



Short Communication

Afr. J. Traditional,
Complementary and
Alternative Medicines
www.africanethnomedicines.net

ISSN 0189-6016©2006

STUDY OF THE ANTIBACTERIAL ACTIVITY OF THE STEM BARK AND LEAF EXTRACTS OF *PARKIA BIGLOBOSA* (JACQ.) BENTH. ON *STAPHYLOCOCCUS AUREUS*

¹Millogo-Kone H., ²Guissou I.P., ³Nacoulma O., ³Traore A. S.

¹Centre National de la Recherche Scientifique et Technologique(CNRST)– Institut de Recherche en Sciences de la Santé (IRSS) – Département Médecine et Pharmacopée Traditionnelles – Pharmacie (MEPHATRA/PH)- 03 B.P. 7192 – Ouagadougou 03 - Burkina Faso, ²CNRST – IRSS – MEPHATRA/PH - Université de Ouagadougou – 03 B.P. 7021 Ouagadougou, 03 – Burkina Faso, ³Université de Ouagadougou 03 B.P. 7021 Ouagadougou 03 – Burkina faso

E-mail: hassmillogo@yahoo.com, hmillogo@hotmail.com, **Fax :** 226 50 36 28 38

Tél : 226 - 50 36 33 64 / 50 36 32 15 – 226 - 76 64 91 35

Abstract

The antibacterial activity of the stem bark and the leaves of *Parkia biglobosa* have been tested on four strains of *Staphylococcus aureus* isolated from patients in the National Hospital Yalgado Ouedraogo – Ouagadougou, Burkina Faso. The tests revealed the efficacy of the hydroalcoholic and the aqueous extracts. They also revealed that the hydroalcoholic extracts were more active than the aqueous extract prescribed by the traditional healers and that the hydroalcoholic extract of the leaves were as active as the bark. The effects of the extracts have been compared to that of the gentamicin, a positive control. The phytochemical screening showed that the extracts of the stem bark were rich in sterols, a triterpenes, tannins, saponosides, anthocyanidins, coumarins, flavonoids and reducing compounds. The leaves extracts were rich in tannins, coumarins, anthocyanins, flavones and reducing compounds.

Key words: *Staphylococcus aureus*, *Parkia biglobosa*, antibacterial activity

Introduction

Staphylococcus aureus is a Gram positive spherical cell. Staphylococci are members of the normal flora of the human skin, respiratory and gastrointestinal tracts. There are at least 30 species of *Staphylococcus*. Three main species of the genus *staphylococcus* are proved to have clinical importance. They are: *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Staphylococcus saprophyticus*. They can cause food poisoning, wound infection, endocarditis, hematogenous osteomyelitis, meningitis, pulmonary infection (pneumonia.) The prototype of a staphylococcal lesion

is the furuncle or other localized abscess. The pathogenic staphylococci often hemolyze blood, coagulate plasma, produce a variety of extracellular enzymes and toxins. Many antimicrobial drugs have some effects against staphylococcus *in vitro*. However, staphylococci have rapidly developed resistance to many antimicrobial drugs and present difficult therapeutic problems (Javwetz et al, 1998).

In modern medicine, the most treatments used are :erythromycin, gentamicin, rifampicin, vancomycin. According to Kerharo (1973), Maydell (1983), Nacoulma (1996), Arbonnier (2002), in local traditional pharmacopoeia, stem bark of *Parkia biglobosa* were successfully used in the treatment of many infectious diseases: violent stomachaches, diarrhoea, pneumonia, bronchitis, severe cough, tracheitis, wounds, dental caries, conjunctivitis, amebiasis, otitis, dermatosis, sexually transmitted diseases. The barks were also active against emorrhoids, bilharziose, leprosis, ankylosis, jaundice, hypertension etc. All parts of *Parkia biglobosa* have medicinal uses : the seeds, the pulp, the exocarpus of the pods, the stem bark, the leaves and the root. The leaves are used against piles, amoebiasis, bronchitis, cough, burn, zoster, abcess, and combined with the roots they are active against dental caires, conjunctivitis.

To ameliorate the recipe of the traditional healers and to protect our environment we have conducted some antimicrobial tests on staphylococci isolated from patients in hospitals and compared these effects with that of gentamicin.

