



Phytochemical Screening and Antimicrobial Activities of n-Hexane and Ethanol Extracts of the Leaves of *Rogeria adenophylla* (J. Gay)

Huraira Mijinyawa^{1*}, Harami M. Adamu², I. Y. Chindo² and Ayim Patrick¹

¹Department of Chemistry, Faculty of Science, Gombe State University, Gombe State, Nigeria.

²Department of Chemistry, Faculty of Science, Abubakar Tafawa Balewa University Bauchi, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Author HM designed the study, performed the statistical analysis, wrote the protocol and first draft of the manuscript. Authors HMA and IYC managed the analyses of the study. Author AP managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aim: In recent times, the increasing microbial resistance to drugs has necessitated the search for alternative antimicrobial agents that are derived from natural sources. *Rogeria adenophylla* is one of such plant that has been reported to possess medicinal properties. This study investigated the antibacterial and antifungal activity of *Rogeria adenophylla* J. Gay and its major phytochemical constituents.

Materials and Methods: The hexane and ethanol extracts from the leaf of the plant were tested for the presence of some phytochemicals. And the extracts were also tested using well diffusion method for their antibacterial activity against *Escherichia coli*, *Shigella sonnei*, and *Salmonella typhi* and anti-fungal activities *Aspergillus niger* and *Blastomyces dermatitidis*.

Results: Preliminary phytochemical analysis showed that both hexane and ethanol leaf extracts contained alkaloids, saponins, and terpenes, only the ethanolic extract has glycosides. The result

revealed that the extracts were active against the microorganisms. The ethanolic extract showed the highest zones of inhibition against tested organisms compared to hexane extract.

Conclusion: The extracts of the plant demonstrated antibacterial activity due to the presence of phytochemical constituents. Therefore, the application of the decoction of leaf of the plant in ethno medicine is justified.

Keywords: Phytochemical; antimicrobials; *Rogeria adenophylla*.

1. INTRODUCTION

From early times, plants and plant products have been the primary source of food, shelter and transport materials, clothing, fragrances, flavors and ingredients of medicinal substances for mankind. It has been reported that a vast majority of the population particularly those living in rural areas largely depend on herbal medicines. The use of herbs in the treatment of diseases and infections began since time immemorial [1]. It has been estimated that up to 90% of the population in developing countries rely on the use of medicinal plants to help meet their primary health care needs [2]. This is true as it was established that diseases have been treated using medicinal plants with high potency and curative effects [3]. In the same vein, diseases that have been managed traditionally using medicinal plant include malaria, epilepsy, infantile convulsion, diarrhea and dysentery, fungal and bacterial infections [4].

Rogeria adenophylla J. Gay of genus *pedalium* and family *pedaliaceae* is a robust herb up to 2.5 meters is found in the dry savannah areas of Mauritania, Senegal, Niger and Nigeria. The common names of the plant include; *kebbe* by the Fulanis, *babarodoo* by the Hausas, *toy* by Serer tribe of Senegal, *genji-lemti* by Songha tribe of Niger and *udogolon* in Kenya [5].

The entire plant affect human digestive system, it could cause constipation. The leaves are used as febrifuge (an antipyretic, which reduce fever). The plant is also use for the treatment of some infections. It is known to be poisonous to non-vertebrae and therefore, used as insecticide. The seed when ground is used for the treatment of breast inflammation and for treatment of wounds and injuries, burns, pains, skin infections and subcutaneous cellular tissue disorders [6]. In another research, *Rogeria adenophylla* J. Gay have larvicidal effect on the larvae of *Aedes aegypti*, the yellow fever mosquito [7]. Additionally, the aerial part of the plant was reported to contain tannins, glycosides, alkaloids and astringent [8].

In spite of the medicinal uses of *Rogeria adenophylla* in herbal medicine for antidiarrheal among other uses in Nigeria, its phytochemical constituents have not been extensively explored and documented. Therefore, this research is aimed at evaluating the constituents of secondary metabolites and hence, their antimicrobial activities so as to justify the medicinal importance of the plant.

2. MATERIALS AND METHODS

2.1 Plant Material

The leaves of *Rogeria adenophylla* were harvested from Dukku local government area of Gombe State. The plant was identified by a botanist in Biological Sciences Department Gombe State University. The leaves after collection were washed with tap water and then distilled water. It was dried at room temperature, ground to powder and then stored in an airtight container.

2.2 Test Organisms

Clinical isolates of *Clostridium difficile*, *Shigella sonnei*, *Streptococcus pneumoniae*, *Salmonella typhi* and *Escherichia coli*, *Aspergillus niger* and *Blastomyces dermatitidis* were obtained from Department of Microbiology of Federal Teaching Hospital Gombe. The pure isolates of each of the test organism were inoculated in sterile slants containing Nutrient agar and transported to the Department of Microbiology GSU and refrigerated at 4°C before use.

2.3 Preparation of Plant Extracts

A mass of 400 g of the fine powder of the plant materials was dissolved in 1000 ml of hexane and ethanol in a conical flask and kept for 7 days in a cabinet and frequently shaken to dissolve the powder properly. After 7 days the solution of the plant materials was filtered using Whatmann filter paper number one (1). The filtrate was kept in rotary evaporator for complete evaporation of the solvent. After running this procedure, a

gummy extract was obtained which was preserved in refrigerator before use.

2.4 Phytochemical Screening

Phytochemical examination of secondary metabolites such as; alkaloids, saponins, flavonoids, tannins, glycoside, antraquinones, terpenes, steroid and phenols were carried out for the two extracts as per the standard methods adopted by Adebisi and Safowora [9], Sofowora [10], Williamson et al., [11] and Bansa and Ngede [12].

