycosides	+ve	+ve	-ve
Flavonoids	-ve	-ve	+ve
Anthraquinones	-ve	-ve	-ve
Iridoids	+ve	+ve	+ve

Table 2: Phytochemical screening of leaf extracts of *A. scholaris*

Phytochemicals (Primary and Secondary Metabolites)	Solvents		
	Aqueous	Methanol	Ethanol
Alkaloids			
Tannic Acid Test	+ve	-ve	+ve
Mayer's Test	-ve	+ve	+ve
Wagner's Test	+ve	-ve	-ve
Hager's Test	-ve	+ve	-ve
Steroids			
Salkowski Test	+ve	-ve	-ve
Liebermann burchard Test (By green approach)	+ve	-ve	-ve
Proteins and Amino Acids			
Ninhydrin Test	-ve	-ve	-ve
Xanthoproteic Test	+ve	+ve	+ve
Biuret Test	-ve	-ve	-ve
Carbohydrates			
Molisch's Test	+ve	-ve	-ve
Fehling's Test	+ve	+ve	-ve
Lipids and Fats	-ve	+ve	-ve
Vitamins	-ve	+ve	-ve
Phenolic Compounds	+ve	+ve	+ve
Saponins	+ve	+ve	+ve
Tannins	+ve	+ve	+ve
Terpenoids	+ve	-ve	+ve
Cardiac Glycosides	+ve	-ve	-ve
Flavonoids	-ve	+ve	+ve
Anthraquinones	-ve	-ve	-ve
Iridoids	+ve	+ve	+ve

RESULT AND DISCUSSION

Preliminary phytochemical screening of *Catharanthus roseus* leaves

The results of phytochemical analysis are presented in Table 1. The presence of alkaloids in all solvent extracts of experimental leaf samples was reported in this study, while lipids, fats, and cardiac glycosides were only found in aqueous and methanol-extracts. In all extracts with the exception of methanol, terpenoids are observed. Of interest is the fact that only ethanol extract contains flavonoids and only aqueous extract contains steroids.

Vitamins are found in aqueous extracts exclusively. Anthraquinones are absent in the leaf extracts with all the three solvents.

Preliminary phytochemical screening of *Alstonia scholaris* leaves

The results of phytochemical analysis are presented in Table 2. It indicated the presence of alkaloids, phenolic compounds, saponins, tannins and iridoids in all solvent extracts of experimental leaf sample. Proteins and flavonoids are found in methanol and ethanol extracts only where as lipids and fats are

observed in aqueous and methanolic extract. Besides, terpenoids are observed in all extracts except methanol. Steroids, carbohydrates and cardiac glycosides are exclusively found in aqueous extracts and vitamins are found in methanolic extracts only. This screening gave negative results for the presence of anthraquinones in all the extracts tested.

Comparative phytochemical analysis

Among all the extracts using three different types of solvents, the aqueous extract of *Catharanthus roseus* possessed 12 types of phytochemicals while, the aqueous extracts of *Alstonia scholaris* showed the presence of 10 types of phytochemicals. So, aqueous extract is considered as the most appropriate solvent for the purpose. Both the plants contain significantly similar phytochemicals.

CONCLUSION

Being the members of same family, both these leaf extracts showed almost comparable presence of phytochemical constituents, which might support their use against several diseases. These are also valuable sources of materials like cosmetics, edible oils, gums, honey, etc. It also imitated optimism with respect to the development of many other novel chemotherapeutic agents or models from a plant that could be used to produce synthetically improved therapeutic agents in future.

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