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Original Article

PHYTOCHEMICAL SCREENING OF SELECTED SPECIES FROM CONVOLVULACEAE

MARIA EMILIA MASCARENHAS*, CIBANI RAMESH MANDREKAR, PRATIKSHA BHARAT MARATHE, LUENA JOEY MORAIS

Department of Botany, St. Xavier's College, Goa 403507
Email: emilia_m@rediffmail.com

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ABSTRACT

Objective: To screen phytochemicals from stems and leaves of 23 selected taxa of Convolvulaceae.

Methods: Stem and leaves of the selected 23 taxa were collected and shade dried. The methanol extract was used for preliminary screening of phytochemicals such as alkaloids, carbohydrates, glycosides, saponins, proteins, phytosterols, terpenoids, fixed oils, phenolic compounds, flavonoids and tannins.

Results: Phytochemicals were present in all selected taxa of Convolvulaceae. Leaves showed most of the phytochemicals than stems. The important phytochemicals in leaves were flavonoids, carbohydrates, alkaloids, saponins, tannins and phenolic compounds while those in stems were carbohydrates, saponins and phenolic compounds. Proteins and fixed oils were absent in the taxa studied.

Conclusion: Phytochemical screening in the present study, revealed that maximum phytochemicals were present in leaves than in stems.

Keywords: Convolvulaceae, Stems, Leaves, Phytochemicals, Medicinal value

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INTRODUCTION

Phytochemicals such as flavonoids, terpenes, alkaloids are plant-derived natural products, which have received considerable attention in recent years due to their diverse pharmacological properties, including cytotoxic and cancer chemoprotective effects [1]. Over 50% of the drugs isolated from natural sources were used in clinical trials for anti-tumour activity [2-3]. In India, about 65% of the population relies on ethnomedicine for their primary health care needs, which is the only source of medicines [4].

Convolvulaceae is known as morning glory or bindweed family consists of approximately 2800 species belonging to 85 genera and are distributed in the tropical and subtropical regions [5]. Plants belonging to Convolvulaceae have a rich floristic diversity and possess medicinal value [6]. In India, it is represented by 20 genera and 158 species occurring mainly in the Southern and Western India [7]. In Goa, 11 genera and 43 species are reported, of which 7 genera and 17 species are from North Goa [8].

Some species of Convolvulaceae contain ergoline alkaloids that may be responsible for the use of these species as ingredients in psychedelic drugs [9]. Certain species such as *Argyreia nervosa* (Burn. *f.*) Boj., *Merremia tridentata* (L.) Hall. f., *M. emarginata* Brum. f. and some species of *Ipomoea* L. are used to treat diseases [5, 10]. Previous phytochemical screening studies in Convolvulaceae have been performed on seeds, stems, leaves, roots, whole plants [5, 11-12]. However, limited studies on phytochemical screening and their medicinal properties of stems and leaves of Convolvulaceae are available in this part of the region. Hence, in the present study, stems and leaves of selected members of Convolvulaceae were screened for phytochemicals.

MATERIALS AND METHODS

Preparation of extracts

Stems and leaves were collected and washed separately of all the selected taxa. The stems were cut into 5 cm long pieces and the leaves were taken without petioles and both were shade-dried. The dried stem and the leaves were powdered separately using a grinder. For screening, methanol extracts were prepared of the stems and leaves samples [13-14].

Preliminary qualitative analysis

Both stem and leaves extracts were used for preliminary screening of phytochemicals such as alkaloids, carbohydrates, glycosides, saponins, proteins, phytosterols, tepenoids, fixed oils, phenolic compounds, flavonoids and tannins as shown in (table 1).

