Antidiarrhoeal Activities of Some Medicinal Plants

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Abstract

The phytochemical screening, extraction and antimicrobial analysis of the crude extracts from the seeds and pods of *Acacia nilotica* Linn, the roots of *Uvaria afzelii* Sc and *Terminalia avicennioides* Guill & Perr were carried out using standard methods. The results of the phytochemical screening of the plants contained saponins, flavonoids, phenols, tannins, terpenoids and triterpenoids. The results of the antibacterial screening showed that the ethyl acetate extract of *Acacia nilotica* Linn exhibited the highest activities against the test microbes with zones of inhibition diameter ranging from 27-32 mm. It was closely followed by the ethyl acetate extract of *Terminalia avicennioides* with zones of inhibition diameter ranging from 25-30 mm and finally, the ethyl acetate extract of *Uvaria afzelii* with zones of inhibition ranging from 24-29 mm. The results of Minimum Inhibitory Concentration (MIC) showed that the extracts of the plants gave MIC values at a concentration of 800, 700, 600 µg/cm³ against *Escherichia coli*, *Vibro cholerea*, *Shigella dysentriae* and *Salmonella enteritidis* respectively. The Minimum Bactericidal Concentration (MBC) values occur at the same concentration against the same microbes. The results of this study showed that the ethylacetate extract of the seeds and pods of *Acacia nilotica* was the most active against diarrhoea causing organisms and may be a potential source of a broad spectrum antibiotic for the treatment of diarrhoea.

Keywords: Antidiarrheal; Medicinal plants; Phytochemical screening

Introduction

Over 75-80% of the world’s population in developed and developing countries depends on herbal medicines derived from medicinal plants for their health care [1]. Herbs have medicinal property due to presence of different active principles like alkaloids, volatile essential oils, glycosides, resins, oleoresins, steroids, tannins, terpenes and phenols found them [2].

It is against this background that the plants such as *Uvaria afzelii* Sc, *Acacia nilotica* Linn., *Terminalia avicennioides* Guill & Perr and *Fagara zanthoxyloides* Lam which were extensively used as herbal preparation in some parts of Nigeria were investigated. The plants were selected based on their medicinal importance among traditional medicine practitioners in Nigeria. The diarrhoea causing organism commonly found in the affected sites of the patients such as *Staphylococcus aureus*, *Escherichia coli*, *Campylobacter* species, *Clostridium difficile*, *Vibrio species*, *Salmonella enteritidis*, *Salmonella typhi* and *Shigella dysentriae* were used for this study. These plants were used for various ailments throughout Nigeria. For example, *Uvaria afzelii* is used in the treatments of liver problems, pulmonary troubles, naso-pharyngeal infections, food poisoning and venereal diseases [3]. *Acacia nilotica* Linn, is used in the treatments of intestinal pains, diarrhea, nerve stimulant, cold, congestion, coughs, dysentery, fever, hemorrhages, leucorrhea, ophthalmia and sclerosis [4]. And *Terminalia avicennioides* Guill & Perr is used in the treatment of diarrhoea, dysentery, dropsy, swellings, oedema, gout, leprosy, mucosae, verminfuges, skin irritations and as pain killers [5].

Materials and Methods

Sample collection

The plants parts were collected in Kaduna, Zaria and Nasarawa state. It was identified by Dr Aijbade, at the Herbarium of Biological Sciences, Faculty of Science, Nigeria Defence Academy, Kaduna. The seeds and pods of *Acacia nilotica* were collected in Nasarawa state and it has a voucher number of 403. The roots of *Uvaria afzelii* and *Terminalia avicennioides* were collected in Zaria and they have voucher numbers of 405 and 406 respectively. The plant materials were air-dried, pulverized by the use of a wooden mortar and pestle and stored in bags.

**Results**

The results of phytochemical screening of crude extracts of the three plants were presented in Table 1. Table 2 showed the results of

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the antimicrobial test while Tables 3 showed the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) respectively.

**Discussion**

The results of the phytochemical screening of the chloroform, ethylacetate, methanol and petroleum ether extracts of *Uvaria afzelii* Sc, *Acacia nilotica* Linn., *Terminalia avicennioides* Guill & Perr and *Fagara zanthoxyloides* Lam showed that they contain Saponins, flavonoids, phenols, tannins, terpenoids and triterpenoids. These phytoconstituents were synthesized by plants to safeguard themselves against antimicrobial infections [7]. They are known to be effective against diarrhoea caused by *Tripanasome* and *Plasmodium* and possess the ability to initiate human physiological activities such as the stimulation of phagocytic cells and mediation of tumor activities [8]. In addition, the extracts of *Acacia nilotica* also contain Alkaloids and Steroids. This therefore showed that the extracts of this plant could be effective against diarrhea because these phytoconstituents have been reported to have antimicrobial properties due to their ability to form complex with nucleophilic amino acids of the microorganism. These therefore suggested that the extracts of the plants targeted may possess antimicrobial activities against diarrhoea causing microbes.

