*International Research Journal of Environment Sciences*_____ ISSN 2319–1414
Vol. **2(4),** 48-49, April **(2013)** *Int. Res. J. Environment Sci.*

Short Communication

Antimicrobial and Cytotoxic Activities of the Crude Extracts of *Callistemon linearis* available in South East region of Bangladesh

Khan M. Shaiful Islam, Chowdhury Mahedy Hasan, Saha Partha*, Haque S.M. Estiar
Department of Applied Chemistry and Chemical Engineering, University of Dhaka, Dhaka-1000, BANGLADESH

Available online at: www.isca.in
Received 27th February 2013, revised 3rd March 2013, accepted 11th April 2013

Abstract

The extracts (n-hexane and chloroform crude extracts) of Callistemon linearis (Family-Myrtaceae) were subjected to antimicrobial screening and brine shrimp lethality bioassay. In case of antimicrobial screening, the n-hexane, and chloroform crude extracts exhibited very prominent antimicrobial activity against most of the test organisms while from the results of the brine shrimp lethality bioassay, it can be well predicted that the n-hexane extract showed highly cytotoxic potency due to 100% mortality over whole concentration range in which cytotoxicity screening was done whereas chloroform crude extract showed moderate cytotoxic potency with LC_{90} of 30.90 µg/mL.

Keywords: Antimicrobial activity, *Callistemon linearis,* Disk diffusion technique, n-hexane extract.

Introduction

Callistemon linearis (Bengali name- Brushful; Family-Myrtaceae) is a beautiful evergreen shrubs and small trees with 34 species. They are commonly known as bottle brushes because of their cylindrical brush like flowers resembling a traditional bottle brush. They are found in the more temperate regions of Australia and seven species of callistemon have been introduced in India as an ornamental tree[1].

Previous Phytochemical studies of different callistemon species revealed that the presence of different monoterpenes, sesquiterpenes, flavonoids. There are several reports of the oil exhibiting fungi toxicity, inhibiting the growth of cowpea mosaic virus, mungbean mosaic virus[2]. The leaf extracts of plant contain carbohydrate, glycoside, flavonoids, saponin, phytosterol, phenolic compounds and volatile oil of leaf contains 4 component namely n-Dec-3-ene,3-carene,1,8-cineol,gamaterpinine[3].

Material and Methods

Collection and preparation of plant material: Fresh leaves of *Callistemon linearis* was collected from Chittagong B.C.S.I.R. A voucher specimen has been deposited in the Bangladesh National Herbarium, Dhaka (DACB -33560) for the collection.

The air-dried and powdered leaves were successively extracted with n-hexane (15 days) and chloroform (15 days) through cold extraction process accompanying occasional shaking and stirring. After filtration of the extracts through fresh Whatman No.1 filter paper, the filtrates were then concentrated at 50 ^{0}C by a rotary evaporator and afforded n-hexane extract (16.11g), and chloroform extracts (22.56g).

Anti Microbial and cytotoxicity screening: The antimicrobial activity of the crude extracts was determined by the disc diffusion method[4-6] against the microbial strains listed in table 1. These were collected as pure cultures from the Institute of Nutrition and Food Science (INFS), University of Dhaka, Bangladesh. Here, Kanamycin (30 µg/disc) was used as the standard. The n-hexane and chloroform extracts were dissolved separately in chloroform and applied to sterile discs at a concentration of 500µg/disc and carefully dried to evaporate the residual solvent. The zone of inhibition (mm) and LC_{90} (µg/mL) were calculated for the antimicrobial screening and brine shrimp lethality bioassay respectively.

For cytotoxicity screening, DMSO solutions of the n-hexane and chloroform extracts were applied against *Artemia salina* [7] in a 1-day *in vivo* assay. For the experiment, 4 mg of each of the n-hexane and chloroform extracts were dissolved in DMSO and solutions of varying concentrations (400, 200, 100, 50, 25, 12.50, 6.25, 3.125, 1.563, 0.781 µg/mL) were obtained by serial dilution technique for each extract.

Following the procedure of Meyer[7-9] the lethality of the n-hexane and chloroform extracts to brine shrimp were evaluated on *A. salina* after 24 hours of exposure the samples and the positive control, vincristine sulphate (VS).

Results and Discussion

The zones of inhibition produced by n-hexane and chloroform extracts were found to be 28 – 34 mm and 24-28 mm respectively at a concentration of 500µg/disc.