RESULTS AND DISCUSSION

Phytochemical screening

The 23 taxa screened for phytochemicals, showed the presence of alkaloids, carbohydrates, glycosides, saponins, phytosterols, terpenoids, phenolic compounds, flavonoids and tannins (table 2). Secondary metabolites such as alkaloids, flavonoids, carbohydrates, saponins, tannins, terpenoids, phytosterols, steroids and phenolic compounds contribute significantly towards biological activities such as anti-inflammatory, anti-oxidants, anti-osteoarthritic, analgesic, anti-diabetic, anti-microbial and hepatoprotective [5, 14-15]. The distribution of phytochemicals in the stems and leaves of the taxa studied are shown in (fig. 1). In the present study variations in the distribution of phytochemicals in leaves and stems were observed. Leaves showed maximum phytochemicals than in stems. This could be due to the collection of leaves in different stages of plants.

The important phytochemicals in leaves were flavonoids, carbohydrates, alkaloids, saponins, tannins and phenolic compounds. Those which occurred in a lesser number of taxa were terpenoids, glycosides and phytosterols (fig. 2). The main phytochemical components in stems were carbohydrates, saponins and phenolic compounds (fig. 3.).

Although flavonoids, tannins and alkaloids were common in leaves, they were not so abundant in stems. Flavonoids are potent anti-oxidants and free radical scavengers, thus preventing oxidative cell damage. They have strong osteo-arthritic and analgesic activities [14], thereby indicating that leaves of the taxa under study have a very high potential to be used in medicine as antioxidants. Similarly, tannins containing plant extracts are used as astringents, as anti-inflammatory, antiseptic and anti-oxidants [5]. In the food industry, tannins are used to clarify wine, beer and fruit juices. Thus the role of tannins as anti-oxidants and as anti-inflammatory phytochemicals can be utilized.

Plant alkaloids have been used as psychoactive substances, such as cocaine, caffeine and cathinone are stimulants of the central nervous system, mescaline and many indole alkaloids having hallucinogenic effect. Seeds of *Turbina corymbosa* (L.) Raf., *Ipomoea violacea* L. and *I. tricolor* Cav. contain ergoline alkaloids and are known to be sources of hallucinogenic drugs with psychedelic [5]. Whereas morphine and codeine are used as strong narcotic painkillers. Thus alkaloids present in the leaves of selected taxa of Convolvulaceae may be exploited to develop potent narcotic painkillers.

Carbohydrates is present abundantly in both stems and leaves of the taxa under study. Stems of *Argyreia involucrata, A. nervosa and Ipomoea mauritiana* did not show the presence of any phytochemicals. Plant dietary fibres such as celluloses, hemicelluloses, non-digestible oligosaccharides protect human health from bowel disorders and decrease the risk of coronary heart diseases [16]. Thus carbohydrates present in the taxa under study shows that they can be used as dietary supplements as well as to prevent coronary heart diseases.

Saponins and phenolic compounds were present about 50% of selected taxa. Saponins are known to promote dietary supplements and nutraceuticals, serve as anti-feedants and protect the plants against microbes, whereas plant phenolic compounds have been studied mainly for their properties against oxidative damage leading to various degenerative diseases. Besides polyphenolic compounds defend against the growth of cancers, diabetes, osteoporosis, cardiovascular and neurodegenerative disorders [17]. Since Saponins and Phenolic compounds are important, these taxa need to be investigated in more detail, for the presence of these compounds.

Phytosterols and terpenoids were found to be present only in 3-7 of the plants studied. Steroids function as signalling molecules in detecting a number of disorders, including malignancies like prostrate cancers [17], dietary phytosterols are known to be effective against cancer [18] and triterpenoids are useful in the healing of anti-inflammatory disorders, arthritis and have anti-tumor properties and anti-microbial activities.

Similarly, glycosides occurred in only 5 taxa each in both stems and leaves. Glycosides are known to show beneficial action on the human immune system by increasing body strength and therefore are valuable as dietary supplements. In plants, glycosides play an important role in involving its regulatory, transpiratory and protective functions [14]. Proteins and fixed oils were absent in the taxa studied.

