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Full Length Research Paper

Antibacterial properties of *Uvaria chamae, Congronema latifolium, Garcinia kola, Vemonia amygdalina* and *Aframomium melegueta*

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The antimicrobial efficacy of cold and hot water and ethanol extracts of *Garcinia kola, Congronema latifolium, Aframomium melegueta, Vemonia amygdalina* and *Uvaria chamae* on *Staphylococcus aureus, Streptococcus pyogenes, Escherichia coli, Salmonella typhi, Pseudomonas aeruginosa* and *Vibrio* spp. were determined using well in agar diffusion technique. Cold and hot water extracts of *G. kola* and *U. chamae* moderately inhibited the growth of *S. aureus* and *S. pyogenes* with zone of inhibition of between 9 – 15 mm. *V. amygdalina, G. kola* and *C. latifolium* slightly inhibited *S. pyogenes* and *E. coli* with a zone of clearing of between 7 -13 mm. Cold or hot ethanol extracts of *U. chamae, G. kola* and *V. amygdalina* profoundly inhibited the growth of *S. aureus, S. pyogenes, E. coli* and *S. typhi* to about 13 to 21 mm. Also ethanol extract of *C. latifolium* inhibited the growth of *S. aureus, S. pyogenes* and *E. coli* with zone size between 13 to 20 mm. While *P. aeruginosa* was slightly inhibited by ethanol extracts of *G. kola, A. melegueta* and *U. chamae.* Soxhlet extracts of *U. chamae, G. kola, V. amygdalina* and *C. latifolium* profoundly inhibited the growth of *S. aureus, S. pyogenes, E. coli* and *S. typhi* with zone of inhibition ranging from 13 – 22 mm. *Vibro* spp. were not inhibited by the cold and hot extract as well as soxhlet extracts of all the plants tested. The standard microorganisms, *E. coli* NCTC 10418 and *S. aureus* NCTC 6571, were moderately inhibited by the various test plant extracts with zones of inhibition ranging between 8 mm to 20 mm. This study reveals the antibacterial potentials of these plants.

Key words: Antibacterial potential, plant extracts, traditional medicine.

INTRODUCTION

Traditional medicine is the most ancient art of medical practice (Soforowa, 1986). Thus the use of medicinal plants in disease treatment and prevention can also be seen as prehistoric and their present use can be supported by the traditional optimization of their application in related disease control as reported by Trease and Evans (1983). Medicinal uses of plants range from the administration of the roots, barks, stems, leaves and seeds to the use of extracts and decoctions from the plants (Soforowa, 1982; Nwanguma, 1999; Ogbulie et al., 2004). The high patronage of this system of health care delivery could be as a result of some factors, such as availability, efficacy and the increasing abuse of orthodox drugs including antibiotics.

Many diseases have been handled traditionally and these include diarrhoea, dysentery, flatulence, malaria, infantile convulsion, tonsillitis, bacterial and fungal infections and worm infestation (Soforowa, 1986; Ogueke et al 2006). Interest in plant extracts exhibiting antimicrobials and pharmacological applications have been on the increase recently. Also several reports on this subject have been published (Pamplona-Roger, 1999; Soforowa, 1996, Ntiejumokwu and Alemika, 1991; Ntiejumokwu and Kolawole, 1991). There is currently hardly any newspaper in Nigeria that does not have a column on herbal reme-

