International Journal of Innovative Research and Advanced Studies (IJIRAS)
Volume 5 Issue 6, June 2018

ISSN: 2394-4404

A Comparative Study On Phytoconstituents Of Three Different Species Of Genus *Alternanthera*

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Abstract: ***The curative properties of medicinal plants are due to the presence of various complex chemical substances of different composition which occur as secondary metabolites. The purpose of the present study was to evaluate the phytoconstituents screening of three different Alternanthera species such as Alternanthera sessilis, Alternanthera philoxeroides and Alternanthera bettzickiana. A total of three plant extracts were used in this study to examine their phytoconstituents. Phytoconstituents screening was done using the procedures of Harborne (1973). Phytochemical screening was performed with aqueous, acetone, chloroform, ethanol and petroleum ether extracts of A. sessilis L, A. philoxeroides (Mart.) Griseb and A. bettzickiana (Regel) G. Nicholson. The ethanol extract of the plant showed presence of various primary and secondary metabolites. The ethanol extract of the aerial parts of the three species of Alternanthera showed presence of many major phytoconstituents. The ethanol and aqueous extract of A. bettzickiana, A. philoxeroides and A. sessilis showed presence of alkaloids, carbohydrates, saponins, phenols, flavonoids, diterpenes, tannin, terpenoids, steroid, oxalate, anthocyanin, leucoanthocyanin, Xanthoprotein, coumarin and glycosides.***

I. INTRODUCTION

Medicinal plants have been the mainstay of traditional herbal medicine amongst rural dwellers worldwide since antiquity to date. Phytochemistry is a branch of science that deals with the chemicals obtained from plants with desirable biological activities (Karthishwaran, 2010). Amaranthaceae is a cosmopolitan family consisting of 64 genera and about 800 species, mostly abundant in tropical regions of America, Africa and India. The Family represented by herbs, few shrubs and a large number of the amaranthaceous species are ubiquitous weeds (Hussien Alwadie 2005). The genus comprises approximately 80 species. *Alternanthera sessilis* commonly called as sessile joyweed and dwarf copper leaf and it is a leafy vegetable. Its leaves and young shoots are eaten as vegetable (Chandrika *et al.,* 2006) or cooked in soup in Sri Lanka and also used as traditional medicine in China, Taiwan and India (Anitha and Kanimozhi, 2012). *Alternanthera philoxeroides* (Mart.) Griseb commonly known as alligator weed. It has been found to be quite rich in iron content and may be used as salad. This species may also be used for production of methane gas and tertiary filtration system for domestic sewage (Hundiwale Jogendra *et al*., 2012). The plants grown in domestic sewage are reported to be free from toxic levels of trace heavy metals (Anon. 1985). *Alternanthera bettzickiana* (Regel) G. Nicholson, native to South America, commonly known in English as Baptist plant, border plant, red calico plant, is an erect and bushy or prostrate perennial herb with food and ornamental values. The shoots and tender leaves are commonly consumed like vegetable or spinach and in soups, either cooked alone or mixed with other vegetables such as cowpeas or amaranth, with added coconut milk and served with a staple food like rice or ugali (Quattrocchi 2012). The whole plant is reported to be useful in purifying and nourishing blood and is claimed to be a soft laxative, a galactagogue and an antipyretic, in addition to its wound healing property (Petrus *et al.,* (2014). Green leafy vegetables occupy an important place among the food crops as these provides promising nutritive value, which can nourish the ever increasing human population (Sheela *et al*., 2004). Three *Alternanthera* species are used as a leafy vegetable. So the present study was to evaluate the phytoconstituents of three different *Alternanthera* species.

ISSN: 2394-4404

II. MATERIALS AND METHODS

COLLECTION AND AUTHENTICATION OF PLANT MATERIALS

The plants were collected from Pechiparai, Kanyakumari District, Tamil Nadu. The collected plants were identified in the Department of Botany, Queen Mary's College and confirmed by Prof. P. Jayaraman, Director, Plant Anatomy Research Centre (PARC) Chennai.