Table 1: Qualitative screening of different phytochemicals

S. No.	Name of test	Test	Observation
1.	Test for Alkaloids	1 ml methanolic extract+few drops of dil. HCl+stir+filter. I ml filtrate+Wagner's reagent	Red-brown ppt.
2.	Test for Carbohydrates	1 ml methanolic extract+2 drops alcoholic alpha-naphthol. Shake well+1 ml conc. H_2SO_4 along sides of test tube+allowed to stand	Violet ring at junction
3.	Test for Glycosides	1 ml methanolic extract+0.5 ml conc. H_2SO_4+1 ml benzene	Dirty yellow ppt.
4.	Test for Saponins	0.5 ml methanolic extract+5 ml dist. H_2O+shake well and allow to stand	Persistent frothing or foaming
5.	Test for Proteins	1 ml methanolic extract+1 drop 2% Cu SO_4+1 ml 95% ethanol = excess KOH pellets	Pink colour
6.	Test for Phytosterols	2 ml methanolic extract+2 ml acetic anhydride+few drops conc. H_2SO_4 along sides of test tube	Array of colour changes
7.	Test for Terpenoids	1 ml methanolic extract+2 ml chloroform = shake well+equal volume conc. H_2SO_4	Yellow to brick red colour
8.	Test for fixed oils	1 ml methanolic extract pressed between 2 filter papers	Oil stains
9.	Test for Phenolic compounds	1 ml methanolic extract+neutral 5% Fe Cl_3	Dark green colour
10.	Test for Flavonoids	2 ml methanolic extract+10% NH_4OH	Yellow fluorescence
11.	Test for Tannins	1 ml methanolic extract+few drops of 5% Fe Cl_3	Deep blue to black colour

Table 2: Phytochemical present in stems and leaves of selected species of Convolvulaceae

S. No.	Taxa	Phytochemicals in stems	Phytochemicals in leaves	Phytochemicals in both stems and leaves
1.	*Argyreia involucrata* C. B. Clark	---------	Saponins, Phenolic compounds, Flavonoids	--------
2.	*A. nervosa* (Brum. f.) Bojer	--------	Alkaloids, Phenolic compounds, Flavonoids	--------
3.	*Ipomoea alba* L.	Carbohydrates	Flavonoids	--------
4.	*I. aquatica* Forssk.	--------	Alkaloids, Saponins	Carbohydrates, Glycosides, Phenolic compounds, Flavonoids
5.	*I. cairica* (L.) Sweet	--------	Phenolic compounds, Tannins	Carbohydrates, Saponins, Flavonoids
6.	*I. carnea* Jacq. subsp. *fistulosa* (Mart ex Choisy) D. Austin	Phenolic compounds	Alkaloids, Terpenoids, Flavonoids	Carbohydrates, Glycosides, Saponins
7.	*I. hederifolia* L.	Phenolic compounds	Alkaloids, Terpenoids, Flavonoids, Tannins	Carbohydrates, Saponins
8.	*I. marginata* (Desr.) H. Manitz forma *marginata*	--------	Alkaloids, Saponins, Phenolic compounds, Flavonoids, Tannins	Carbohydrates
9.	*I. mauritiana* Jacq.	--------	Alkaloids, Saponins, Phenolic compounds, Flavonoids	--------
10.	*I. muricata* Jacq.	Phenolic compounds	Flavonoids, Tannins	Carbohydrates, Glycosides, Saponins
11.	*I. nil* (L.) Roth	--------	Alkaloids, Phenolic compounds, Flavonoids, Tannins	Carbohydrates, Saponins
12.	*I. obscura* (L.) Ker-Gawl. forma *concolor* Naik and Zate	--------	Flavonoids, Tannins	Carbohydrates