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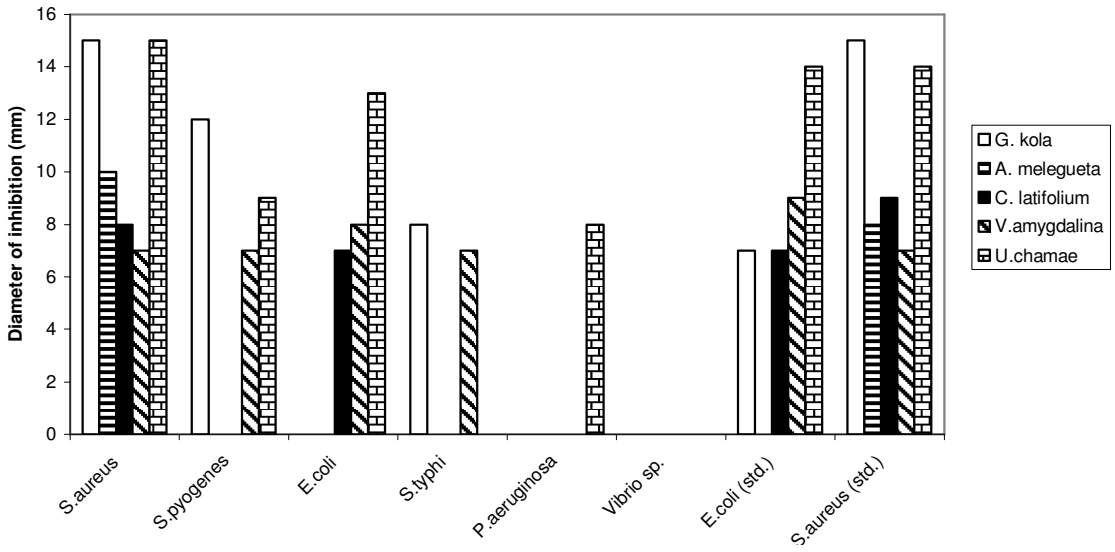

Figure 1. Mean values of the activity of cold water extracts of the test plants on bacterial isolates.

dies t least once in a week.

Many plants are constantly being screened for their analgesic, anaesthetic, antibiotic and anticancer properties. By carrying out scientific research on these plants to ascertain, validate and verify their potentials, traditional medicine will be documented so that acquired knowledge is not completely lost (Nwaogu, 1997). Usually the isolation of the bioactive agents involves searching for the compounds or physiological effects they produce (Obi and Onuoha, 2000). Consequently, this study was designed to ascertain the antibacterial effects of *Uvaria chamae, Congronema latifolium* (utazi), *Garcinia kola* (bitter kola), *Vemonia amygdalina* (bitter leaf) and *Aframomium melegueta* (aligator pepper) on *Staphylococcus aureus, Streptococcus pyogenes, Escherichia coli*, *Salmonella typhi, Pseudomonas aeruginosa* and *Vibrio* spp.

MATERIALS AND METHODS

Extraction of plant samples

Fresh leaves of *V. amygdalina, C. latifolium, U. chamae* and seeds of *G. kola and A. melegueta* were collected from Dimagu Ideato South about 28 km North of Owerri, the capital of Imo State, Nigeria. The leaves were air dried and separately ground to powder using sterilized manual grinder. The seeds were crushed using sterile mortar. These processed samples were stored in airtight glass containers protected from direct light and heat until needed for analysis. Cold and hot extractions with water and ethanol and soxhlet extraction with ethanol (99%) as described by Obi and Onuoha (2000) and by AOAC (1980) were adopted for the study. The extracts were evaporated to dryness and the dry extracts stored in 'air tight' amber coloured bottles. A concentration 100 µg/ml of each of the dry plant extracts were freshly prepared for each sensitivity test by dissolving the extracts in sterile distilled water (Ntiejumokwu and Onwukaeme 1991; Ogbulie et al., 2004).

Assay for antibacterial properties

The bacterial isolates; *S. aureus, S. pyogenes, P. aeruginosa, E. coli*, *S. typhi* and *Vibrio* spp. were obtained from the Microbiology laboratory of Federal Medical Centre, Owerri. These isolates were re-identified and subcultured on Nutrient agar slants and stored at 4°C until required for the study. Also standard *E. coli* NCTC 10418 and *S. aureus* NCTC 6571 were collected and used as control. The well in agar diffusion method as described by Ntiejumokwu and Alemika (1991) and Ogueke et al. (2006) was used to evaluate the antibacterial activities of the extracts. The plates were incubated at 37°C for 24 – 48 h. Zones of clearing were measured at the end of the incubation.

