IJPSR (2012), Vol. 3, Issue 02 **(Research Article)**

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 24 September, 2011; received in revised form 18 December, 2011; accepted 29 January, 2012

BIOCHEMICAL AND ANTIMICROBIAL STUDY OF *BOERHAVIA ERECTA* AND *CHROMOLAENA ODORATA* (L.) KING & ROBINSON

M. Suriyavathana*, G. Parameswari and S. Penislus Shiyan

Department of Biochemistry, Periyar University, Salem-11, Tamil Nadu, India

Keywords:
Boerhavia erecta,
Chromolaena odorata,
Biochemical constituents,
Antimicrobial activity

Correspondence to Author:

Dr. M. Suriyavathana

M. Sc., M. Phil., Ph. D, Assistant Professor, Department of Biochemistry, Periyar University, Salem- 636011, Tamil Nadu, India

ABSTRACT

Purpose: The present study was designed to evaluate the phytochemical, biochemical and antimicrobial activity of leaf extracts of *Boerhavia erecta* and *Chromolaena odorata*.

Methods: The leaves of *Boerhavia erecta* and *Chromolaena odorata* were washed with tap water followed by distilled water. The cleaned leaves were shade dried and then made to fine powder by using homogenizer. About 1.0 gram of clean dried leaf was taken along with 10 ml ethanol and mashed well in a homogenizer and filtered, then used for biochemical,phytochemical analysis and antimicrobial activity by using various standard methods.

Results and Conclusions: Since, these plants possess many medicinal properties and the results showed that both the plant extracts possessed significant levels of minerals and vitamins. The presence of biochemical constituents and positive antimicrobial activity expertise its medicinal property. Natural products perform various functions, and many of them have interesting and useful biological activities. *Boerhavia erecta* and *Chromolaena odorata* are plants which are extensively used in folk medicine.

INTRODUCTION: In India, the use of different parts of several medicinal plants to cure specific ailments has been in vague from ancient times. The indigenous system of medicine namely Ayurvedic, Siddha and Unani have been in existence for several centuries [1]. The plants supply us with large number of excellent "chemicals" which form sources for different types of drugs.

The present trend in modern medicine is towards a change from the use of cellulose coated medicinal pills to extracts of plant supplied either in pure forms or in synthetic versions for curing many human ailments. Thus plants have provided the blue prints for the modern medicine. Natural products perform various functions, and many of them have interesting and useful biological activities [2].

Boerhavia erecta is a weedy herb of the family Nyctaginaceae and is commonly available in almost all places. It is used as a traditional medicinal plant in Africa [3]. It has been found to possess diuretic action [4], anti-inflammatory [5], antifibrinolytic [6], anticonvulsant [7] and hepatoprotective activities [8, 9].

Chromolaena odorata (L.) King & Robinson (formerly Eupatorium odoratum) is used as a traditional medicine in Vietnam [10], where its Vietnamese common name is "co hoi". While it has widely considered a weed by agriculturalists [11], the aqueous extract and the decoction from the leaves of their plant have been used throughout Vietnam for the treatment of soft tissue wounds, burn wounds, and skin infections.

MATERIALS AND METHODS:

Materials: All the chemicals used including the solvents were of analytical grade and purchased from Mercury Scientific Company.

Sample Collection: The plant samples of *Boerhavia erecta* & *Chromolaena odorata (L.)* King & Robinson were collected from Kolli Hills in Namakkal (Dt), Tamil Nadu.

Extraction of Leaf Sample: The leaves were washed with tap water followed by distilled water. The cleaned leaves were shade dried and then made to fine powder by using homogenizer. About 1.0 gram of clean dried leaf was taken along with 10 ml ethanol and mashed well in a homogenizer and filtered, then used for analysis.

Phytochemical Analysis: The qualitative analysis of Tannins, Phenols, glycosides, alkaloids, steroids and flavonoids were analyzed by standard method [12].

Estimation of Total Carbohydrate: The Total Carbohydrate was determined by Anthrone Method [13].

Estimation of Starch: The starch content was estimated by Anthrone Method [13].

Estimation of Protein: The protein content was estimated by Lowry's method [13].

