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Identification of Phenolic Acids and Free Phenols of the Stem Barks *Parkia Biglobosa* (JACQ.) Mimosaceae

Comparative study of the activity of the total and hydroalcoholic extracts with that of the Gentamicin against pathogenic bacteria

By

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Résumé

Le screening chimique des écorces de tronc de Parkia biglobosa a montré leur richesse en composés polyphénoliques. L'extraction de ces composés polyphénoliques à l'éthanol a été suivie de l'identification des acides phénoliques et phénols libres par chromatographie sur papier. Les extraits aqueux et éthanoliques se sont avérés actifs contre un certain nombre de bactéries pathogènes. La gentamicine s'est avérée de loin plus active que les extraits éthanolique et aqueux sur toutes les bactéries pathogènes testées.

Summary

The chemical screening of the stem bark of Parkia Biglobosa has shown that they are rich in polyphenolic compounds. The extraction of these compounds with ethanol was followed by the identification of phenolic acids and free phenols using paper chromatography. The aqueous and ethanolic extracts were proven active against a number of pathogenic bacteria. The gentamicin was found far more active than the ethanolic and the aqueous extracts against the tested pathogenic bacteria.

Key words: *Parkia Biglobosa*, polyphenolic compounds, paper chromatography, pathogenic bacteria.

Introduction

Parkia Biglobosa is a savana tree utilised in traditional medicine for the treatment of many infectious diseases such as violent stomach aches, diarrhoea, bronchitis, pneumoniae, tracheitis, dental caries, skin diseases, leprosy and against guinea worms. It is also used in the treatment of infertility, oedema, rickets (1, 2). The seeds are used for the treatment of arterial hypertension (3).

In view to produce standardised, efficient and more affordable drugs from natural products we have conducted comparative tests with the total extract (exactly the extract used in traditional medicine), the ethanolic extract and the gentamicin which is used in modern medicine and has a very broad spectrum of antimicrobial activity (4).

Materials and Methods

The barks of the stem wood were collected from Abuja area, allowed to dry at the natural temperature and was finely grounded. The powder was kept in a dry place for analysis.

For the chemical screening, the extraction of the chemical compounds was done using a soxhlet extractor with solvents of increasing polarities (chloroform< ethanol < water). Compounds were identified in the different fractions. The total extract was obtained by decoction, after 5 minutes from the boiling point and filtered using Whatman No. 1 paper. The ethanolic extract was obtained with ethanol 30% after the powder was defatted with petroleum ether and soaked for 18 hours. The phenolic compounds were extracted with boiling ethanol 70%. The ethanolic extract obtained was subjected to acid hydrolysis. Then petroleum ether was used to remove phenolic acids and free phenols.

The phenolic acids and free phenols were identified through unidimensional and bidimensional chromatographs and the R_f compared to a table of references (5).

— Solvent system used for unidimensional chromatography:
Butanol – Acetic acid – Water (4 : 1 : 5)

— Solvent system used for bidimensional chromatography:
System 1: Acetic acid – Chloroform 1 : 9)
System 2: Acetic acid – Toluene (9: 11)

The ethanolic extract, aqueous extract obtained and gentamicin were tested against *Salmonella typhi, Salmonella paratyphi, Klebsiella pneumoniae, Staphylococcus aureus, Vibrio cholera, Shigella dysenteriae, Proteus sp, Pseudomonas aeruginosa* using the same concentration. The agar diffusion method was used for the antimicrobial activity (6). Ethanol 30% and water were used as control.

Results

The chemical screening has shown that the stem barks are rich in polyphenolic compounds, in sterols and triterpenes. They did not contain alkaloids.

The results obtained from unidimensional and bidimensional chromatographies are shown in Tables 1 and 2 respectively.