RESULTS

The results below reveal the effect of cold and hot water, and ethanol and soxhlet extracts of *G. kola, U. chamae, A. melegueta, C. latifolium* and *V. amygdalina* on test hospital and standard bacterial isolates. Figure 1 shows the effect of cold-water extracts on the various bacterial isolates and the standard bacterial isolates. *G. kola* and *U. chamae* moderately inhibited the growth of *S. aureus* and *S. pyogenes.* Hot water extracts of these plants had the same effect on the isolates and the standard microorganism (Figure 2). *S. pyogenes* and *E. coli* were slightly inhibited by *V. amygdalina, G. kola* and *C. latifolium.* The cold and hot ethanol extracts of *U. chamae, G. kola* and *V. amygdalina* profoundly inhibited *S. aureus, S. pyogenes E. coli* and *S. typhi* (Figures 3 and 4) with zones of inhibition ranging from 13 – 21 mm. *C. latifolium* also moderately inhibited *S. aureus, S. pyogenes* and *E. coli* with zones of inhibition between 13 to 20 mm. *G. kola. A, melegueta* and *U. chamae* slightly inhibited the growth of *P. aeruginosa* with zones of inhibition between 9 to 16 mm. The standard *S. aureus* NCTC 6571 isolate was moderately inhibited by *G. kola,*

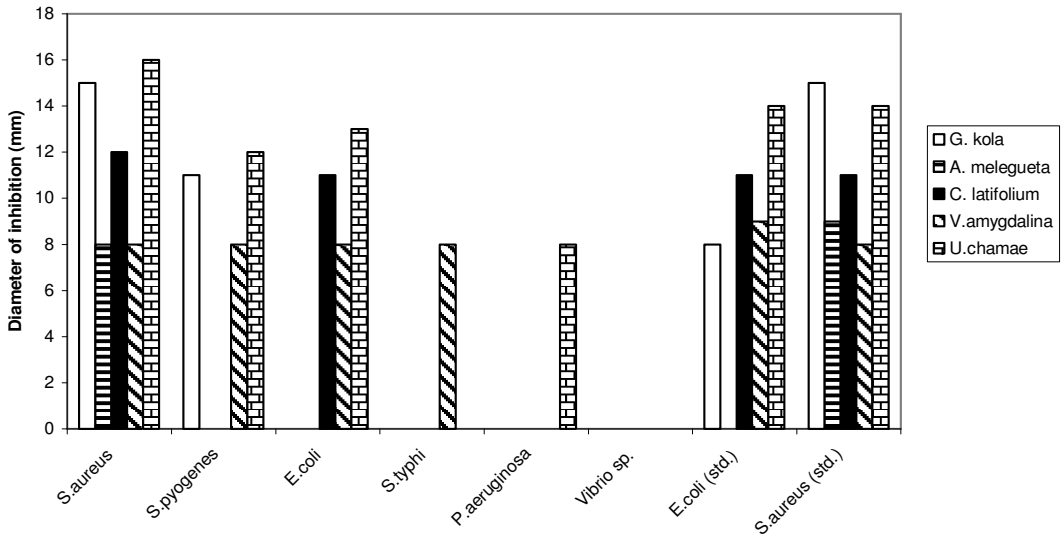

Figure 2. Mean values of the activity of hot water extracts of the test plants on bacterial isolates.

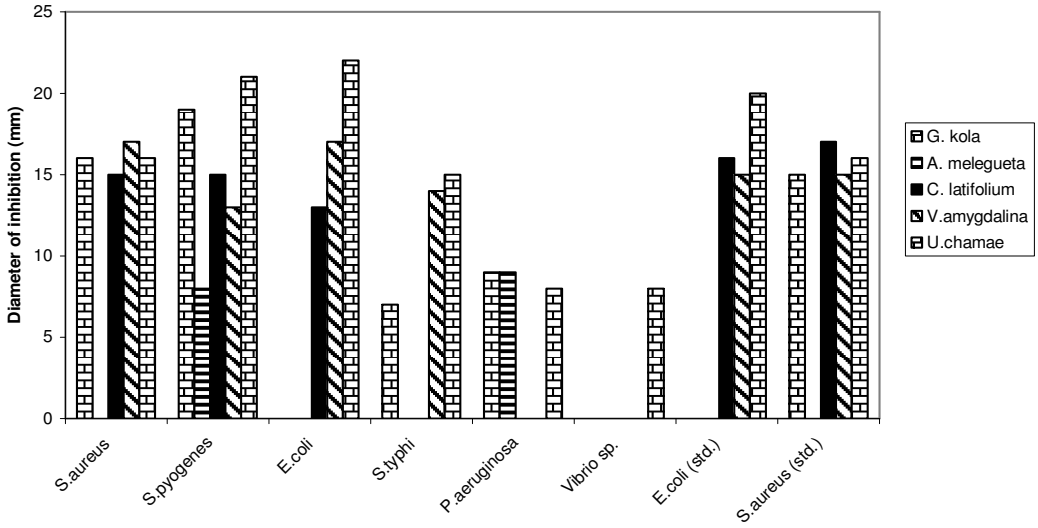

Figure 3. Mean values of the activity of cold ethanol extracts of the test plants on bacterial isolates.