Materials and Methods

Stem bark of *Parkia biglobosa* were collected on May, 2003 at Yako, Central Area of Burkina Faso. The extracts were obtained by decoction (recipe of the traditional healer) and boiling ethanol 70% (J.B. Haborne, 1973). Solvents of increasing polarities (chloroform, ethanol and water) were used for the phytochemical screening. The antimicrobial tests were conducted on four strains of staphylococci , isolated from pus and blood obtained from patients. The tests were also conducted with the gentamicin. Sex and age were not taken into account. The antimicrobial activity was determined by the agar – well diffusion method (Perez et al, 1990).

Results

The results are shown in Table 1. Table 1 showed that the stem bark contain sterols and triterpenes, polyphenolic compounds including tanins, flavonoids, coumarins, anthocyanidins and also saponosides and reducing sugars. The leaves also are rich in tannins, reducing compounds, anthocyanins and flavonones.

Antimicrobial tests

The antibacterial tests conducted on the four strains gave the results shown in Figure 1. The diameter of the inhibition zone obtained with the gentamicin is 31 ± 0.2 mm.

Discussion

The results provided in Table I indicated that the bark extracts were richer in sterols and triterpenes, anthracenosides, saponosides than the leaves. They also show that the

leaves are richer in tannins, coumarins and flavonones than the stem bark. The leaves and bark were tested negative for the alkaloids. For the standardization of the samples, we have determined the concentration in equivalent tannic acid.

Table 1: Phytochemical screening of the barks and of the leaves

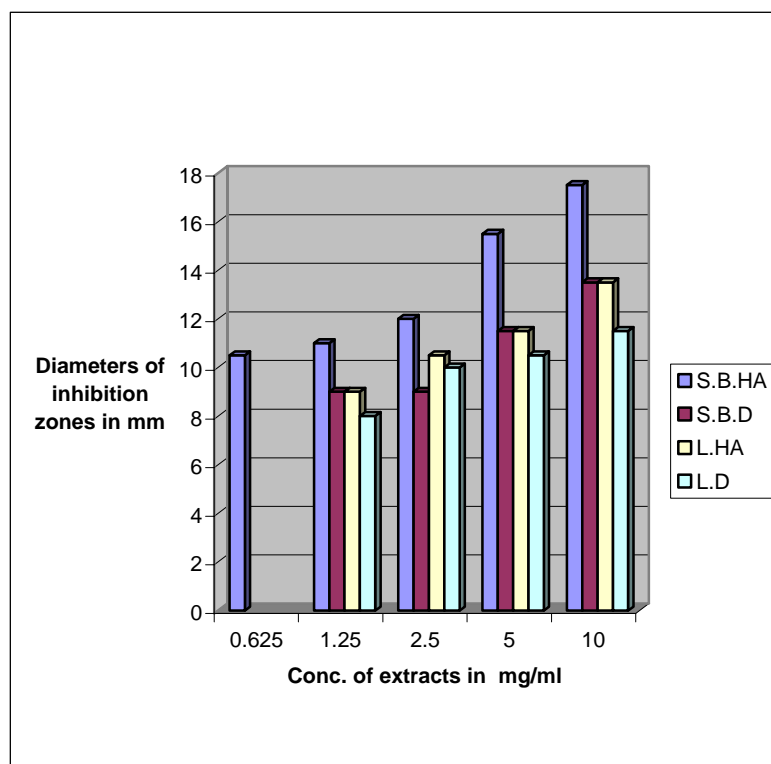
Solvents of increasing polarity	Chemical compounds	Stem bark	Leaves
Chloroform (CHCl ₃)	Sterols and triterpens	+++	±
	Emodols	-	-
	Alkaloids	-	-
	Coumarins	+	++
	Flavonones	±	+++
	Anthocyanins	+++	+++
Ethanol – Water (EtOH– H ₂ O – 70:30)	Reducing compounds	+++	+++
	Tannins	++	+++
	Anthracenosides	+	±
	Saponosides	+++	++
	Alkaloids	-	-

- : absent
- ++ : abundant
- + : present
- +++ : very abundant
- ± : traces
- stem bark : 0.35 ± 0.02 % eq. tannic acid
- leaves : 0.56 ± 0.04 % eq. tannic acid

The results confirmed the fact that the leaves contain more tannins than the bark. Sterols and triterpens, tannins and saponosides are very well known for their antimicrobial activity.

