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Antibacterial Activity of *Cordyline terminalis* Kunth. Leaves

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The methanolic extract of *Cordyline terminalis* Kunth. as well as its different solvent fractions were tested for their antibacterial activity. The methanolic extract showed a moderate antibacterial activity against *Escherichia coli*, *Shigella boydii*, *Streptococcus pyogenes* and *Staphylococcus epidermis*. The n-hexane soluble fraction showed a mild antibacterial activity against *Salmonella typhi*, *Shigella boydii* and *Shigella dysenteriae* whereas the acetone and chloroform fraction did not show any activity.

Key words: Antibacterial activity, *Cordyline terminalis*

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Introduction

Cordyline terminalis Kunth. (Liliaceae) is an evergreen tropical perennial shrub with terminal tufts of elongated leaves, mostly grown in Tropical Southeastern Asia, Australia, Hawaii and Bangladesh. The plant is traditionally used for the treatment of cardiovascular bleeding, indigestion, diarrhoea, dysentery and skin infections. Also used in the treatment of liver cancer, arthritis, neuritis and traumatic injury. Leaves are used in inflammation and urinary infections (Das, 2003). It is evident from the existing information that this plant may possess some important biological activity specially antibacterial activity. A little work has been performed on this plant to evaluate its biological activity. Ooi, ***et al.*** (1993), isolated and identified a substance with antiproliferative bioactivity. Cambie ***et al.*** (2003) reported it as a potential functional foods. The main objective of this study was to evaluate the antibacterial activity of the methanolic extract of *Cordyline terminalis* Kunth.

Materials and Methods

Collection of plant

Cordyline terminalis Kunth. (Liliaceae) was collected from the district of Narail during the month of January 2003 in its flowering stage and was identified by the National Herbarium of Bangladesh (accession no. 29752).

Extraction

The collected plant parts (leaves) were washed with water, separated from undesirable materials or plants or plant parts. They were sun-dried for one week after cutting into small pieces and were ground into a fine powder with the help of a suitable grinder (Capacitor start motor, Wuhu motor factory, China). The powder was stored in an airtight container and kept in a cool, dark and dry place until analysis commenced.

About 400 gm of powered material was taken in a clean, flat bottomed glass container (4l) and soaked in 1300 ml of 90% methanol. 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 followed by a filtration through Whatmann filter paper and the filtrate thus obtained was concentrated by using a rotary evaporator (Bibby RE200, Sterilin Ltd., UK) to get the crude methanolic extract. 5 g of this extract was triturated with 100 ml methanol (90%) to prepare a solution of the crude extract. This was used as mother solution which was partitioned off successively by three solvents of different polarity as for example, n-hexane, acetone and chloroform (Rahman, 1994).

Test of antibacterial activity

Antimicrobial activity of the crude extract as well as different solvent fractions were determined by disk diffusion method (Bauer ***et al.***, 1966 and Ahmed ***et al.***, 2001).

Preparation of disks

Three types of disks were used for antibacterial screening.

Sample disks

Sterile filter paper disks (5 mm in diameter) were taken in a blank petridish. 5 µl of sample solution (prepared by dissolving 1 g of the extract in 10 ml of methanol) of the desired concentration (100 $\mu g\mu l^{-1}$) was applied on the disks with the help of a micropipette in an aseptic condition. These discs were left for few minutes in aseptic condition for complete removal of solvent.

Standard disks

These were used as positive control to ensure the activity of standard antibiotic against the test organisms as well as for comparison of the response produced by the known antimicrobial agent with that produced by test samples. In this investigation standard kanamycin (30 $\mu gdisk^{-1}$) disks(Oxoid, U.K.) were used as the reference.

Blank disks

These were used as negative control. They ensure that the residual solvents (left over the disks even after air drying) and the filter paper were not active themselves. 5 µl of methanol was applied on the sterile filter paper disk with the help of a micropipette and left for few minutes for complete removal of solvent.