U chamae, V. amygda-lina and *C. latifolium.* The zones of inhibition ranged from 15 to 22 mm while the standard *E. coli* NCTC 10418 isolate was moderately inhibited by all the plant extracts except *G. kola.*

Soxhlet extracts of some of the plants inhibited the growth of *S. aureus, S. pyogenes, E. coli*, *S. typhi* and the standard microorganisms (Figure 5). *U. chamae* gave zone diameters ranging from 16 to 22 mm; *V. amygdalina* produce zones between 13 and 18 mm; *C. latifolium* produced zones from 8 to 18 mm while *G. kola* ranged from 9 to 21 mm. *S. aureus* NCTC 6571 was inhibited by all plant extracts (except *A. melegueta*) with zone diameters between 17 and 20 mm. *E. coli* NCTC 10418 was also inhibited by all plant extracts except *A. melegueta.* The zones of inhibition ranged from 7 to 18 mm. *A. melegueta* extract did not inhibit any of the test isolates. *G. kola* and *A. melegueta* extracts had no effect on *S. typhi* while *A. melegueta, C. latifolium* and *V. amygdalina* did not inhibit *P. aeruginoS. Vibrio* spp.was not inhibited by the cold and hot extracts, as well as soxhlet extracts of all the plants examined.

DISCUSSION

The results obtained from this study indicate that the cold, hot and soxhlet extracts of *G. kola, C. latifolium, V. amygdalina* and *U. chamae* inhibited the growth of the

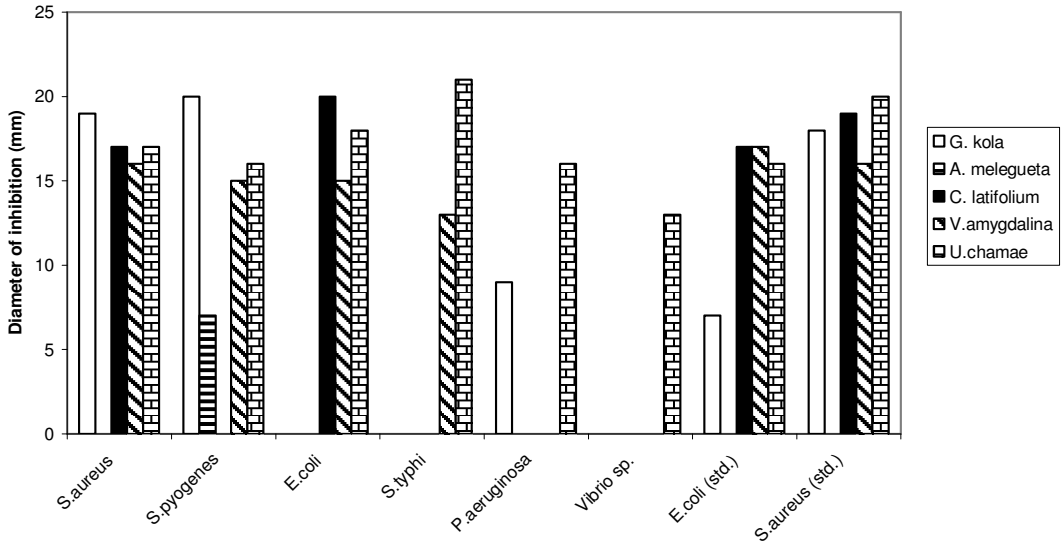

Figure 4. Mean values of the activity of hot ethanol extracts of the test plants on bacterial isolates.