Estimation of Lipid (Cholesterol, Free Fatty Acids): The lipid content was estimated by Zak's method [13].

Estimation of Iron: The amount of Iron was determined by Wongs method [14].

Estimation of Calcium: The amount of Calcium was determined [15].

Estimation of Vitamin C: The amount of Vitamin was determined [16].

Antimicrobial Screening:

Antibacterial studies: The antimicrobial activity of extract was studied systematically against four different strains of bacteria by agar diffusion in Pour Plate & cup diffusion method.

Antifungal Studies: The antifungal activity of extract was studied systematically against various fungal strains by agar diffusion in pour plate & cup diffusion method.

RESULTS AND DISCUSSION: The phytochemical preliminary screening analysis is presented in **Table 1**. Since, Phytochemicals are used as antimicrobial compounds and pesticides of antimicrobial agents which are found in aromatic and essential oils of plants which have made great contribution for the quick and effective management of microbial contamination in several agricultural condition.

TABLE 1: QUALITATIVE ANALYSIS OF PHYTOCHEMICALS IN *BOERHAVIA ERECTA* & *CHROMOLAENA ODORATA* (L.) KING & ROBINSON

PARAMETERS	RESULTS	
	Boerhavia erecta	*Chromolaena odorata (L.)* King & Robinson
Flavonoids	+	+
Alkaloids	+	+
Glycosides	+	+
Steroids	+	+
Phenols	+	+
Tannins	-	+
Saponins	+	+

Mostly, the phytochemical classified as secondary metabolites are produced mainly by the shoot part of the plants often their function plant unknown some phytochemicals are known to have structural, functional and general defense against plant pathogens [17]. The qualitative phytochemical analysis indicates that *Chromolaena odorata* and *Boerhavia erecta* possess alkaloids, flavonoids, saponins, steroids, glycosides etc., and more polar compounds like sugar, proteins, minerals and vitamins.

Table 2 reveals the biochemical constituents far more pronounced and of utmost concern are the protein sources in monogastric diets [18]. The greens (green plants of various sources) have long been recognized as the cheapest and most abundant potential source of proteins because of their ability to synthesize amino acids from a wide range of virtually unlimited and readily available primary materials such as water, CO_2, atmospheric N_2 (as in legumes) [19]. Since, carbohydrates play an important role as an immunomodulator. In this study, the amount of the total carbohydrate was calculated.

TABLE 2: BIOCHEMICAL CONSTITUENTS OF *BOERHAVIA ERECTA* & *CHROMOLAENA ODORATA* (L.) KING & ROBINSON

PARAMETERS	RESULTS (mg/g)	
	Boerhavia erecta	*Chromolaena odorata (L.) King & Robinson*
Total carbohydrate	0.46±0.01	0.945±0.04
Starch	1.62±0.02	0.395±0.02
Total protein	1.64±0.06	1.32±0.04
Cholesterol	0.84±0.01	0.51±0.05
Free fatty acids	1.05±0.02	0.15±0.06
Ascorbic acid	1.02±0.02	0.61±0.04
Calcium	0.5±0.01	0.15±0.06
Iron	1.05±0.01	0.15±0.013

The level of iron was found to be higher than calcium. This might be of nutritionally important especially in the part of anemia and iron deficiency [20]. The presence of calcium might be a reason for its use in treating wounds and stop bleeding and is also necessary for blood coagulation and for the membrane integrity. Ascorbic acid is required for normal wound healing [21].

Table 3 reveals that the plants possess 100% antibacterial effect. Because of the resistance pathogenic against antibiotics, there is a great interest in the search for new antimicrobial drugs from natural crude plant extract and biologically active compound isolated from the plant species used in traditional medicine [22].