PREPARATION OF PLANT MATERIAL

Fresh and healthy plants were washed thoroughly three to four times with running tap water then finally with sterile water followed by shade drying at room temperature for 20-30 days and powdered by using an electric blender and stored in airtight container. Each sample of 10g were taken and soaked for 24h in 50ml of ethanol, chloroform, acetone, petroleum ether and aqueous separately. The extracts were filtered using Whatman filter paper No. 1, evaporated to dryness and re-dissolved in DMSO (Dimethyl Sulphoxide). The extracts were preserved in airtight container and kept at 4-5°C for further use.

III. PHYTOCHEMICAL ANALYSIS

Phytochemical tests were carried out to determine the presence of chemical constituents using standard methods of Harborne (1973). Alkaloids are determined by Wagner's Test (Tiwari *et al*., 2011); carbohydrates by Benedict's Test (Tiwari *et al*., 2011); saponin by Foam Test (Tiwari *et al*., 2011); phenol by Ferric Chloride Test (Tiwari *et al*., 2011); flavonoids by Lead Acetate Test (Tiwari *et al*., 2011); diterpenes by Copper Acetate Test (Tiwari *et al*., 2011), terpenoids by Salkowski's Test (Khanam *et al*., 2014.), aminoacids by Ninhydrin Test (Tiwari *et al*., 2011); proteins by Biuret Test (Khanam *et al*., 2014.), Tannins by Ferric Chloride Test (Tiwari *et al*., 2011); and oxalate by Ethanoic acid glacial (Ugochukwu *et al*., 2013). Further detection of steroids was carried out by (Harborne, 1973); detection of coumarin was done by (Mace, 1963) method and quinone by conc. H2SO4. Xanthoproteins by conc. HNO3 and NH3 Test (Kumar *et al*., 2013.), cardiac glycosides by Kellerkillani synthesis (Misra *et al*., 2011), anthocyanin by HCl and NH3 (Godghate *et al*., 2012), leucoanthocyanin by isoamyl alcohol (Godghate *et al*., 2012); carboxylic acid by effervescence test (Kumar *et al*., 2013) and glycosides by Modified Borntrager's Test (Kokate *et al*., 2006).

IV. RESULTS AND DISCUSSION

Name of the Test	Ethanol			Chloroform			Acetone			Petroleum ether			Aqueous		
	Ab	Ap	As	Ab	Ap	As	Ab	Ap	As	Ab	Ap	As	Ab	Ap	As
Alkaloids	+	+	+	-	-	-	-	-	-	-	-	-	+	+	-
Carbohydrates	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+
Saponins	+	+	+	+	+	-	-	-	-	-	+	-	+	+	+
Phenols	+	+	+	+	-	-	-	-	+	-	-	+	+	+	-
Flavonoids	+	+	+	-	-	+	+	+	-	+	-	-	-	+	+
Aminoacids	-	+	-	-	-	-	-	-	-	-	-	-	+	+	+
Diterpenes	+	+	-	-	+	-	+	+	-	-	+	-	+	+	-
Tannins	+	+	+	+	-	+	-	-	+	-	-	+	+	+	-
Terpenoides	+	+	+	-	-	-	+	+	-	-	+	-	+	+	+
Protein	-	+	+	-	+	-	-	-	-	-	+	-	+	+	+
Steroid	+	+	+	-	+	+	+	-	+	+	+	-	-	-	+
Oxalate	+	+	-	+	+	-	+	+	-	+	+	-	-	-	-
Cardiac glycosides	-	-	+	+	-	-	-	-	-	+	+	-	-	-	-
Anthocyanin	+	-	+	-	-	-	+	-	-	-	-	-	+	-	-
Leucoanthocyanin	+	-	-	+	-	-	-	-	-	-	-	-	+	-	-
Carboxylic acid	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xanthoprotein	+	-	-	-	+	-	+	-	+	-	+	-	-	-	+
Coumarin	+	+	+	-	+	-	-	+	-	-	+	+	+	+	+
Quinones	-	-	-	-	-	+	+	+	-	-	-	-	+	+	-
Glycosides	+	-	-	-	-	-	-	-	-	+	-	-	+	+	-

Note: Ab- Alternanthera bettzickiana; Ap –Alternanthera philoxeroides; As Alternanthera sessilis; "+" indicates presence "-" indicates absence.

