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## The antimicrobial activities of crude methanolic extracts of *Basella alba* on selected microorganisms

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### ABSTRACT

The antimicrobial effects of *Basella alba* against *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli*, and *Candida albican* was determined using the agar cup plate method. The phytochemical components of the crude methanolic extracts of the leaf and stem of *B. alba* indicates the presence of tannin, terpene, steroid, saponin, anthraquinone, and with carbohydrate only in the stem extracts. The result of this study showed that all the organisms except *Candida albican* were susceptible to 60mg/ml and 100mg/ml. The minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) were also determined. The result obtained showed that the MIC for the crude methanolic extract of the leaf and stem extract of *P. aeruginosa*, *E. coli* and *S. aureus* was 50mg/ml, while the MBC was 50mg/ml for *P. aeruginosa*, *E. coli* and for *S. aureus* was 100mg/ml. The result of this study suggests that the crude methanolic extracts of *B. alba* could be suitable for the treatment of diseases caused by *S. aureus*, *P.aeruginosa* and *E.coli*.

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### KEYWORDS

*Basella alba*;  
Antimicrobial;  
Phytochemical;  
Methanolic extract;  
MIC;  
MBC.

### INTRODUCTION

*Basella alba* belongs to the family *Basellaceae*, a fast growing vegetable, native to tropical Asia, probably originating from India or Indonesia and extremely heat tolerant. It is commonly known as Malabar, Ceylon, East-Indian, Surinam and Chinese spinach<sup>[1,3]</sup>. The Yoruba natives calls it "amunututu"<sup>[5]</sup>, and the Akwa-Ibom natives of Nigeria calls it "Atameme"<sup>[4]</sup>. Of more than twenty leafy vegetables consumed in South-Western Nigeria, there are several reports on routine cultivation on only eight. Fewer than six are actually grown for commercial purpose, while some others like *Basella* grow wild and are under-explored<sup>[33]</sup>. The paste of root

of red *B. alba* along with rice washed water is taken in the morning in empty stomach for one month to cure irregular periods by the rural people of Orissa, India. Leaves of *B. alba* is used for the treatment of hypertension by Nigerians in Lagos, and malaria in Cameroonians folk medicine<sup>[32]</sup>. It is high in vitamin A, vitamin C, vitamin B9 (folic acid), calcium, magnesium and several vital anti-oxidants. It is low in calories by volume and high in protein per calorie. In addition, the cooked roots and leaves have been reported to be used in the treatment of diarrhoea and as laxative, respectively. The flowers are used as an antidote for poisons<sup>[1]</sup>. It is administered in gonorrhoea and balanitis. The mucilaginous liquid obtained from the leaves and tender stalks

of this plant is a popular remedy for habitual headaches. The flowers are used as an antidote to poisons and also as diuretic and febrifuge. A paste of the root is applied to swellings and is also used as a rubefacient, leaf juice is used in Nepal to treat catarrh and is applied externally to treat boils<sup>[3]</sup>. It is also a safe aperient for pregnant women and its decoction has been used to alleviate labour. Moreover, it is locally reported to be used in the treatment of anaemia<sup>[1]</sup>. A red dye is obtained from the juice of the fruits. It has been used as rouge and also as a dye for official seals<sup>[31]</sup>.

Plants provide the possibility of an alternative strategy in exploration for new drugs<sup>[16]</sup>. Infectious diseases, which account for the significant proportion of the health problems, are most often catered for by this system of medicine<sup>[21]</sup>. Herbal drug analyses the part or parts of a plant used for the preparation of herbal and traditional medicines (for examples: leaves, flowers, seeds, roots, barks, stems, etc.)<sup>[14]</sup>. The progressing failure of chemotherapeutics and resistance to antibiotics exhibited by pathogenic microbial infectious agents has led to the screening of several medicinal plants for their potential antimicrobial activity. Plants constitute many biologically active compounds that possess ability and criteria for development as medicinal agents<sup>[16]</sup>.

The aim and objectives of this study is to determine the phytochemical components of the methanolic extracts of the leaf and stem of *B. alba*, to determine the antimicrobial spectrum of the methanolic extracts of the leaf and stem of *B. alba* on *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli*, and *Candida albicans*, and also to determine the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of the crude extracts on the above test organisms.

## MATERIALS AND METHODS

### Collection and preparation of samples

Fresh plants of *Basella alba* were collected from the environs of Ilorin town, Kwara State, Nigeria. The leaves were separated from their stems and were air-dried for five weeks in microbiology laboratory of Federal University of Technology, Minna. The dried materials were blended using sterilized electric blender and well packaged for subsequent analysis.

### Collection of specimen

Pure cultures of *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Escherichia coli*, and *Candida albicans* were obtained from microbiology laboratory of Federal University of Technology, Minna, Niger State and were subcultured in agar slants.

### Phytochemical screening of the extracts

Then the screening of the plant extract was carried out according to the method described by Odebiyi and Sofowora (1978) and Trease and Evans (1989) for the purpose of detecting active components like glycosides, tannin, alkaloid, terpene, steroids, phenolics, saponins, anthraquinone, carbohydrate, and flavonoids.