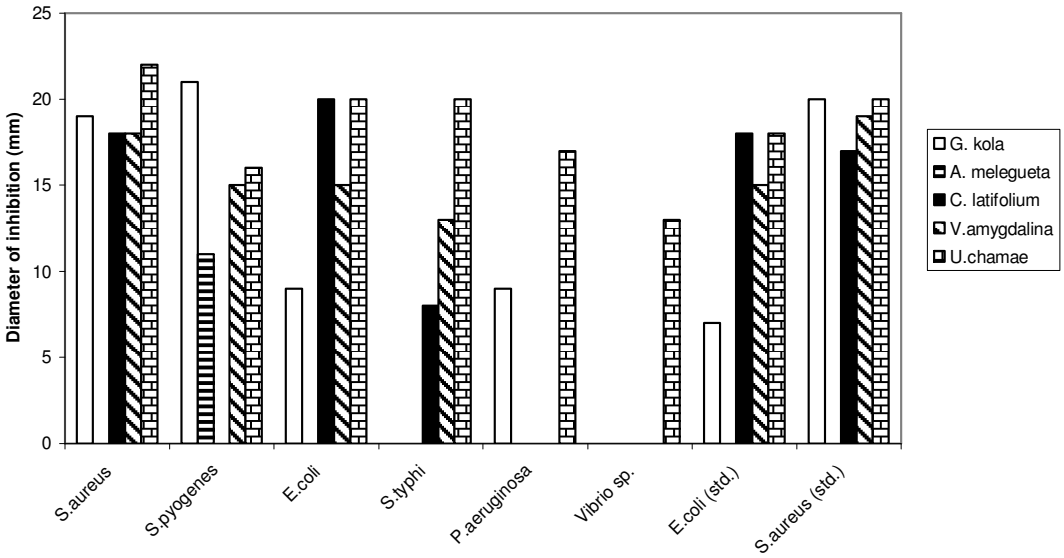

Figure 5. Mean values of the activity of soxhlet extracts of the test plants on bacterial isolates.

test isolates and the standard organisms. This indicates that the plants contain active principles that can inhibit the growth of some microorganisms. These results support their traditional use by herbalists and individuals in the treatment of various ailments. For example, *G. kola* is used in the treatment of cough and sore throat (Nwanguma, 1999). These infections are usually associated with those organisms found in the respiratory tract. *C. latifolium* and *V. amygdalina* are also used in the treatment of gastrointestinal tract infections, enteritis and other non-bacterial health problems such as diabetes (Adetunji, 1999, Nwanguma, 1999). The results of this study also indicate that ethanol is a better solvent than water in the extraction of the active principles of these plants, with the soxhlet extraction method being the best. This corroborates the reports of Obi and Onuoha (2000) and Ogueke et al., (2006) that ethanol is the best solvent for the extraction of most plant active principles of medicinal importance.

The high inhibition of the test isolates and standard organisms shown by *U. chamae* and to a lesser extent *V. amygdalina* and *C. latifolium* is not surprising as they have been listed amongst the traditional medicinal plants commonly used in West Africa (Akewele, 1990; Iwu, 1993; Anderson, 1996). Addae-Kyereme et al. (2001) reported that the alkaloids pleiocarpine, kopsmine, pleiocar-

panine, eburnamine and pleiomutinine are present in *U. chamae.* These may be responsible for the high antibacterial activity recorded in this study. Since more alkaloids and essential oils are extracted with alcohol than water (Soforowa, 1995; Tumwesigy, 1996; Burkill, 1995; Obi and Onuoha, 2000; Ogbulie et al., 2004), it may be possible that the antibacterial effects observed with the ethanol extracts of *V. amygdalina, C. latifolium* and *G. kola* may be due to the presence of alkaloids and other essential oils.

The results also indicate that *A. melegueta* has no antibacterial effect on the isolates showing that it does not contain any active principle against these organisms. *Vibrio* spp. was not affected by all the plant extracts, except *U. chamae.* This may be that the organism is resistant to the active principles present in the extracts. The observed inhibition of *S. typhi* by cold ethanol extracts of *G. kola* and not the hot ethanol and soxhlet extracts of the same plant shows that the active principle responsible for the antibacterial effect may be volatile and may have been lost during heating of the extraction solvent. Since the various extraction methods have varying effects on the active principles of these plants further studies should be directed towards characterizing them and thus determining the best strategy to be adopted in their extraction and administration.

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