

**ANTIBACTERIAL ACTIVITY OF Khaya Senegalensis  
(MADACCI) ON RESPIRATORY TRACT PATHOGENS  
BY**

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**ABSTRACT**

Crude extracts of the leaves and the stemback of Khaya Senegalensis were investigated for invitro antibacteria activities against respiratory tract pathogens, using disc diffusion method. The tested organism were Klebsiella Pneumoniae, Staphylococcus aureus, Pseudomonas Aeruginosa, Streptococcus Pneumoniae and Sterptococcus Phogenes, isolated from patients with respiratory tract infections attending the Specialist Hospital, Sokoto. Extracts were obtained by boiling at 100c and at room temperature (35c) using sterile distilled water. The extract produced measurable zones of inhibitions of 10m 30m as seen with the boiled extracts while less inhibition zones are observed (2mm-19mm) with the unboiled extracts. These results indicated that both the leaves and stemback of Khaya Senegalensis contain a potent antibacterial principles that may be active both in the acute and chronic forms of respiratory tract infections.

**INTRODUCTION:**

Khaya senegalensis is a tree that most of the African homes particularly Nigeria use as a medicinal plant (Newsome, 1991; McNeely, 1990; Lewis, 1981). khaya senegalensis is a tall evergreen tree of 15m-30m high and upto 3m in diameter (Dwama *et al*, 1978). It has a clean dark grey back with small, thin reddish tinged scalc. It has a dark pink to bright crimson slash exuding a bitter sap (Margaret, 1966 and Sandberg, 1979). The tree is commonly found distributed over some parts of African Countries such as Nigeria, Ghana, Sudan, and republic of Benin (Maurice, 1993).

Many researches have been carried out in different parts of the wold on different tree species by many researchers and have been confirmed to be effective in one way or the other on various disorders in man and animals (Walter and Memory, 1977), Abayomi, 1981). Other studies in Nigeria carried out include that of Gbodi and Irobi (1992) in which crude extracts of Aspergillus Oaurdrilineatus was investigated and found to have antifungal activities. Similarly infusion of the stemback of Blighia unjugata are said to be used by traditional healers in Nigeria in the treatment of diarrhoea and other stomach disorders and certain venereal diseases (Obasi and Igboechi, 1992). Aspergillus quadrilineatus was investigated and found to have antifungal activities. Upon all these researches carried out on different medicinal plants, Khaya Senegalensis has been found to be effective only in treating stomach disorder in Nigeria and other parts of African Countries (Newsome, 1991). Little or no effort has been made to try this plant on the treatment of respiratory tract infections associated with pathogenic bacterial activities.

Respiratory tract pathogens are the major cause of mortality and morbidity throughout the world and, more so in African Countries (Newsome 1991). The impact of these pathogens has been found to be more common in Nigeria. This is because the cost of living is very high with the result that more people are malnourished. Due to poverty most people are unable to afford the conventional treatment for the infections.

Although most of these infections are responsive to chemotherapy, resistance is always encountered which could be attributed to under dose or underuse by the patients during the course of administration (Cruckshank, 1975 and Lacey, 1984). In view of this reason and the increasing high cost charges of orthodox medication, there is need for further search for an alternative therapy that might be inexpensive, quick and readily available and efficacious against the pathogenic bacteria of the respiratory tract patient (Gbodi and Irobi, 1992). The aim of this study is to evaluate the possibility of substituting conventional drugs used in the treatment of respiratory tract infections caused by pathogenic bacteria with the traditional medicinal plants which if successful, will be within the reach of resource-poor rural populace and possibly reduce the emergence of the resistant strains of the bacteria.

### MATERIALS AND METHODS

The plant material was collected from the Science and Agriculture Complex premises of Usman Danfodiyo University, Sokoto and was identified as Khaya Senegalensis both by the Departments of Forestry and Botany of the Science and Agricultural Complex. The parts of the plant collected are the leaves and stem bark.

The test organisms used for the antibacterial activity screening were isolates obtained from Specialist Hospital. The isolates were identified according to the procedures of Cowan (1974) as: Staphylococcus aureus, Streptococcus Pneumoniae, Pseudomonas aeruginosa, Klebsiella Pneumoniae and Streptococcus Pyogenes. The methods employed in the analysis and sensitivity testing was according to the altered procedures of Muhammed (1990), Abdul (1990), and Aboiyami and Sofowora (1979).

### PLANT PROCESSING AND EXTRACTION

The parts of the plant were sundried and ground to powder. Different weights were measured as 1g, 2g, 5g, and 10g. The portions were dissolved in sterile distilled water. Some portions of the leaves and stem bark were left at room temperature and later filtered using a funnel clogged with cotton wool. The other portions were boiled repeatedly until a well concentrated solution was obtained.

### DISC PREPARATION

From No.1 Whatman filter paper, discs of 6mm diameter were made using a paper puncher. The paper discs were sterilized using hot air oven and later dissolved in the boiled and unboiled extracts of both the leaves and stem bark. The preparation was allowed to stand for 2 hours. The discs were then air dried.

### MEDIA

The media used in this analysis was the Mueller-Hilton agar (Oxoid) and broth (MHB).



## BIOASSAY PROCEDURE

Disc diffusion method was employed according to Lacey (1984) and Aishatu (1994). Approximately 0.1ml of  $10^5$  cFU/ml of the bacterial strains was used as standard inoculum throughout the experiments. The paper discs were then seeded on the agar plates. The inhibitory activity of the plant extract was noted after incubation at 37°C for 24-48 hours.