Ajaiyeoba (2002) in her phytochemical study of the leaves of *Parkia biglobosa* (Jacq.) Benth. and *Parkia bicolor*, two species of *Parkia* growing in Nigeria, had shown that they were very rich in tannins and contain traces of sterols thus confirming our results. She also found that they contain alkaloids but no saponin glycosides and no anthraquinones, contrary to our results. Our antibacterial results showed that the hydroalcoholic extract of the stem bark was more active than the decoction as prescribed by the traditional healer, in accordance with results we obtained when working on a sample collected from Abuja, Central area of Nigeria. (Millogo et al, 2001). Even at 625µg/ml the hydroalcoholic extract has an effect on *Staph. Aureus*. All the tested extracts were active at as low as 1.25mg/ml. The results also showed that the decoction of the leaves were less active than all the other extracts. But more important is the fact that the leaves become as active as the bark when extracted with aqueous ethanol . Ajaiyeoba had tested the extracts of the leaves in serial dilutions of 12.5 mg/ml and 25 mg/ml and did not notice any antibacterial activity. It was only at 100 mg/ml that some antibacterial activity on *Staphylococcus aureus* with ethyl acetate, ethanol and water was observed and with all these solvents the diameter of the zones of inhibition ranged between 8 to 12 mm. These results have confirmed our observation when working on a sample collected in the West of Burkina Faso where only the bark of *Parkia biglobosa* were used at a high concentration to clean the wounds, and the only use of the leaves is

to treat the piles. The differences between our results and those of Ajaiyeoba in phytochemical composition as well as antibacterial activity could be explained by the intra-specific and inter-specific variation of the plants.



S.B.HA = Stem barks hydroalcoholic extract
 S.B.D = Stem barks decoction
 L.HA = Leaves hydroalcoholic extract
 L.D = Leaves decoction

Figure 1 : Antimicrobial activity of the leaves and the stem barks of *Parkia biglobosa* on *Staphylococcus aureus*

Conclusion

The stem bark of *Parkia biglobosa* (Jacq.) Benth are very active against *Staphylococcus aureus*. The results show that the leaves, when extracted with aqueous ethanol, become much active and as potent as the decoction of the stem bark prescribed by the traditional healers. To protect our environment and its biodiversity, we would advise the use of the leaves instead of the bark, the removal of which traumatizes the tree if it does not kill it.

Acknowledgements

The following are hereby acknowledged: Prof Ouattara Abou, Laboratory of Microbiology and his personnel - C.R.S.B.A.N. – University of Ouagadougou –

Burkina faso, Prof H.A.B. COKER, Dean of the Department of Pharmaceutical Chemistry and his personnel, College of Pharmacy, Lagos University Teaching Hospital (LUTH), NIGERIA, the Department of Pharmaceutical Chemistry - Nigerian Institute of Pharmaceutical Research and Development (N.I.P.R.D.), Abuja, NIGERIA

References

1. Ajaiyeoba, E. (2002). Phytochemical and antibacterial properties of *Parkia biglobosa* and *Parkia bicolor* leaf extracts, *Afr.J.Biomed. Res.* **5**: 125-129.
2. Arbonnier, M. (2000). Arbres, arbustes et lianes des zones sèches d'Afrique de l'Ouest, 392, 574p.
3. Corrado T., Carmela S., Onofrio D.L. (2000). Bioactive constituents of the bark of *Parkia biglobosa*, *Fitotherapia* **71**: 118-125
4. Brooks G. F., Butel J. S., Morse S. A. (1998). *Medical Microbiology*, McGraw-Hill Companies, **21**, 740p.
5. Maydell, H.J.von (1981).- Arbres et arbustes du Sahel : leurs caractérisations et leurs Utilisations, 312-315, 531p.
6. Millogo, H. (2000). Etude pharmacochimique et antibactérienne des extraits d'écorces de *Parkia biglobosa* (Jacq.)Benth. (Mimosacées) : évaluation comparée de l'activité des extraits totaux et hydroalcooliques versus gentamicine vis-à-vis de germes pathogènes, *Sciences et Techniques*, **24** : 97-103
7. Millogo H., Guissou I.P., Idika N., Adepoju-Bello A., Coker H.A.B. and Agomo P.U. (2001). Identification of phenolic acids and free phenols of the stem barks of *Parkia biglobosa* (Jacq.) Benth., *West African J. Pharm.*, **15** :74 – 76.
8. Nacoulma O. (1996). Plantes médicinales et pratiques médicales traditionnelles au B.F. Cas du Plateau Central, **2** : 179-180, 254p.