The n-hexane extract was screened against 8 test bacteria and 2 fungi. This extract showed high activity against the test bacteria

Bacillus subtilis, Bacillus cereus, s.aureus, E.coli, Salmonella typhi, Shigella boydii, Vibrio mimicus and the fungi *C. albicans, Aspergillus niger.*

The chloroform extract was also screened against 8 test bacteria and 2 fungi. This fraction showed high activity against the test bacteria *Bacillus subtilis, Bacillus cereus, Bacillus megaterium, S.aureus, E.coli, Salmonella typhi, Shigella boydii, Vibrio mimicus* and the *fungi C. albicans, Aspergillus niger.*

Table-1
Antimicrobial activity of *C.linearis* extracts (500 µg/disc) and Kanamycin (30 µg/disc)

Test microorganisms	Diameter of zone of inhibition (mm)		
	HE	CE	KAN
Gram Positive			
Bacillus cereus	33	26	39
B. megaterium	30	24	32
B. subtilis	28	26	20
Staphylococcus aureus	28	24	22
Gram Negative			
Escherichia coli	31	28	23
S. typhi	31	24	20
Shigella boydii	31	25	26
Vibrio mimicus	30	28	24
Fungi			
Candida albicans	34	25	24
Aspergillus niger	31	24	32

HE: Hexane extract; CE: Chloroform extract; KAN: kanamycin.

The LC_{50} could not be found for n-hexane (HE) and chloroform (CE) extracts from the graph of log of concentration of extracts versus percent mortality. Moreover even the LC_{90} could not be found for n-hexane (HE) due to 100% mortality over whole concentration range in which cytotoxicity screening was done. Comparison with positive control, vincristine sulfate (VS) signifies that cytotoxicity exhibited by the n-hexane is very much significant and it might have antitumor or pesticidal compounds.

Conclusion

Historically, medicinal plants have provided a source of inspiration for novel drug compounds, as plant derived medicines have made large contributions to human health and well being. On the basis of the result obtained in this present investigation and conclude that the n-hexane extract of *Callistemon linearis* had significant in vitro microbial activity and the most active extracts can be further subjected to isolation and identify therapeutic antimicrobials and undergo further pharmacological evaluation.

Table-2
LC_{90} and LC_{50} data of C. *linearis* extracts and vincristine sulfate

Samples	LC_{50} (µg/mL)
VS	0.33
Samples	LC_{90} (µg/mL)
CE	30.90

Acknowledgements

The authors wish to thank the Bangladesh Council of Scientific and Industrial Research under Ministry of Science and Information and Communication Technology, Government of the Peoples' Republic of Bangladesh.

References

1. Kanjilal and Das, Flora of Assam, Omsons Publications, **(2),** 287 **(1992)**

2. Aburjaj Talal and Hudaib Mohammad, Antiplatelet, antibacterial and antifungal activities of *Achillea falcata* extracts and evaluation of volatile oil composition, *Phcog. Mag: Research Article*, **(2),** 191-198 **(2006)**

3. Das Anudwipa, Zaman K. and Singh Akhilesh V., Phytochemical and Chemical composition evaluation of Volatile Oil of *Callistemon linearis DC* Leaf, *Advances in Natural and Applied Sciences,* **3(1),** 56-59 **(2009)**

4. Bauer A.W., Kirby W.M.M., Sherris J.C. and Turck M., Antibiotic susceptibility testing by a standardized single disc method, *Am. J. Clin. Pathol. (***45),** 493-496 **(1966)**

5. Gazi H.R., Kabir S, Rahman M.S., Chowdhury A.M.S., Begum B., and Rashid M.A., Antimicrobial and cytotoxic activities of the crude extracts of *Hopea scaphula*, *Dhaka Univ. J. Pharm. Sci.,* **6(2),** 131-133 **(2007)**

6. Nahar K., Khan M.G.U., Rahman M.S., Begum B. and Rashid M.A., Antimicrobial and cytotoxic activities of *Bryophyllum daigremontianum, Dhaka Univ. J. Pharm. Sci.,* **7(1),** 99-101 **(2008)**

7. Meyer B.N., Ferringni N.R., Puam J.E., Lacobsen L.B., Nichols D.E. and McLaughlin J.L., Brine shrimp: a convenient general bioassay for active constituents, *Planta Medica*., **(45),** 31-32 **(1982)**

8. Kabir Humayun, Siddiqi M.M.A., Al-Mansur M.A., Sohrab M.H., Chowdhury A.M., Sarwaruddin and Choudhury M. Hasan, Phytochemical and Biological Investigations of *Casuarina equisetifolia, The Dhaka University Journal of Science,* **58(2),** 191-193 **(2010)**

9. Mostafa Md. Faisal Kabir, Siddiqi M.M.A., Al-Mansur, Sohrab M.A., M.H., Chowdhury A.M., Sarwaruddin and Choudhury M. Hasan, Antimicrobial and Cytotoxic Activities of the Crude Extracts of *Abroma augusta, The Dhaka University Journal of Science,* **58(2),** 199-200 **(2010)**

10. Alagammal M., Paulpriya K. and Mohan V.R., Anticancer activity of Ethanol extract of *Polygala javana* DC whole Plant against Dalton Ascites Lymphoma, *Res.J.Recent Sci*., **2(2),** 18-22 **(2013)**