2.5 Antimicrobial Activities

In determining the antimicrobial activities of the extract, Agar well diffusion method was used [13]. Here, the media was prepared based on the manufacturer's instruction, where the prepared nutrient agar (NA) and potatoes dextrose agar (PDA) was selected to be the culture media. An 18 – 24 hour old standardized culture of bacteria was poured on the plate containing NA and the culture of fungi, on the other hand, was pour on the plate containing PDA. A sterile cork borer of 6 mm in diameter was used to bore ditch on the plates and each media contained seven ditches on the NA plates and four ditches on the PDA plates. 20 mg/ml of the extracts was introduced into each of the labeled ditch. Gentamicin was gotten from Soothe healthcare and investment Ltd, and fulcin was sourced from Ciron drugs and Pharmaceutical Pvt Ltd. These were used as positive control for bacteria and fungi while distilled water was used as negative control. The inoculated plates were left for an hour for the extracts to diffuse in the agar. The bacteria plates were incubated aerobically for 48 hours at 37 °C, on the other hand, the plate containing the fungi were incubated for 48 hrs at 25 °C. Zones of inhibition produced after incubation were measured in millimeter and recorded.

3. RESULTS AND DISCUSSION

The results of the qualitative phytochemical screening of the leaves extracts of *Rogeria adenophylla* J. Gay is shown in Table 1.

Table 2 shows the results for the antimicrobial activities of the leaves extracts of *Rogeria adenophylla* J.Gay.

3.1 Phytochemical Screening

Preliminary Phytochemical Analysis of *Rogeria adenophylla* in the present study was carried out

to identify the active constituents such as alkaloids, flavonoids, sterols, terpenoid, Anthraquinones, saponins, tannins, terpenes, glycosides and phenols, present in the leaves of the plant.

Table 1. The phytochemicals present in the extracts of the leaves of *Rogeria adenophylla* J. Gay

Phytochemicals	Hexane extract	Ethanol extract
Saponins	+	+
Tannins	-	-
Terpenes	+	+
Terpenoids	-	-
Glycoside	-	+
Anthraquinones	-	-
Phenoliccompounds	-	-
Alkaloids	+	+
Steroids	-	-
Flavonoids	-	-

Note: Positive result is represented as (+), a negative result is represented with (-)

Table 2. The antimicrobial activity of the cold extraction of leaves of *Rogeria adenophylla* J. Gay

Test organisms	HE (mm)	E.E (mm)	Gent. (mm)	Ful. (mm)
<i>C. difficile</i>	6	6	22	NA
<i>Streptococcus</i>	8	26	22	NA
<i>Shigella sonnei</i>	12	15	22	NA
<i>Salmonella</i>	10	23	22	NA
<i>E. coli</i>	6	22	24	NA
<i>Aspergillus niger</i>	10	16	NA	15
<i>Blastomyces dermatitidis</i>	12	17	NA	15

Note: H.E = n-hexane extract, E.E = ethanol extract, - = negative activity, Gent.=Gentamicin, Ful = fulcin and NA = not applicable

Table 1 shows the results of the qualitative phytochemical screening of *Rogeria adenophylla* J. Gay. From the result, the n-hexane extract showed the presence of alkaloids, saponins and terpenes. The ethanol extract, on the other hand, revealed the presence of alkaloids, saponins, terpenes and glycosides as seen in the results. These phytochemical constituents in ethanol extract are higher in concentrations compared to the n-hexane extract. A similar research was carried out by Olivier [8] and reported the

presence of alkaloids, glycosides and saponins in the aerial (all the upper) part of the plant using methanol as solvent. However, in this research terpenes were found to be present in the leaves extract which could be due to the location of sampling or use of different solvent of extraction.

3.2 Antimicrobial Activity

The results in table 2 showed the antimicrobial activities of *Rogeria adenophylla* J. Gay. The results found that the most active extract is ethanol extract which has 26 mm zone of inhibition of streptococcus and the least with only 6mm zone of inhibition is the *C. difficile*. The antimicrobial activity of *Rogeria adenophylla* J. Gay is expected due to phytochemical compositions of the extracts which are in line with the research conducted by Madzigar on the leaves of *Acalypha wilkesiana* [14] it was found that some phytochemicals such as alkaloids and terpenes possessed antimicrobial activity. This finding is in conformity with the recent study of Marshall [15] and Yahaya [16], who reported that the presence of these phytochemical constituents in plants serves as good antimicrobial agent on test microorganisms of different form. In another research, plant material extracts with traces of alkaloids, glycosides and terpenes exhibits high antibacterial activity [17]. Supporting this finding, the antifungal activities of some secondary metabolites; saponins and alkaloids were reported [18]. The antifungal activities of saponins and alkaloids were also reported [19].

4. CONCLUSION

The leaves of *Rogeria adenophylla* J. Gay was successively extracted with n-hexane and ethanol using cold extraction method. Preliminary phytochemical screening of the extracts revealed the presence of saponins, alkaloids, glycosides and terpenes. The crude extracts exhibited some anti-bacterial activity against the following strains of bacteria, *Salmonella typhi* and *Escherichia coli*; and anti-fungal activities against *aspergillus niger*. It is, therefore, recommended that Government, research institutes and pharmaceutical industries should encourage similar researchers in this field so that the spread of antibacterial and antifungal resistant pathogens can be drastically controlled.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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