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ORIGINAL ARTICLE

ANTIMICROBIAL ACTIVITY OF GLANDULAR FRUIT OF *MALLOTUS PHILIPPENSIS*

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ABSTRACT

The acetone extracts of fruits of an ethnomedicinal plant, *Mallotus philippensis* (Lam.) Muell. Arg., (Euphorbiaceae) was tested for *in vitro* antimicrobial healing activity against various human pathogens by Well diffusion method. The results showed significant concentration dependent antimicrobial activity against both gram-positve and gram-negative bacteria and also against fungi. These activities may be caused due to the presence of various bioactive molecules present in the glandular fruit. It revealed the medicinal potential of acetone extract to develop novel antimicrobial agents against various diseases caused by these microorganisms.

Keywords: *Mallotus philippensis*, fruit, antimicrobial activity, drug development

1.INDRODUCTION

Nature has been a source of medicinal agents for thousands of years and an impressive number of modern drugs have been isolated from natural sources, many based on their use in traditional medicine (Cragg and Newman, 2001). About 80% of the world population relies on Traditional Medicine for their primary health care needs (Farnsworth and Soejarto, 1991; Pei, 2001; WHO, 2002; Robinson and Zhang, 2011). A total of 122 biomolecules have been isolated from 94 species of plants and 80% of these compounds were used for the same (or related) ethnomedicinal purposes (Fabricant and Farnsworth, 2004). Because these compounds are derived from only 94 species of plants, there should be an abundance of drugs yet to be discovered in other plants.

The genus *Mallotus* Lour., (Euphorbiaceae) comprises of about 150 species in the world, of which 20 species has been reported from India (Santapau and Henry 1973) and 11 species with 2 varieties were reported from Tamil Nadu state (Henry *et al*., 1987). An Indian ethnomedicinal plant, *Mallotus philippensis* (Lam.) Muell. Arg., var. *tomentosus* Gamble locally known as *Kaatusiruvembupatchilai*, *Kaatuthakadipatchilai* has been used medicinally in South India. Ethnomedicinally, the whole plant is used for hand and leg pain, hydration, throat pain, while leaves and flowers are used for blood discharge, gastric complaints, piles rheumatism, and fruits for piles by the Kani tribals of Tamil Nadu (Viswanathan et al., 2004). After the scrutiny of the published literature, no work has been reported on this selected plant. Hence in the present study, an effort was undertaken to carry out the antimicrobial activity of the acetone extracts and its isolated compound rottlerin of glandular fruits of this plant against various human pathogens.

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2. MATERIALS AND METHODS

Plant Material and Preparation of the Extracts

The fruits of *M. philippensis* (Lam.) Muell, Arg. (Euphorbiaceae) were collected from the Tirunelveli hills, Tamil Nadu, its botanical identity was confirmed by the second author and the herbarium specimen was prepared for future reference. The fruit glands were dissolved in acetone by cold percolation method and thus acetone extracts prepared were collected and distilled off on a water bath at atmospheric pressure and the last traces of the solvents were removed *in vacuo*. These extracts were used for antimicrobial activity in various doses such as 100, 50, 25 and 12.5mg/ml concentrations respectively.

Antimicrobial activity

Test organisms

All the microbial strains of human pathogens were assigned from Institute of Microbial Technology (IMTECH), Chandigarh. These microorganisms include the gram-

positive bacteria, viz *Bacillus subtilis* (MTCC 441), *Staphylococcus aureus* (MTCC 96) and *Streptococcus pneumoniae* (MTCC 655), gram-negative bacteria such as *Escherichia coli* (MTCC 724), *Pseudomonas aeruginosa* (MTCC 741), *Salmonella typhi* (MTCC 733), *Vibrio parahaemolyticus* (MTCC 451) and fungi *Candida albicans* (MTCC 227) respectively.

Agar well-diffusion method

Agar well-diffusion method (Perez et al. 1990) was used to determine the antimicrobial activity. Mueller-Hinton Agar (MHA) and Sabouraud Dextrose Agar (SDA) (Hi-Media, Mumbai) were used respectively for testing the antibacterial and antifungal activities. MHA and SDA plates were swabbed (sterile cotton swabs) with 8 h old - broth culture of respective bacteria and fungi. Four wells (10mm diameter) were made in each of these plates using sterile cork borer. About 0.3 ml of different concentrations of plant extracts were added using sterilized dropping pipettes into the wells and allowed to diffuse at room temperature for 2 h. Control experiments comprising inoculums without plant extract were set up. Respective solvents were used as control. The plates were incubated at 37°C for 18-24 h for bacterial pathogens and 28°C for fungal pathogens. Diameter of the inhibition zones was recorded. Triplicates were maintained and the experiment was repeated thrice and the average values were recorded.