TABLE 3: ANTIBACTERIAL SCREENING OF *BOERHAVIA ERECTA* AND *CHROMOLAENA ODORATA* BY CUP DIFFUSION METHOD

species	Zone of Inhibition *Boerhavia erecta*				Zone of Inhibition *Chromolaena odorata*			
	Standard	50 (µg)	100 (µg)	150 (µg)	Standard	50 (µg)	100 (µg)	150 (µg)
Aeromonas hydrophila	1.6 mm	0.5 mm	1.0 mm	1.5 mm	2.0 mm	0.7 mm	1.1 mm	1.3mm
Bacillus subtilis	2.0 mm	0.7 mm	1.0 mm	1.5 mm	3.0 mm	1.1 mm	1.4 mm	2.9 mm
Pseudomonas aeruginosa	1.5 mm	0.8 mm	1.0 mm	1.3 mm	2 .0mm	0.6 mm	1.0 mm	1.5 mm
Vibrio parahaemolyticus	2.0 mm	0.5 mm	0.8 mm	1.0 mm	2.0 mm	0.7 mm	1.5 mm	1.8 mm

The particular technique is performed using standard with varying concentration of the plant extract namely 50µg, 100µg, 150µg. The zone of inhibition developed against the bacterial species seems to be interesting and notable. All the organisms responded to the plant extract but the inhibitory zone varied according to the concentration.

Nearly, the concentration (150 µg) seems to show the maximum inhibitory zone against the bacterial strains. Among the different organisms screened the *Chromolaena odorata* showed maximum inhibitory zone and found to be highly effective against *Bacillus subtilis* while the *Boerhavia erecta* showed moderate response against *Bacillus subtilis* and *Aeromonas hydrophila*, and minimal response against *Pseudomonas aeruginosa*.

The increasing prevalence of multidrug resistance strain of bacteria and the recent appearance of strain with reduced susceptibility to antibiotic raises the specter of untreatable bacterial infections and add urgency to the search of new infection fighting strategies [23].

The result obtain nearly signifies that the plant selected for the screening of bacteria and the result further control confirms that the plant extract possess antibacterial effect.

From **table 4,** it is clearly evident that the plant extract showed effective anti-fungal effect compared with the control against the fungal species. The negative results shown in the plate emphasizes on the antifungal potential of the plant.

The fungi are the major disease causing agent on plants, loss upto 90% of agricultural yield. Various systemic fungicides have been used to control the plant diseases but due to indiscriminate use of fungicides, various plant pathogens have been developed resistance to many currently available fungicides. With this view the present investigation validates the antifungal efficacy of *Boerhavia erecta* and *Chromolaena odorata*.

Both the species (Aspergillus flavus and Aspergillus niger) showed response against *Boerhavia erecta* and *Chromolaena odorata* at varied concentration [24].

The zone of inhibition developed by *Boerhavia erecta* against *Aspergillus flavus* seems to be significantly high at 150µg concentration than *Aspergillus niger*. *Chromolaena odorata* showed the very good inhibitory zone against *Aspergillus flavus* (2.8mm) than *Aspergillus niger* (2.3mm) both the species possess effective antifungal store.

TABLE 4: ANTIFUNGAL SCREENING OF *BOERHAVIA ERECTA* AND *CHROMOLAENA ODORATA* BY CUP DIFFUSION METHOD

Species	Zone of Inhibition *Boerhavia erecta*				Zone of Inhibition *Chromolaena odorata*			
	Standard	50 (µg)	100 (µg)	150 (µg)	Standard	50 (µg)	100 (µg)	150 (µg)
Aspergillus flavus	2.5 mm	1.0 mm	1.8 mm	2.2 mm	3.0 mm	1.1 mm	1.7 mm	2.8 mm
Aspergillus niger	2.0 mm	0.8 mm	1.2 mm	1.8 mm	2.5 mm	0.9 mm	1.9 mm	2.3 mm

CONCLUSION: Phytomedicines derived from plants have a great prospect and promise in providing good and effective antimicrobial agents to treat against interactable life threatening diseases, with this view, the present study has explored the efficiency of the *Boerhavia erecta* and *Chromolaena odorata* as valuable natural source.

ACKNOWLEDGEMENTS: We are thankful to Department of Biochemistry, Periyar University, Salem, Tamil Nadu, for providing the necessary infrastructural facilities.