## RESULTS AND DISCUSSION

The results obtained from the antibacterial activities of the boiled stem bark and leaves extracts of Khaya Senegalensis on the respiratory tract pathogens are shown in tables 1 and 2. Analysis of variance carried out indicated no significant difference. However, coefficient of variation indicated differences between the results. A general trend was observed as a result of increasing in activity of the extract as the concentration increases from 1g to 10g.

The antibacterial activities of the unboiled stem bark and leaves are shown in table 3 and 4. Analysis of variance indicated no significant difference, while coefficient of variation showed that the activities of the extracts and their relative concentrations are directly proportional.

In general, the results of the boiled extracts of leaves and stem bark tended to have a greater antibacterial activities than in the unboiled forms. This is because certain chemicals present in the extracts are better extracted using heat, which complies with a work carried out by Muhammed (1990) in which he reported that the extracts of a night shade plant (Atropa belladonna) was better extracted using heat. The unboiled extracts of the leaves and stem bark showed lower activity. This could be attributed to the fact that most of the chemical contents of the plant materials are not well extracted due principally to lack of heating.

Concentrations at which activities were most effective in the boiled extracts when coefficient of variation was done are the 10g concentration for both stem bark and leaves. Coeff. of var. of 3.68% and 3.94% was recorded for stem bark and leaves respectively, while 6.55% and 5.46% were recorded for the former and the latter accordingly. It can therefore be said that leaves have more activities than stem bark in both high and low temperatures. This is because in some plants, the site of synthesis of active chemicals is the photosynthetic site (leaves and green parts). Such chemicals produced are translocated to the Stem bark where they get conjugated with the other chemicals (Manske, 1950).

Organisms mostly affected in this research by the stem bark extracts include : Pseudomonas aeruginosa, staphylococcus aureus and streptococcus pyogenes having the zones of inhibition of 23.50mm, 20.75mm and 19.5mm respectively. Similar trend was observed with the boiled extracts of leaves, in which case organisms mostly affected are : pseudomonas aeruginosa, streptococcus pyogenes and klebsiella pneumonia with p aeruginosa being mostly affected followed by spygenes and k pneumoniae. The unboiled extracts of both the leaves and stem bark only affected S pyogenes, S. pneumoniae and S aureus.

In conclusion, the results obtained from this work showed that a higher concentrations (10g), stem bark and leaves of Khaya Senegalensis possesses sufficient antibacterial activities and that the activity is higher when portions are extracted using high temperature. The broad spectrum antibacterial activity provides the basis for the

use of the stem bark and leaves. for the treatment of bacteria of the respiratory infections. The plant certainly deserves further investigations.

**TABLE 1** Antibacterial activity of *Khaya senegalensis* Stem bark extracts at 100°C

Test organism	Zone of inhibition at different weights mm			
	1g	2g	5g	10g
<i>Klebsiella pneumoniae</i>	10	16	20	27
<i>Staphylococcus aureus</i>	11	15	20	28
<i>Pseudomonas aeruginosa</i>	12	18	23	30
<i>Streptococcus pneumoniae</i>	10	16	22	29
<i>Streptococcus pyogenes</i>	10.5	17	22.5	29
Total	53.5	82	107.5	143
Mean	10.7	16.4	21.5	28.6
S. D	0.83	1.14	1.14	1.14
C. V	7.75%	6.95%	6.55%	3.98%

S. D = Standard deviation  
 C. D = Coefficient of variation

**TABLE 2** Antibacterial activity of *Khaya senegalensis* leaves at 100°C

Test organism	Zone of inhibition at different weights in mm			
	1g	2g	5g	10g
<i>Klebsiella pneumoniae</i>	10	15	21	28
<i>Staphylococcus aureus</i>	11	15	20	27
<i>Pseudomonas aeruginosa</i>	10.5	18	23	30
<i>Streptococcus pneumoniae</i>	9	16	21	29
<i>Streptococcus pyogenes</i>	10	14	19	28
Total	50.5	78	104	142
Mean	10.1	15.6	20.8	28.4
S. D	0.74	1.51	1.48	1.12
C. V	7.33%	9.68%	7.12%	3.94%



**TABLE 3** Antibacterial activity of *Khaya senegalensis* stem bark at room temperature (35°C)

Test organism	Zone of inhibition at different weights in mm			
	1g	2g	5g	10g
<i>Klebsiella pneumoniae</i>	2	5.5	9	17
<i>Staphylococcus aureus</i>	2.5	7	9.5	17
<i>Pseudomonas aeruginosa</i>	2	6	9.5	16
<i>Streptococcus pneumoniae</i>	3.5	7	11	18
<i>Streptococcus pyogenes</i>	3	8	11	19
Total	13	33.5	50	87
Mean	2.6	6.7	10	17.4
S. D	0.58	0.97	0.94	1.14
C. V	2.31%	14.48%	9.4%	6.55%

**TABLE 4** Antibacterial activity of *Khaya senegalensis* leaves at room temperature (35°C)

Test organism	Zone of inhibition at different weights mm			
	1g	2g	5g	10g
<i>Klebsiella pneumoniae</i>	2	4	9	16
<i>Staphylococcus aureus</i>	1.5	4	9	14
<i>Pseudomonas aeruginosa</i>	2.5	6	9.5	15
<i>Streptococcus pneumoniae</i>	2	6	10	15
<i>Streptococcus pyogenes</i>	3	7	11	16
Total	11	27	48.5	76
Mean	2.2	5.4	9.7	15.2
S. D	0.57	1.34	0.83	0.83
C. V	25.90%	24.81%	8.55%	5.46%

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