Table 1: Phytochemical Analysis of Three Different Species of Alternanthera

To promote the proper use of herbal medicine and to determine their potential as sources for new drugs, it is essential to study medicinal plants. The curative properties of medicinal plants are mainly due to the presence of various complex chemical substances of different composition which occur as secondary metabolites (Karthikeyan *et al*., 2009; Lozoya and Lozoya 1989). The phytochemical analysis was carried out from the dried plant powder using aqueous, acetone, ethanol, chloroform and petroleum ether. The results are depicted in the Table. Twenty different phytochemical tests were carried out for the five different extracts in three different species of *Alternanthera*. *A. bettzickiana* ethanol extracts showed the presence of fifteen phytoconstituents; *Alternanthera philoxeroides* ethanol extracts showed the presence of fourteen phytoconstituents, and *Alternanthera sessilis* ethanol extracts showed the presence of twelve phytoconstituents. Comparatively, *A. bettzickiana* showed the presence of higher phytoconstituents when compared to other two species. Ethanol and aqueous extracts of the *Alternanthera* were found to be more active. Pamila and Karpagam (2017) reported that the preliminary phytochemical analysis showed primary and secondary metabolites such as alkaloids, carbohydrates, saponins, phenols, flavonoids, diterpenes, tannin, terpenoids, steroid, oxalate, anthocyanin, leucoanthocyanin, Xanthoprotein, coumarin and glycosides in the ethanol extract of *A. bettzickiana*. *A. sessilis* contains bioactive components especially in ethanolic extract of the leaves. Different phytochemicals have been found to possess a wide range of activities, which may help in protection against chronic diseases. For example, alkaloids protect against chronic diseases. Saponins protect against hypercholesterolemia and antibiotic properties. Steroids and triterpenoids show the analgesic properties. The steroids and saponins are responsible for central nervous system activities (Amin *Mir et al*., 2013). The phenolic compounds are one of the largest and most ubiquitous groups of plant metabolites

(Yadav and Agarwala 2011; Singh *et al* 2007). Flavonoids are large family of polyphenolic components that are found to reduce blood lipid and glucose and to enhance human immunity (Han *et al*., 2007). Tannins are generally defined as naturally occurring polyphenolic compounds of high molecular weight to form complexes with the proteins (Atoui *et al*., 2005).

V. CONCLUSION

The present investigation shows the presence of various bioactive compounds which has important role in nutritive value of *Alternanthera* species and proves its edible nature. Comparatively, higher phytoconstituents were recorded in *A. bettzickiana* when compared to A. *philoxeroides* and *A. sessilis.* The ethanol extract of *A. philoxeroides* and *A. sessilis* contains enormous amount of phytoconstituents. The medicinally important phytoconstituents in *A. sessilis*, *A. philoxeroides* and *A. bettzickiana* are bioactive in nature. The bioactive compounds are important medicinally in the treatment of different ailments. From the above results and discussions it can be concluded that *Alternanthera* species can be used for further pharmaceutical analyses for producing new drugs.

