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FREE RADICAL SCAVENGING ACTIVITY OF SOME BANGLADESHI MEDICINAL PLANTS

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Abstract

Barringtonia acutangula (Local name-Hijal, Kumia etc.), Erythrina variegata (Local name- Mandar) and Sida cordifolia (Local name- Brela, Bala etc.) are traditionally employed to cure various disorders. The crude extracts of these three traditionally used medicinal plants available in Bangladesh were tested for their potential antioxidant activity against the stable DPPH (2,2-diphenyl-1-picryl-hydrazyl) free radical. Ethanolic extracts of the leaves of Barringtonia acutangula and Erythrina variegata showed potential antioxidant activity (IC50:1 □g/ml) against DPPH free radical whereas their ethanolic bark extracts and ethanolic root extract of Sida cordifolia showed moderate to mild activity.

Keywords: Sida cordifolia, Barringtonia acutangula, Erythrina variegata, Free radical scavenging.

Introduction

Barringtonia acutangula is a small to medium sized, glabrous tree 7.5-15 m. high and grows commonly in the low lying areas through out the country [1]. It also grows throughout India, Ceylon (Srilanka)-Malay, Australia [2]. Like other mangrove plants it has some folklore uses. Root is considered to be warm, stimulating & emetic, often prescribe alone or in combination with other medicines as an external application in colds. The juice of the leaves is given in diarrhea & dysentery. The seed in conjunction with other drugs are recommended for the treatment of snake bite (Bapat); but they are not an antidote to snake-venom (Mhaskar and Caius). Bark is given as an astringent in diarrhea & blennorrhagia, and as a febrifuge in malaria; Fruit is given as an astringent and tonic in gingivitis & also used as lactagogue; useful in gleet, abdominal cholic, lumbar pain, syphilis, and nasal catarrh (Yunani). *Erythrina variegata* Linn. (Family-Moraceae) locally known as Mandar, a medium-sized deciduous small tree with prickly stems and branches [1], usually grows the Old World tropics, possibly originally from India to Malaysia, but is native or of ancient introduction westward to Zanzibar and eastward to eastern Polynesia (the Marquesas)[3]. *Sida cordifolia* (Family: Malvaceae) is an annual and perennial undershrub with long branches. It is one of the most often used Ayurvedic herbs because it simultaneously balance all three laws of the physiology (Vata, Pitta, Khapa), a rare effect. Decoction of roots with ginger is used as febrifuge. Juice of roots is used for healing wounds and curing facial paralysis & sciatica [4]. The aim of the present study was to investigate the free radical scavenging activities of the crude ethanolic extract of *Sida cordifolia*, *Barringtonia acutangula and Erythrina variegata.*

Materials and Methods

Plant materials

Barringtonia acutangula (Family: Lecythidaceae) leaves and barks, *Erythrina variegata* (Family: Papilionaceae) leaves and barks, *Sida cordifolia*(Family: Malvaceae) roots were collected from Khulna University campus and Khulna region respectively and were identified by the National Herbarium of Bangladesh (accession no.: *Barringtonia acutangula* – 31258, *Erythrina variegata* -31259, *Sida cordifolia* –31116). The collected plant parts were sun-dried for one week, ground into a coarse powder with the help of a suitable grinder and the powder was stored in an airtight container and kept in a cool, dark and dry place until analysis commenced.

Preparation of the extract

About 200 gm of powdered materials of each plant part was taken in a clean, flat-bottomed glass container and soaked in 1000 ml of 80% ethanol. The container with its contents was sealed and kept for a period of 7 days accompanying occasional shaking and stirring. The whole mixture then underwent a coarse filtration by a piece of clean, white cotton material. Then it was filtered through Whatman filter paper. The filtrate (ethanol extract) thus obtained was evaporated by using a suitable rotary evaporator (Bibby RE200, Sterilin Ltd.,UK) to get a viscous mass. The viscous mass was then kept at room temperature under a ceiling fan to get a dried extract (about 15% yield). The extract thus obtained was used for pharmacological screening.

