

SHORT COMMUNICATION

Studies on Phytochemical Constituents of Some Selected Mangroves

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Abstract

Extract of mangrove plants are widely used in folk medicines since time immemorial. The phytochemicals found in these plants must be known to find out the medicinal aspects of these plants. So the present study elucidated various phytochemicals found in the leaves of selected mangrove plants. The mangrove plants examined in the present study are *Acanthus illicifolius* L. (Acanthaceae), *Aegiceras corniculatum* (Myrsinaceae), *Avicennia marina* and *A. officinalis* (Avicenniaceae), *Bruguiera cylindrica*, *Ceriops decandra*, *Rhizophora mucronata* and *R. apiculata* (Rhizophoraceae), *Excoecaria agallocha* (Euphorbiaceae), *Lumnitzera racemosa* (Combretaceae), *Suaeda monoica* and *S. maritima* (Chenopodiaceae). Preliminary phytochemical screening revealed the presence and absence of tannins, alkaloids, steroids, glycosides, flavonoids, phenols, saponins, terpenoids in these plants.

Keywords: Mangrove plants, folk medicines, phytochemicals, tannins, alkaloids, terpenoids.

Introduction

The mangroves are marvel of nature, ecological wonder and scenic splendor. These plants grow in mud flats and shallow water coastal areas where the water is generally brackish. These areas are tough places for plants to grow. But mangroves survive in these harsh conditions because they are highly adaptable to their environment in terms of their anatomy, physiology and morphology. They contain many bioactive compounds of toxicological, pharmacological and ecological importance. These compounds are synthesized by primary or secondary metabolism of living organism. Secondary metabolites are chemically and taxonomically extremely diverse compounds with obscure function. The knowledge of chemical constituents of these plants is desirable to understand herbal drugs and their preparation. Many workers have referred the usefulness of mangrove plants in traditional medicine (Kokpal *et al.*, 1990; Premanathan *et al.*, 1992; 1996). Due to their medicinal values, mangrove plant extracts have been used for centuries by the local people as folk medicine for curing many health disorders. The present study was undertaken to investigate the presence or absence of phytochemicals of some mangroves.

Materials and methods

The mangrove plants examined were *Acanthus illicifolius* L. (Acanthaceae), *Aegiceros corniculatum* (Myrsinaceae), *Avicennia marina* and *A. officinalis* (Avicenniaceae), *Bruguiera cylindrica*, *Ceriops decandra*, *Rhizophora mucronata* and *R. apiculata* (Rhizophoraceae), *Excoecaria agallocha* (Euphorbiaceae), *Lumnitzera racemosa* (Combretaceae), *Suaeda monoica* and *S. maritima* (Chenopodiaceae).

The leaves of the mangroves were collected from Pitchavaram mangrove forest, Cuddalore District, Tamil Nadu. The collected leaves were washed with tap water and shade dried at room temperature. The dried leaves were powdered using electrical blender. Ten grams of material was stirred overnight in 70% methanol (100 mL) and then centrifuged at 10,000 rpm for 10 min at 4°C. The resultant supernatant was collected and the methanol was removed by evaporation. This extract was used for further phytochemical analysis.

Qualitative phytochemical tests for the identification of alkaloids, flavonoids, steroids, tannins, terpenoids, saponins, glycosides and phenols were carried out in the extract as per the method described by Harborne (1973), Sofowora (1993) and Trease and Evans (1989).

Test for Tannins: A small portion of the extract was diluted with 20 mL of distilled water and boiled in a boiling tube. Then few drops of 0.1% ferric chloride was added. The appearance of brownish green or blue-black colour indicates the presence of tannins.

Test for Saponins: One mL of the extract was diluted with 20 mL of distilled water and shaken vigorously. The formation of stable foam indicates the presence of saponins.

Test for Flavonoids: About 1 mL of the extract was mixed with few fragments of magnesium ribbon and concentrated hydrochloric acid. The appearance of pink or magenta-red colour indicates the presence of flavonoids.

Table 1. Phytochemical constituents of mangrove plants.

Mangrove plants	Alkaloids	Flavonoids	Glycosides	Phenols	Saponins	Steroids	Tannins	Terpenoids
<i>Acanthus illicifolius</i>	+	+	+	+	+	+	+	+
<i>Aegiceras corniculatum</i>	+	+	+	+	+	-	+	+
<i>Avicennia marina</i>	+	+	-	+	+	-	+	+
<i>Avicennia officinalis</i>	+	+	+	+	-	+	+	+
<i>Bruguiera cylindrica</i>	-	+	-	-	+	-	+	+
<i>Ceriops decandra</i>	+	+	-	+	+	+	+	+
<i>Excoecaria agallocha</i>	+	-	+	+	-	-	+	+
<i>Lumnitzera racemosa</i>	+	+	-	+	-	+	+	+
<i>Rhizophora apiculata</i>	+	+	-	+	+	+	-	+
<i>Rhizophora mucronata</i>	+	+	+	+	+	+	+	+
<i>Suaeda maritima</i>	+	+	+	+	-	+	+	+
<i>Suaeda monoica</i>	+	+	+	+	+	+	+	-

+ Present, - Absent.

Test for Phenols: A small portion of the extract was mixed with 2 mL of ferric chloride solution. The appearance of green or blue colour indicates the presence of tannins.

Test for Alkaloids: Two mL of the extract was mixed with 0.2 mL of 1% HCl. Then 1 mL of Mayers' reagent was added. Any precipitate or turbidity indicates the presence of alkaloids.

Test for Steroids: A small portion of the extract was mixed with 2 mL of acetic anhydride. Then 2 mL of sulphuric acid was added by the sides of the test tube. The appearance of bluish-green or violet colour indicates the presence of steroids.