REFERENCES:

1. S.S. Khan and S.A. Chaghtai. Ethnobotanical study of some plants used for curing skin afflictions. Ancient. Sci. Life., 1982, 236-238.
2. M .Galal , A.K. Bashir, A.M. Salih and S.E.I. Adam,. Activity of water extracts of Albiziaanthelmintica and A. Lebbek backs against experimental *Hymenolepis diminuta* infection in rats. J. Ethnopharmacol., 1991, 31: 333-337.
3. C.S Florian, K.Dietmar, S. Andreas, A Hilou, G.N. Odile, C. Reinhold, Z.Naturforsch.,2004, 59c: 1-8.
4. [4] R.P. Singh, K.P. Shokala, B.L. Pandey, R.G.Singh, Usha, R Singh,. Recent approach in clinical and experimental evaluation of diuretic action of punarnava (*Boerhaavia diffusa*) with special effect to nephrotic syndrome. Journal of Indian Medicinal Research. 1992, 11: 29–36.
5. T.N. Bhalla, M.B. Gupta, K.P. Bhavgava. Anti-inflammatory activity of *Boerhaavia diffusa* L. Journal of Indian Medicinal Research., 1971, 6: 11–15.
6. G.K Jain, N.M. Khanna, Punarnavoside: a new antifibrinolytic agent from *Boerhaavia diffusa* L. Indian Journal of Chemistry., 1989, 28: 163–166.
7. V. Mudgal, Studies on medical properties of *Convolvulus phuricaulis* and *Boerhaavia diffusa*. Planta Medica., 1975, 28: 62–68.
8. B.K Chandan, A.K. Sharma, K.K Anand. *Boerhaavia diffusa*: a study of its hepatoprotective activity. Journal of Ethno pharmacology. 1991, 31:299–307.
9. A.K.S Rawat, S Mehrotra, S.C Tripathi, U. Shome, Hepatoprotective activity of *Boerhaavia diffusa* L. roots a popular Indian ethnomedicine. Journal of Ethnopharmacology., 1997, 56:61–66
10. DP Nghiem. The therapeutic effects of the extract from the leaves of *Eupatorium odoratum* on the infection soft tissue and non-healing wounds (PhD thesis) Code 3.01.21. Hanoi. 1992 [in Vietnamese].
11. Holm. The world's worst weeds. Distribution and Biology. University Press of Hawali, Honolulu, Hawaii. 1979, 609pp.
12. JB Harborne Phytochemical methods. Chapman and Hall Ltd., London. 1973, 49-188.
13. Sadasivam and Manickam, Biochemical methods 2nd edition, new age international publish., 2005, pp: 8-11, 139-143, 177-180, 185-189
14. S.Y. Wong .J.Biol.Chem. 1928, 77:409.
15. EP. Clark & JB Collip J.Biol. Chem., 1925, 63:461
16. LJ Harris & SN Ray, Lancet, 1, 1935, 71:462.
17. Sazada Siddiqui,"Allelopathic Effect of Different concentration of water extract of Propolis *Juliflora* leaf on seed germination and radical length of wheat (*Triticum aestivum* Var- Lok-1)" American – Eurasian Journal of Scientific Research., 2009, 4 (2): 81-84.
18. A.O Fasuyi, Nutrient composition and processing effects on cassava leaf (*Manihot esculenta*,Crantz) antinutrients Pak. J. Nutri., 2005, 4:37-42
19. A.O Fasuyi and V.A. Aletor, Protein replacement value of cassava (*Manihot esculenta*,Crantz) leaf protein concentrates (CLPC) in broiler starter: effect on performance, muscle growth, haematology and serum metabolites. Int.J. Poult. Sci., 2005b, 4:339-349.
20. Jimoh Fo & AT Oladiji, Afr J Biotechnol, 2005, 4(12):1439-1442.
21. DE Okwu, J. Sustain. Agric Environ. 2004, 6(1): 30-37,.
22. M.L. Ancelin, H.J. Vial. Quaternary ammonium compounds efficiently inhibit *Plasmodium falciparum* growth *in vitro* by impairment of cholin transport. Antimicrobial aquest and chemotherapy. 1986, 29: 814-820.
23. K Sieradzki, Wu SW, A. Tomasz. Inactivation of the methicillin resistance gene mecA in vancomycin-resistant Staphylococcus aureus. Micro Drug Resist. 1999, 5: 253-257.
24. M.K Pandey, A.K Singh, and R.S Singh. Mycotoxic potential of some higher plants. Plant Disease Research 2002, 17(1): 51-56.

****