Table 1

Rf	Phenolic acids and free phenols
91%	Coumaric acid
84%	Scopoletin
79%	Esculetin

Table2

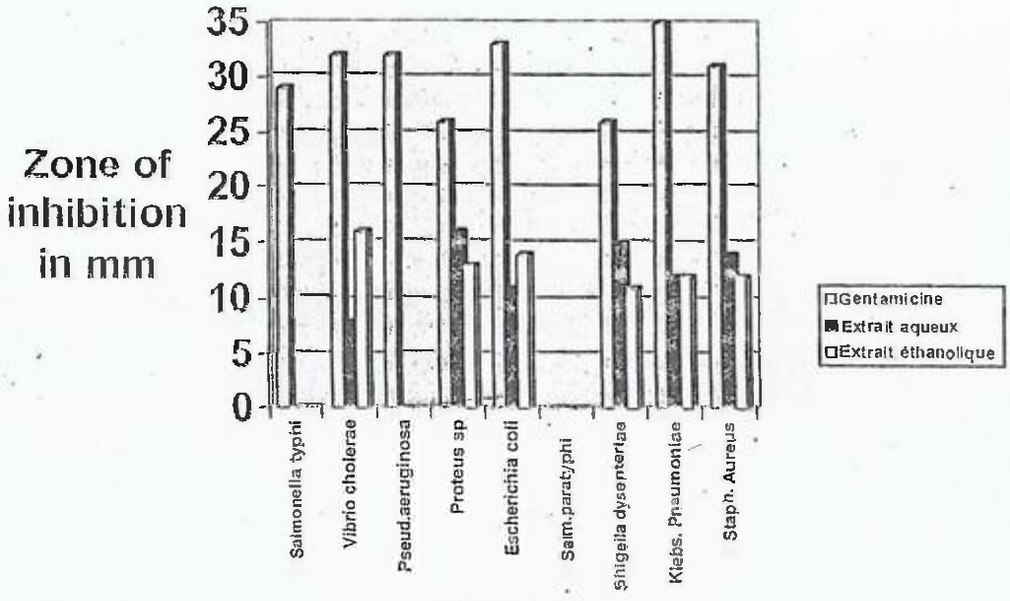
Rf	Phenolic acids and free phenols
80%	Hydroxybenzoic acid
48%	Phloroglucinol
25%	Non identified spot
24%	Pyrogallol

The results obtained from the microbiology studies are shown in Table 3.

Table3

Zone inhib. mm / Microorg.	Gentamicin 5mg/ml	Aqueous extract 5mg/ml	Ethanol extract 5mg/ml
Salmonella typhi	29±0.05	0(R)	0(R)
Vibrio cholerae	32±0.01	8±0.2	16±0.2
Pseud. Aeruginosa	32±0.1	0(R)	0(R)
Proteus sp	26±0.09	16±0.2	13±0.08
Escherichia coli	33±0.1	11±0.05	14±0.1
Salm Paratyphi	34±0.0	0(R)	0(R)
Shigella dysenteriae	26±0.06	15±0.1	11±0.3
Klebs. Pneumoniae	35±0.3	12±0.05	12±0.05
Staph. Aureus	31±0.2	14±0.3	12±00

R= resistant



Discussion

The results show that at the same concentration, 5mg/ml, the gentamicin is far more active than the aqueous and ethanolic extracts on the different microorganisms tested.

The aqueous extract is active against *Staphylococcus aureus, Proteus, Shigella dysenteriae* and *Klebsiella pneumoniae,* justifying the use of the decoction in traditional medicine for the treatment of infections caused by these microorganisms.

The aqueous extract is more active than that of ethanol against *Staphylococcus aureus, Proteus* and *Shigella dysenteriae.* On the other hand, the ethanolic extract, richer in polyphenolic compounds has a more inhibitory activity on *Eschericha coli,* causing violent stomachaches in infants and also on *Vibrio cholerae,* responsible for cholera.

Salmonella paratyphi, Salmonella typhi and *Pseudomonas aeruginosa* all showed resistance to the aqueous and hydroalcoholic extracts.

On *Klebsiella pneumoniae,* both aqueous and ethanolic extracts have inhibitory effect.

Conclusion

The stem barks of *Parkia Biglobosa,* used as a decoction by traditional healers for the treatment of many infectious diseases have been tested efficient against a number of microorganisms, especially, *Staphylococcus aureus, Proteus sp* and *Shigella dysenteriae.*

The ethanolic extract is more active against *E. coli* and *V. cholerae* than the aqueous extract, probably because it contains more polyphenolics than the aqueous extract. The gentamicin is far more active than both aqueous and ethanolic extracts against the number of microorganisms but remains a very costly drug, not always available and with many undesirable side effects.

The results obtained with the natural extracts (aqueous and ethanolic) are worthy of interest and would be followed up in subsequent research works.

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