Test for Terpenoids: A small portion of the extract was mixed with 2 mL of chloroform. Then 3 mL of sulphuric acid was carefully added. The appearance of reddish brown or pinkish brown ring/colour indicates the presence of terpenoids.

Test for Glycosides: A small portion of the extract was mixed with 2 mL of glacial acetic acid containing 1-2 drops of ferric chloride solution. The mixture was then poured into another test tube containing 2 mL of concentrated sulphuric acid. The appearance of brown ring indicates the presence of glycosides.

Results and discussion

The phytochemicals found in various taxa of mangrove plants are shown in Table 1. The leaf extract of *Acanthus illicifolius* shows the presence of phytochemical compounds such as alkaloids, flavonoids, glycosides, phenols, saponins, tannins and terpenoids. The same phytochemical compounds were reported by Ganesh and Vennila (2011) in their study. Amer *et al.* (2004) extracted novel alkaloids namely 6-hydroxyl-benzoxanzolinone, 4-hydroxyacanthamine and acanthaminoside from *Acanthus arboreus* in their study. The preliminary phytochemical analysis of *Avicennia marina* and *A. officinalis* extract showed alkaloids, phenols, flavonoids, tannins and terpenoids.

In the extract of *A. marina*, saponins are present but it was absent in *A. officinalis*. Similarly in the extract of *A. officinalis*, glycosides and steroids are present but they are absent in the extract of *A. marina*. In the family Rhizophoraceae four taxa *Bruguiera cylindrica*, *Ceriops decandra*, *Rhizophora apiculata* and *R. mucronata* are evaluated for phytochemicals. The phytochemicals present in all the four taxa were flavonoids, saponins and terpenoids. The glycosides are absent in *Bruguiera cylindrica*, *Ceriops decandra* and *Rhizophora apiculata* but it is present in *R. mucronata*. Except glycosides, all other phytochemicals studied were present in *Ceriops decandra*. Among the two *Rhizophora* species studied, all the above mentioned phytochemicals were present in *Rhizophora mucronata* but glycosides and tannins were absent in *R. apiculata*. Among the two *Suaeda* species studied, except terpenoids all other phytochemicals were present in *Suaeda monoica*. But saponins were absent in *S. maritima*. The presence of these chemicals in these plants shows the maximum activity against the various bacterial strains (Patra *et al.*, 2009). Most of these plants showed presence of phenolic compounds which are toxic to microbial pathogens (Aboaba *et al.*, 2006). Similarly flavonoids present in these plants are preventing the oxidative cell damage and having strong anticancer activity (Okwu, 2004). Saponins have the property of cholesterol binding and bitterness (Okwu, 2004). Alkaloids found in these plants are used as basic medicinal agents for analgesic, antispasmodic and antibacterial effect (Okwu, 2004). Saponins present in these plants are considered to be antifungal agents and tannins prevent the growth of the microorganism by precipitating nutritional microbial proteins.

Conclusion

This work is an attempt to find out the phytochemicals present in the various mangrove taxa. This research may lead to the development of a phytomedicine to act against pathogenic microbes. Further research is necessary to extract the antibacterial compounds from these plants and this will give a platform for further phytochemical and pharmaceutical applications.

References

1. Aboaba, O.O., Smith, S.I. and Olude, F.O. 2006. Antimicrobial effect of edible plants extracts on *Escherichia coli* 1057: H7. *Pak. J. Nutr.* 5(4): 325-327.
2. Amer, M.E., Abou-shoer, M.S., Abdel kader, A.M.S., El-Shaibany and Abdel salam, N.A. 2004. Alkaloids and flavone acyl glycosides from *Acanthus arboreus*. *J. Braz. Chem. Soc.* 15: 262-266.
3. Ganesh, S. and Vennila, J. 2011. Phytochemical analysis of *Acanthus illicifolius* and *Avicennia officinalis* by GC-MS. *Res. J. Phytochem.* 5: 60-65.
4. Harborne, J.B. 1973. *Phytochemical Methods*. Chapman and Hall Ltd., London. pp.49-188.
5. Kokpal, V., Miles, D.H., Payne, A.M. and Chittarwong, V. 1990. Chemical constituents and bioactive compounds from mangrove plants. *Stud. Nat. Prod. Chem.* 7: 175-199.
6. Okwu, D.E. 2004. Phytochemicals and vitamin content of indigenous species of South Eastern Nigeria. *J. Sustainable Agri. Environ.* 6(1): 30-37.
7. Patra, J.K., Panigrahi, T.K., Rath, S.K., Dhal, N.K. and Thatoi, H.N. 2009. Phytochemical screening and antimicrobial assessment of leaf extracts of *Excoecaria agallocha* L.: A mangal species of Bhitarkanika, Orissa, India. *Adv. Nat. Appl. Sci.* 3(2): 241-246.
8. Premanathan, M., Chandra, K., Bajpai, S.K. and Kathiresan, K. 1992. A survey of some Indian marine plants for antiviral activity. *J. Bot.* 321: 35.
9. Premanathan, M., Nakashima, H., Kathiresan, K., Rajendran, N. and Yamamoto, N. 1996. *In vitro* anti human immunodeficiency virus activity of mangrove plants. *Ind. J. Med. Res.* 130: 276-279.
10. Sofowora, A. 1993. *Medicinal plants and traditional medicine in Africa*. Spectrum Books Ltd., Ibadan, Nigeria. pp.191-289.
11. Trease, G.E. and Evans, W.C. 1989. *Pharmacognosy*, 11th edn., Bailliere Tindall, London. pp.45-50.