REFERENCES

[1] Amin Mir M, Sawhney SS, Jassal MMS. (2013). Qualitative and quantitative analysis of phytochemicals of Taraxacum officinale. Wudpecker Journal of Pharmacy and Pharmocology; 2(1):1- 5.
[2] Anitha R and Kanimozhi S (2012). Pharmacognostic Evaluation of Alternanthera Sessilis (L.) R.Br.ex.DC; Pharmacognosy Journal, 4(28): 31-34.
[3] Anon (1985). The Wealth of India: A Dictionary of Raw Materials and Industrial Products. Raw Materials Vol. I: A, Revised Edition, CSIR, New Delhi
[4] Atoui K, A Mansouri, G Bosku, P Kefalas. (2005). Tea and herbal infusions: their antioxidant activity and phenolic profile. Food Chemistry 89, Page No. 27-36
[5] Chandrika UG, Svanberg U, Jansz ER (2006). In vitro accessibility of ß-carotene from cooked Sri Lankan green leafy vegetables and their estimated contribution to vitamin A requirement. J Sci Food Agricul.; 86:54-61.
[6] Godghate A, Sawant R and Sutar A: (2012) Phytochemical analysis of ethanolic extract of roots of Carrisa carandus rasayan J.Chem.; 5(4): 456-459.
[7] Han X, Shen T, Lou H. (2007). Dietry polyphenols and their biological significance. Int. J. Mol. Sci., 950-988.
[8] Harborne JB: Phytochemical Methods. Chapman and Hall Ltd., London 1973; 49-188.
[9] Hundiwale Jogendra C, Patil Avinash V, Kulkarni Mohan V, Patil D.A., and Mali Ravindra G. (2012). A current update on phytopharmacology of the genus Alternanthera. Journal of Pharmacy Research, 5(4), 1924-1929
[10] Hussien M Alwadie, Morphology and Distribution of Three Genera of Amaranthaceae in the South Western Area of Saudi Arabia, J.King Saud Univ, 18 (1), 2005, 51-62.
[11] Karthikeyan A, Shanthi V, Nagasathaya A. Int J Green Pharm 2009; 3: 78-80.
[12] Karthishwaran K, Mirunalini S, Dhamodharanand G. Arulmozhi V.'Phytochemical investigation of Methanolic Extract of the Leaves of Pergularia daemia', Jr of biological sciences 2010; 10(3):242-246.
[13] Khanam Z, Wen CS, UI-Haq BI: (2014). Phytochemical screening and antimicrobial activity of root and stem extracts of wild Eurycoma longifolia Jack (Tongkat Ali). Journal of King Saud University – Science; 1-8.
[14] Kokate CK, Purohit AP and Gokhale SB: "Chapter V-Experimental pharmacognostic evaluation in" The text book of Pharmacognosy" 2006; 67.
[15] Kumar SR, Venkateshwar C, Samuel G and Gangadhar S: Phytochemical screening of some compounds from plant leaf extracts of Holoptelea integrifolia (Planch.) and Celestrus emarginata (Grah.) used by Gondu tribes at Adilabad District, Andrapradesh, India. International Journal of Engineering Science Invention 2013; 2(2): 65-70.
[16] Lozoya M, Lozoya X. Tepescohuite Arch Invest Mex 1989; 87-93.
[17] Mace ME: Phytochemistry 1963; 16: 915-925.
[18] Misra CS, Kumar P, Dev LMS, James J, Veeettil AKT and Thankamani V: A comparative study on phytochemical screening and antibacterial activity of roots of Alstonia scholaris with the roots, leaves and stem bark. Int. J. Res. Phytochem. Pharmacol 2011; 1(2): 77-82.
[19] Pamila UA and Karpagam S (2017). Antimicrobial activity of Alternanthera bettzickiana (Regel) G. nicholson and its phytochemical contents. Int J Pharm Sci Res; 8(6): 2594-99.doi: 10.13040/IJPSR.0975-8232.8(6).2594-99.
[20] Petrus AJA, Kalpana K and Bharadha Devi A: Oriental J. Chem. (2014); 30(2): 491-499.
[21] Quattrocchi U: 2012). CRC World Dictionary of Medicinal and Poisonous Plants, CRC Press, Taylor and Francis Group, Boca Raton; 214-215.
[22] Sheela K, KG Nath, D Vijayalakshmi, GM Yankanchi and RB Patil (2004). Proximate Composition of Underutilized Green Leafy Vegetables in Southern Karnataka; J. Hum. Ecol., 15(3): 227-229.
[23] Singh R, S K Singh, S Arora. (2007). Evaluation of antioxidant potential of ethyl acetate extract/fractions of Acacia auriculiformis A. Cunn,. Fod Chem. Toxicol., 45: 1216-1223.
[24] Tiwari P, Kumar B, Kaur M, Kaur G and Kaur H: (2011). Phytochemical screening and Extraction: A Review. International Pharmaceutica Sciencia; 1(1): 99-106.
[25] Ugochukwu SC, Arukwe UI and Ifeanyi O: (2013). Preliminary phytochemical screening of different solvent extracts of stem bark and roots of Dennetia tripetala Baker. Asian J. Plant Sci. Res; 3(3): 10-13.
[26] Yadav RNS and Munin Agarwala (2011). Phytochemical analysis of some medicinal plants. Journal of Phytology, 3(12): 10-14.