3. RESULTS

Antimicrobial activity of acetone extract of *M. philippensis* was given in the Table 1. In the present study, concentration dependent activity was observed against all the tested microorgansims. The zone of inhibition recorded was ranged from 12 to 25mm against gram-positive bacteria, 12 to 25mm against gram-negative bacteria and 12 to 21mm against fungi at various concentrations. In *B. subtilis*, maximum zone of inhibition was recorded as 24mm at 100 mg/ml concentration, moderate zone of inhibition was recorded as 22mm at 50mg and 22mm at 25mg/ml and minimum zone of inhibition was recorded as 14mm at 12.5mg/ml concentration respectively. In *S. aureus*, maximum zone of inhibition was recorded as 25mm at 100 mg/ml concentration, moderate zone of inhibition was recorded as 23mm at 50mg and 20mm at 25mg/ml and minimum zone of inhibition was recorded as 11mm at 12.5mg/ml concentration respectively. In *S. pneumoniae*, maximum zone of inhibition was recorded as 23mm at 100 mg/ml concentration, moderate zone of inhibition was recorded as 21mm at 50mg and 17mm at 25mg/ml and minimum zone of inhibition was recorded as 12mm at 12.5mg/ml concentration respectively. In *E.coli*, maximum zone of inhibition was recorded as 21mm at 100 mg/ml concentration, moderate zone of inhibition was recorded as 19mm at 50mg and 16mm at 25mg/ml and minimum zone of inhibition was recorded as 12mm at 12.5mg/ml concentration respectively. In *P. aeruginosa*, maximum zone of inhibition was recorded as 22mm at 100 mg/ml concentration, moderate zone of inhibition was recorded as 19mm at 50mg and 17mm at 25mg/ml and minimum zone of inhibition was recorded as 14mm at 12.5mg/ml concentration respectively. In *S. typhi*, maximum zone of inhibition was recorded as 25mm at 100 mg/ml concentration, moderate zone of inhibition was recorded as 22mm at 50mg and 17mm at 25mg/ml and minimum zone of inhibition was recorded as 13mm at 12.5mg/ml concentration respectively. In *V. parahaemolyticus*, maximum zone of inhibition was recorded as 24mm at 100 mg/ml concentration, moderate zone of inhibition was recorded as 21mm at 50mg and 15mm at 25mg/ml and minimum zone of inhibition was recorded as 12mm at 12.5mg/ml concentration respectively. In *C. albicans*, maximum zone of inhibition was recorded as 21mm at 100 mg/ml concentration, moderate zone of inhibition was recorded as 17mm at 50mg and 14mm at 25mg/ml and minimum zone of inhibition was recorded as 12mm at 12.5mg/ml concentration respectively.

Table 1. Antimicrobial activity of glandular fruits.

Microorganisms	Acetone extract (mg/ml)				Standard (mg/ml)
	100	50	25	12.5	
Gram-positive bacteria					
B. subtilis	24	22	20	14	33 (K)
S. aureus	25	23	20	11	34 (M)
S. pneumoniae	23	21	17	12	33 (Cf)
Gram-negative bacteria					
E. coli	21	19	16	12	34 (K)
P. aeruginosa	22	19	17	14	32 (Tr)
S. typhi	25	22	17	13	33 (K)
V.parahaemolyticus	24	21	15	12	32 (Cf)
Fungi					
C. albicans	21	17	14	12	31 (Kt)

(Measurement indicates the zone of inhibition in mm)
*Cf - Ciprofloxacin; K - Kanamycin; Kt – Ketonazole ; M - Methicillin ; Tr - Trimethoprim; zone of inhibition measured in mm

4. DISCUSSION

Acetone extract of fruit glands showed maximum zone of inhibition against all the tested bacteria and fungi. Thus the present findings revealed significant antimicrobial activity of glandular fruit extracts against both gram-positve and gram-negative bacteria and also against fungi. These activities may be caused due to the presence of various bioactive molecules present in the glandular fruit. To prove this, earlier reports shows the presence of various compounds such as complex flavonoids (Furusawa et al., 2005), isoprenylated flavonoids (Barron and Ibrahim, 1996), triterpenoids (Mahato and Sen, 1997), Kamalachalcones A and B (Tanaka et al., 1998) from the glandular hairs which may be responsible for this antibiotic actions. It revealed the medicinal potential of acetone extract to develop novel antimicrobial agents against various diseases caused by these microorganisms. In addition, the present study tends to validate the traditional claim of various ethnobotanical uses of the test plant against wounds (Dhar et al., 1968), skin diseases (Karuppasamy, 2007) by different tribals in India.

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