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 healthcare 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 Convolvulacea contain ergoline alkaloids that may be responsible for the use of these species as ingredients in psychedelic drugs [9]. Certain species such as Argyrostaنشرis (Burn. f.) Boj., Merremia triodonta (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 Convolvulacea 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].

RESULTS AND DISCUSSION

Phytochemical screening

The 23 taxa screened for phytochemicals, showed the presence of alkaloids, carbohydrates, glycosides, saponins, proteins, 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-osteoporotic, 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-arthritis 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, anti-septic 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.

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: Convolvulacea, Stems, Leaves, Phytochemicals, Medicinal value
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 Turbinia corymbosa (L.) Raf., Ipomoea violacea L. and L. 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]. 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.

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.

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. 1 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. H₂SO₄ along sides of test tube+allowed to stand | Violet ring at junction |
| 3.    | Test for Glycosides | 1 ml methanolic extract+0.5 ml conc. H₂SO₄ = shake well and allow to stand | Dirty yellow ppt. |
| 4.    | Test for Saponins | 0.5 mlmethanolic extract+5 ml dist. H₂O+shake well and allow to stand | Persistent frothing or foaming |
| 5.    | Test for Proteins | 1 ml methanolic extract+1 drop 2% Cu SO₄ = excess KOH pellets | Pink colour |
| 6.    | Test for Phytosterols | 2 ml methanolic extract+2 mlacetic anhydride+few drops conc. H₂SO₄ 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. H₂SO₄ | 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% FeCl₃ | Dark green colour |
| 10.   | Test for Flavonoids | 2 ml methanolic extract+10% NH₄OH | Yellow fluorescence |
| 11.   | Test for Tannins | 1 ml methanolic extract+few drops of 5% FeCl₃ | 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.    | Ipomoea aquatica Forrsk. | ------ | Alkaloids, Saponins | ------ |
| 5.    | Ipomoea cairica (L.) Sweet | ------ | Phenolic compounds | ------ |
| 6.    | Ipomoea cairica subsp. Fistulosa (Mart ex Choisy) D. Austin | Phenolic compounds | Alkaloids, Terpenoids, Flavonoids | ------ |
| 7.    | Ipomoea hederifolia L. | Phenolic compounds | Alkaloids, Terpenoids, Flavonoids | ------ |
| 8.    | Ipomoea marginata (Desr.) H. Manitz forma marginata | ------ | Alkaloids, Saponins, Phenolic compounds, Flavonoids | ------ |
| 9.    | Ipomoea mauritiana Jacq. | ------ | Alkaloids, Saponins, Phenolic compounds, Flavonoids | ------ |
| 10.   | Ipomoea muricata Jacq. | ------ | Alkaloids, Phenolic compounds, Flavonoids | ------ |
| 11.   | Ipomoea nil (L.) Roth | Phenolic compounds | Alkaloids, Phenolic compounds, Flavonoids, Tannins | ------ |
| 12.   | Ipomoea obscura (L.) Ker-Gawl. forma concolor Naik and Zate | ------ | Flavonoids, Tannins | ------ |
13. *Ipomoea pes-caprae* (L.) Sweet
- Phenolic compounds
- Alkaloids, Flavonoids, Tannins
  - Carbohydrates, Saponins, Terpenoids

14. *I. pestigrides* L.
- Phenolic compounds, Tannins
- Carbohydrates, Glycosides, Flavonoids

15. *I. quamoclit* L.
- Phenolic compounds
- Alkaloids, Terpenoids, Flavonoids, Tannins

16. *I. violacea* L.
- Phenolic compounds
- Alkaloids, Flavonoids, Tannins

17. *Ipomoea sp. 1*
- Alkaloids, Phenolic compounds
- Carbohydrates, Phytosterols, Terpenoids, Flavonoids, Tannins

18. *Ipomoea sp. 2*
- Alkaloids
- Carbohydrates, Saponins, Phytosterols, Terpenoids, Phenolic compounds, Flavonoids, Tannins

19. *Merremia vitifolia* Hall. f.
- Phenolic compounds
- Carbohydrates, Saponins, Flavonoids

20. *Rivea hypocrateriformis* (Desr.) Choisy
- Phytosterols
- Alkaloids, Saponins, Flavonoids, Tannins

21. *Xenostegia tridentata* (L.) D. F. Austin and Stapels subsp. tridentata
- Phenolic compounds, Flavonoids, Tannins

22. *X. tridentata* (L.) D. F. Austin and Stapels subsp. hastata (Oostrtr.) Panar
- Glycosides
- Alkaloids, Tannins
- Carbohydrates, Flavonoids

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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