### Extraction of materials

Methanol was used as solvents for the extraction of the plant materials using reflux extraction method by suspending 50g of blended sample in 400ml of 98% methanol for 3hours. The extracts were filtered and the solvent was evaporated using a steam bath at 60°C.

### Antimicrobial susceptibility test

The susceptibility test of the test organisms to extracts of *Basella alba* at concentrations of 100mg/ml, 60mg/ml, and 40mg/ml was carried out using agar cup plate technique as described by Silver *et al.* (1997). Nutrient agar was prepared according to the standard concentration and autoclave at 121°C for 15 minutes. It was then poured on to plates and allowed to solidify after which wells were made on the agar media using a sterile cup borer. Standardized inoculum of each test organisms was spread on to agar plates so as to achieve a confluent growth. Different concentration of the extract was introduced into the wells equidistant from one another. The plates were then incubated at 37°C for 24 hours.

### Determination of minimum inhibitory concentration (MIC)

The minimum inhibitory concentration (MIC) of the test organisms was determined using the tube dilution technique. Nine millilitre (9mls) of the nutrient broth was pipetted into various test tubes containing concentrations of 100mg/ml, and 50mg/ml of the extract. The overnight culture of the test organisms diluted at 10<sup>6</sup>cfu/ml was added to the test tubes and then incubated at

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37°C for 24 hours. The least concentration of the extract that did not indicate any visible growth of the incubated organisms in broth culture was taken as the minimum inhibitory concentration (MIC)<sup>[7]</sup>.

### RESULT

#### Phytochemical screening of the extracts

TABLE 1 shows the phytochemical screening of the crude Methanolic extracts of *Basella alba*. The result indicates the presence of tannin, terpene, steroids, saponins, anthraquinone, in the leaf and stem extracts of the plant, while carbohydrate is present only in stem.

**TABLE 1 : Phytochemical components of the crude methanolic extracts of *Basella alba***

Phytochemical component	Leaf extracts	Stem extracts
Glycosides	-	-
Tannin	+	+
Alkaloid	-	-
Terpene	+	+
Steroids	+	+
Phenolics	-	-
Saponins	+	+
Anthraquinone	+	+
Carbohydrate	-	+
Flavonoids	-	-

Key : + = present; = absent

#### Antimicrobial activities of the extracts

TABLE 2 shows the antimicrobial profile of methanolic extracts of *Basella alba* at different concentrations (mg/ml). At all the concentrations examined, methanolic extracts of *B. alba* did not show any antimicrobial activity against *C. albicans*. At 40mg/ml concentration, there were no antimicrobial activities of the leaf and stem of *B. alba* on the test organisms

**TABLE 2 : Antimicrobial activity of methanolic extracts of *Basella alba***

Test organisms	40mg/ml		60mg/ml		100mg/ml		20mg/ml
	Leaf	Stem	Leaf	Stem	Leaf	stem	Control
<i>P. aeruginosa</i>	0	0	4	6	13	17	19
<i>E. coli</i>	0	0	5	7	14	13	22
<i>S. aureus</i>	0	0	5	4	11	8	24
<i>C. albicans</i>	0	0	0	0	0	0	14

Control: ciprofloxacin (bacteria) and fusin (fungi)

#### Minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of the extract

TABLE 3 shows the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of the test organisms on the crude extract of *Basella alba*. The MIC and MBC were 50mg/ml for *P. aeruginosa* and *E. coli* of extracts of both the leaf and stem. MIC of *S. aureus* shows MIC and MBC of 50mg/ml and 100mg/ml for the leaf and stem respectively.

**TABLE 3 : The minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of the crude extracts of *Basella alba***

Test organisms	Leaf		Stem	
	MIC (mg/ml)	MBC (mg/ml)	MIC (mg/ml)	MBC (mg/ml)
<i>P. aeruginosa</i>	50	50	50	50
<i>E. coli</i>	50	50	50	50
<i>S. aureus</i>	50	100	50	100

### DISCUSSION

The phytochemical component of the crude extracts of *Basella alba* leaf and stem revealed the presence of tannin, terpene, steroid, saponin, and anthraquinone, but stem extracts only contains carbohydrates. The result of this study supports the previous work with an exception of the presence of flavonoids and phenolic compounds<sup>[5]</sup> and the absence of saponin and anthraquinone<sup>[3]</sup>. The antimicrobial activity showed that *P. aeruginosa*, *E. coli* and *S. aureus* were susceptible to 60mg/ml and 100mg/ml concentration of the extract except *C. albicans*. The presence of these phytochemicals may be responsible for the antibacterial potency of *B. alba* extracts<sup>[3]</sup>. The minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of *P. aeruginosa*, and *E. coli* were 50mg/ml, while MIC for *S. aureus* is 50mg/ml of the leaf and stem and MBC of 100mg/ml. The result of this study showed that *P. aeruginosa*, *E. coli* and *S. aureus* were susceptible to the crude methanolic extract of leaf and stem of *Basella alba* which is in support of the study of Yasmin *et al.*, 2009 and Sushila, *et al.*, (2010).

The result of this study suggests that the crude methanolic extracts of *B. alba* could be suitable for the treatment of diseases caused by *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Escherichia coli*.

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