13.	*I. pes-caprae* (L.) Sweet	Phenolic compounds	Alkaloids, Flavonolids, Tannins	Carbohydrates, Saponins, Terpenoids
14.	*I. pestigrides* L.	Carbohydrates, Terpenoids, Tannins	Glycosides, Flavonoids	Alkaloids
15.	*I. quamoclit* L.	Phenolic compounds, Tannins	--------	Alkaloids, Carbohydrates, Saponins, Flavonoids
16.	*I. triloba* L.	---------	Saponins, Flavonoids, Tannins	Alkaloids, Carbohydrates
17.	*I. violacea* L.	Phenolic compounds	Alkaloids, Terpenoids, Flavonoids, Tannins	Carbohydrates, Saponins
18.	*Ipomoea* sps. *1*	--------	Alkaloids, Phenolic compounds	Carbohydrates, Phytosterols, Terpenoids, Flavonoids, Tannins
19.	*Ipomoea* sps. *2*	--------	Alkaloids	Carbohydrates, Saponins, Phytosterols, Terpenoids, Phenolic compounds, Flavonoids, Tannins
20.	*Merremia vitifolia* Hall. f.	--------	Alkaloids, Terpenoids, Phenolic compounds, Tannins	Carbohydrates, Saponins, Flavonoids
21.	*Rivea hypocrateriformis* (Desr.) Choisy	Phytosterols	Alkaloids, Saponins, Flavonoids, Tannins	Carbohydrates, Glycosides, Phenolic compounds
22.	*Xenostegia tridentata* (L.) D. F. Austin and Stapels subsp. *tridentata*	--------	Phenolic compounds, Flavonoids, Tannins	Carbohydrates, Phytosterols
23.	*X. tridentata* (L.) D. F. Austin and Stapels subsp. *hastata* (Oostrtr.) Pamar.	Glycosides	Alkaloids, Tannins	Carbohydrates, Flavonoids

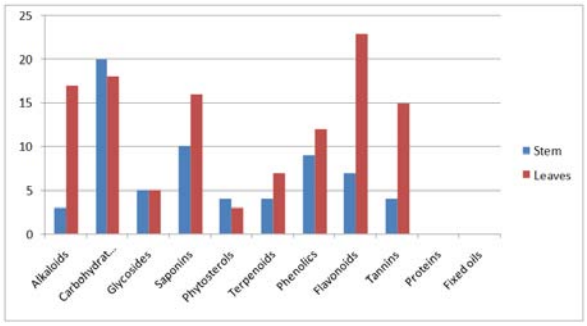

Fig. 1: Comparison of phytochemicals in stems and leaves of selected taxa of convolvulaceae

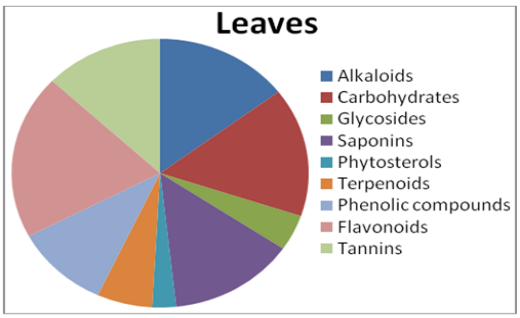

Fig. 2: Pie chart showing the phytochemicals in leaves

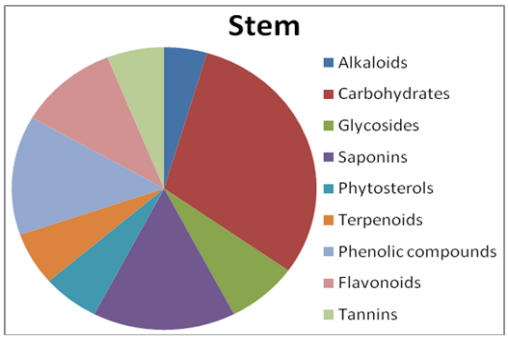

Fig. 3: Pie chart showing the phytochemicals in stems

CONCLUSION

During the present study, phytochemicals were present in all the taxa investigated. Till now most of the phytochemical studies are done with seeds, but in our study, it was observed that leaves contained maximum phytochemicals. Besides leaves are readily available in all stages of plants in comparison to seeds, which makes them easier to be exploited for the same. Therefore, more detailed studies are needed to be carried out on leaves, also with regards to its quantitative estimation. Our study suggests that Convolvulaceae which is a readily available invasive family and is known to possess medicinal properties may be studied in more detail for phytochemicals.

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CONFLICT OF INTERESTS

Declared none

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