Preparation of media

14 g dried Nutrient Agar Media (Oxoid, UK) was dissolved in 500 ml of distilled water and a clear medium was obtained by thorough shaking and heating in a water bath. The media was then sterilized in an autoclave at a temperature of 121°c and pressure of 15 $lbs.sq\text{-}inch^{-1}$ for 20 min.

Selection of the test organisms

Following bacteria were used as test organisms for the antibacterial activity test (Table 1).

Table 1: List of bacteria used for the test

Staphylococcus aureus	*Shigella boydii*
Staphylococcus epidermis	*Shigella dysenteriae*
Streptococcus pyogenes	*Shigella flexneri*
Escherichia coli	*Vibrio cholerae*
Salmonella typhi	

Preparation of the seeded test plates

16 ml of the sterilized medium was poured to each (sterilized) test tubes aseptically, under laminar air hood. Each of the test organisms was transferred from the subculture to the test tube with the help of the sterilized inoculating loop at 45°C under laminar air hood. The test tubes were shaken by rotation to get a uniform suspension of organisms. The bacterial suspensions were immediately transferred to the sterile petri-dishes and the petri-dishes were rotated several times, first clockwise and then anticlockwise, to assure homogeneous distribution of the test organisms to give a uniform layer of depth of approximately 4 mm. After the medium became cooled to room temperature, it was stored in a refrigerator (4°C) for 2 h.

Table 2: Antibacterial activity of methanolic extract of *C. terminalis*

Bacteria	Zone of inhibition (mm)	
	Methanol Extract 500 µgdisk^{-1}	Kanamycin (30 µgdisk^{-1})
Staphylococcus aureus	--	30
Staphylococcus epidermis	12	32
Streptococcus pyogenes	13	40
Escherichia coli	12	39
Salmonella typhi	9	30
Shigella boydii	14	38
Shigella dysenteriae	8	34
Shigella flexneri	8	31
Vibrio cholerae	--	30

Table 3: Antibacterial activity of different solvent extracts of *C. terminalis*

Bacteria	Zone of inhibition (mm)			
	500 µg disk $^{-1}$			30 µg disk $^{-1}$
	n-Haxane fractions	Acetone extract	Chloroform extract	Kanamycin
Staphylococcus aureus	--	--	--	30
Staphylococcus epidermis	7	6	7	32
Streptococcus pyogenes	7	8	7	40
Escherichia coli	8	6	6	39
Salmonella typhi	9	--	--	30
Shigella boydii	8	6	7	38
Shigella dysenteriae	9	--	6	34
Shigella flexneri	--	--	--	31
Vibrio cholerae	--	--	--	30

(--): No inhibition

All of the three disks(sample, standard and blank) were then placed in the seeded test plates using sterile transfer loop for antibacterial screening . The plates were then kept at 4-8°C facilitating maximum diffusion. The plates are then kept in an incubator at 37°C for 12-18 h to allow the growth of bacteria. The experiments were carried out more than twice and the mean of the reading were recorded.

Results and Discussion

The methanolic extract of ***C. terminalis*** showed a moderate antibacterial activity against ***Escherichia coli***(zone of inhibition 12 mm), ***Shigella boydii*** (14mm), ***Staphylococcus epidermis***(12 mm) and ***Streptococcus pyogenes*** (13 mm) (Table 2). As it showed a moderate activity against ***E. coli and S. boydii*** and mild activity against ***S. boydii, S. dysenteriae and S. flexneri***, the results support the traditional use of this plant as a remedy of diarrhoea, dysentery and systemic shigellosis. Table 3 shows the result of antibacterial activity of different solvent fractions of ***C. terminalis***. The n-hexane soluble fraction showed a mild antibacterial activity against ***E. coli*** (8 mm),

Salmonella typhi (9 mm), ***S. boydii*** (8 mm) and ***S. dysenteriae*** (9 mm) that also support its traditional use. The acetone and chloroform fraction did not show any significant antibacterial activity.

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