Tests for different Chemical groups

The crude ethanolic extract was tested for its different chemical groups as alkaloids, flavonoids, gums, reducing sugars, saponins, steroids and tannins [5]. In each test 2% (w/v) solution of the extract in ethanol was taken unless otherwise mentioned in individual test.

Test for free radical scavenging activity

Purpose**:** To investigate the free radical scavenging activity of the plant extracts *Sida cordifolia*, *Barringtonia acutangula and Erythrina variegata in-vitro*.

Qualitative assay

A Suitably diluted stock solutions of each plant part were spotted on pre-coated Silica gel TLC plates and the plates were developed in solvent systems of different polarities (polar, medium polar and non-polar) to resolve polar and non-polar components of the extract. The plates were dried at room temperature and were sprayed with 0.02% DPPH in ethanol. Bleaching of DPPH by the resolved bands was observed for 10 minutes and the color changes (yellow on purple background) were noted [6].

Quantitative assay

Quantitative assay was performed on the basis of the modified method of Gupta et al., 2003. Stock solutions (10 mg/ml) of different parts of plant extracts were prepared in ethanol from which serial dilutions were carried out to obtain concentrations of 1, 5, 10, 50, 100 and 500 μg/ml. Diluted solutions (2 ml) were added to 2 ml of a 0.004% ethanol solution of DPPH, mixed and allowed to stand for 30

min for reaction to occur. The absorbance was determined at 517 nm and from these values corresponding percentage of inhibitions were calculated. Then % inhibitions were plotted against log concentration and from the graph IC_{50} was calculated. The experiment was performed in duplicate and average absorption was noted for each concentration. Ascorbic acid was used as positive control.

Results and Discussion

Results of different chemical tests on the ethanolic extract of *Sida cordifolia*, *Barringtonia acutangula and Erythrina variegata* are given in the table I. All the extracts gave positive test for either flavonoids or tannins (Table 1). Most of the tannins and flavonoids are phenolic compounds and may be responsible for antioxidant properties of the plants [7]. The color changes (yellow on purple background) on the TLC plate were observed due to the bleaching of DPPH by the resolved bands. The Ethanolic extracts of the leaves of *Barringtonia acutangula and Erythrina variegata* showed potential activity against DPPH free radical where the IC_{50} was 1 μg/ml comparable to that of ascorbic acid used as standard drug where the IC50 was 3.16 μg/ml.

Moderate activity was observed with their ethanolic extract of barks where IC_{50} was 5 μg/ml respectively whereas the ethanolic extract of the root extract of *Sida cordifolia* showed mild activity (IC_{50}=50 μg/ml) (Table II).

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Table 1. Results of different group test

Ethanolic Plant Extract	Alkaloid	Reducing Sugars	Tannins	Gums	Flavonoids	Saponins	Steroids
***Barringtonia acutangula* (Leaf)**	+	+	+	+	-	+	+
***Barringtonia acutangula* (Bark)**	+	+	+	-	-	+	-
Erythrina variegate (Leaf)	+	+	-	+	+	+	+
Erythrina variegata(Bark)	+	+	-	+	+	+	+
Sida cordifolia (Root)	+	+	+	-	-	+	+

+: Positive result; **-** : Negative result;

Table 2. Antioxidant activity of the plant extracts

Ethanolic Plant Extract	Concentration (μg/ml)	% inhibition	IC_{50} (μg/ml)
Barringtonia acutangula (leaves)	1	50.74	1
	5	50.90	
	10	52.04	
	50	58.32	
	100	64.19	
	500	87.36	
Barringtonia acutangula (Barks)	1	49.96	5
	5	50.74	
	10	50.97	
	50	54.16	
	100	58.13	
	500	79.14	
***Barringtonia acutangula* (leaves)**	1	50.32	1
	5	50.88	
	10	52.45	
	50	54.95	
	100	58.65	
	500	77.34	
***Barringtonia acutangula* (Barks)**	1	49.19	5
	5	49.82	
	10	50.27	
	50	52.53	
	100	55.32	
	500	69.95	
***Sida cordifolia* (Roots)**	1	43.83	50
	5	45.45	
	10	46.66	
	50	48.90	
	100	55.25	
	500	75.86	

Values are expressed as mean ± S.D;