The results of the antimicrobial screening of the extracts (Table 2) showed that *Acacia nilotica* exhibited the highest activity and possess appreciable antibacterial properties by inhibiting the growth of the test organisms at concentrations of $7 \times 10^{-5} - 8 \times 10^{-3}\mu g/cm^3$. It showed the highest zone of inhibition of 32 mm for the ethylacetate extract against *Streptococcus faecalis*. The MIC showed no colour change on the organisms *Salmonella typhi* and *Campylobacter sp.* (Tables 3). However, most of the plant extracts exhibited moderate activities against the test organisms. From Table 2, *Uvaria afzelii* exhibited zones of inhibition diameter of 26, 25, 27, 29, 26 and 24 mm against *Escherichia coli*, *Vibro...
### Table 2: Results of Antimicrobial sensitivity test of the crude extracts. Zone of inhibition diameter (mm). KEY: NI - No inhibition; C1 - Control 1 (Ciprofloxacin=50 µg/ml); C2 - Control 2 (Fluconazole=50 µg/ml); Ec: *Escherichia coli*; Vc: *Vibro cholera*; Sf: *Streptococcus feacalis*; Sd: *Shigella dysentriae*; St: *Salmonella typhi*; Se: *Salmonella enteritidis*; Cs: *Campylobacter sp.*; Ck: *Candida krusei*.

| Terminalia avicennoides | Chloroform | 4 | NI | NI | NI | NI | NI | NI | NI | 4 | 6 | NI | 7 |
|------------------------|------------|---|----|----|----|----|----|----|----|----|---|---|---|
|                        | Ethylacetate| 4 | NI | NI | NI | NI | NI | NI | 4 | 6 | NI | 7 |
|                        | Methanol   | 4 | 5  | NI | NI | NI | NI | 4  | 6 | NI | 5  | NI |
|                        | Pet-ether  | 4 | NI | NI | NI | NI | NI | NI | 5 | NI | NI | NI |
|                        |            | 6 | NI | 11 | NI | 5  | NI | 9  | NI |
|                        |            | 8 | NI | 13 | NI | 8  | 15 | 11 | 15 |
|                        |            | 10| NI | 19 | NI | 15 | 18 | 17 | 18 |
|                        |            | 21| NI | 20 | NI | 20 | 22 | 19 | 20 |
|                        | C1         | 37| NI | 41 | 42 | 47 | NI | 39 | NI |
|                        | C2         | 37| NI | 41 | 42 | 47 | NI | 39 | NI |
|                        |            | 6 | 11 | NI | 5  | NI | 6  | NI | NI |
|                        |            | 13| NI | 9  | NI | 12 | 10 | 13 |
|                        |            | 13| NI | 18 | NI | 18 | 19 | 18 | 18 |
|                        | C1         | 37| NI | 41 | 42 | 47 | NI | 39 | NI |
|                        | C2         | 37| NI | 41 | 42 | 47 | NI | 39 | NI |
| Uvaria afzelii         | Chloroform | 4 | 7  | 5  | 5  | NI | 6  | 6  | NI | 7  |
|                        | Ethylacetate| 4 | NI | 10 | 7  | NI | 8  | 8  | NI | 5  |
|                        | Methanol   | 4 | NI | 6  | NI | NI | NI | 4  | NI | NI |
|                        | Pet-ether  | 4 | 6  | NI | NI | NI | NI | 4  | NI | NI |
|                        |            | 8 | NI | 8  | NI | NI | 10 | 7  | NI | 11 |
|                        |            | 12| NI | 13 | NI | 13 | 9  | NI | 7  |
|                        |            | 16| NI | 13 | NI | 18 | 12 | NI | 10 |
|                        |            | 22| NI | 19 | NI | 25 | 25 | NI | 12 |
|                        | C1         | 37| NI | 41 | 42 | 47 | NI | 39 | NI |
|                        | C2         | 37| NI | 41 | 42 | 47 | NI | 39 | NI |
Conclusion

The result of the phytochemical screening carried out on *Uvaria afzelii*, *Acacia nilotica*, *Terminalia avicennioides* and *Fagara zanthoxyloides* revealed that the plants contained Saponins, flavonoids, phenols, tannins, terpenoids and triterpenoids. The crude extract from the four plants are found to be very active against *Escherichia coli*, *Streptococcus faecalis*, *Salmonella enteritis* and *Candida krusei* respectively (Table 2). The results of the MIC showed no colour change for *Shigella dysentriae* and *Campylobacter sp*. The lowest concentration where there is no colour change (MIC value), ranges from $6 \times 10^{-5}$ to $7 \times 10^{-6}$ µg/cm² for the extracts. Finally, *Fagara zanthoxyloides* shows the highest zone of inhibition of 26 mm for the ethylacetate extract against *Streptococcus faecalis*. The MIC showed no colour change on the organisms *Salmonella typhi*, *Salmonella enteritidis* and *Candida krusei* respectively (Table 2). The results of the MIC showed no colour change for *Shigella dysentriae* and *Campylobacter sp*. The lowest concentration where there is no colour change (MIC value), ranges from $6 \times 10^{-5}$ to $7 \times 10^{-6}$ µg/cm² for the extracts. Finally, *Fagara zanthoxyloides* shows the highest zone of inhibition of 26 mm for the ethylacetate extract against *Streptococcus faecalis*. The MIC showed no colour change on the organisms *Salmonella typhi*, *Salmonella enteritidis* and *Candida krusei* respectively.

These differences in the activities of the crude extracts could be due to the fact that they contain different types of phytochemicals and antimicrobial activities compared to the ethylacetate extract of the seeds and pods of *Acacia nilotica*. This indicates that the extracts of this plant could be used as broad spectrum antibiotic against diseases caused by the test microbes.

These results also showed that the ethylacetate extract of *Acacia nilotica* Linn was the most active extract and it suggested that the extracts of this plant could be a good source of new antimicrobial compounds as shown by the preliminary results. It was therefore selected for further work, which include isolation and characterization of the phytochemicals responsible for the activity of the plant extract.

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