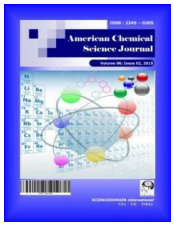

American Chemical Science Journal
11(2): 1-7, 2016, Article no.ACSJ.21519
ISSN: 2249-0205

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Preliminary Phytochemical Screening of Medicinal Plants Found in the Vicinity of Quarry Site in Demsa, Adamawa State, Nigeria

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Authors' contributions

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

Article Information

DOI: 10.9734/ACSJ/2016/21519
Editor(s):
(1) Marcelo Daniel Preite, Department of Organic Chemistry, Pontifical Catholic University of Chile, Chile.
(2) Dimitrios P. Nikolelis, Chemistry Department, Athens University, Greece.
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Complete Peer review History: http://sciencedomain.org/review-history/12346

Original Research Article

Received 21st August 2015
Accepted 31st October 2015
Published 20th November 2015

ABSTRACT

The preliminary phytochemical screening of bioactive constituents of ethanolic leaves extracts of *Anogeissus leiocarpus, Bauhinia reticulata, Prosopis oblonga, Sterculiar tomentosa and Tamarindus indica* was carried out. Saponins, flavonoids, alkaloids, phenols, tannins, volatile oils, glycoside and steroids were found in all samples of the plants from the study area. Glycoside however was not found in *A. leiocarpus* from the study site but present in samples from the control area. It was also absent in *B. reticulata and T. indica* from control area. Alkaloids content has highest value in *P. oblonga* with 31.2% *and 4.8%* lower in *A. leiocarpus* in the quarry site. Also, *P. oblonga* showed the highest value of alkaloids 28.0% while *B. reticulata* has the least value of 7.6% in the control sample. Flavonoids content is higher in *P. oblonga* sample with the value of

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46.8% while *A. leiocarpus* has the least value of 10.8% in the quarry site. Also, *P. oblonga* sample has the higher value of 37.6% while *B. reticulata* has the least value of 21.6% in the control sample. Saponin content is higher in *B. reticulata* with 39.6% while *P. oblonga* has the least value of 22.0% in the quarry site. Also, *T. indica* has the highest value of 40.8% while *A. leiocarpus* with least value of 12.0% in the control site. Tannins content is higher with value of 0.09% in *P. oblonga* and *B. reticulata* respectively while *S. tomentosa* has the least value of 0.01% in the quarry sample. Also *T. indica* has the highest value of 0.10% while *B. reticulata* has the least value of 0.01% in the control sample. Phenols content is higher in *P. oblonga* with value of 0.42% while *T. indica* has the least value of 0.09% in quarry samples. Also *A. leiocarpus* has the highest value of 0.44% while *B. reticulata* has the least value of 0.02% in the control sample.

Keywords: Anogeissus leiocarpus; flavonoid; medicinal plants; quarry; quantitative analysis.

1. INTRODUCTION

Sickness and disease have been a primary concern to man for time immemorial. Every generation has tried to respond to the variety of disabilities afflicting its members according to its level of intellectual and technological development, such response must be seen to be compatible with societal, culture and belief [1]. The ancient Nigerian system of medicine is mainly plant based; it is now revealed that medicine blends with socio-cultural life of the people [2]. Also, plants caters for the needs of our population and offers first line therapy against many diseases like Jaundice, asthma, diabetes, fever and Heat related diseases. Most of Africa, Asia and Latin America have a lot of these plants referred to as medicinal plants. Plant leaves are generally eaten as vegetable or salad on many African countries. They are eaten at least once daily in many areas and some of them have been found to have high crude protein content [3]. In Nigeria and other developing countries, as a result of food shortage and high cost of cultivated green leafy vegetables wild and semi-wild food resources are frequently consumed as the dominant source of leafy vegetables especially in the rural communities [4].

Plants have been a direct provider of shelter and foods for people and their livestock, water, medicine, building material and fuel. Medicinal plants are those plants which are rich in secondary metabolites and are potential sources of drugs [5]. They contain vitamins needed by human body for healthy living [6]. These secondary metabolites include alkaloids, glycosides, commarins, flavonoid and steroids. They possess therapeutic properties and exert beneficial pharmacological effects on the animal body [7]. Among the most useful ones are those related to how medicinal plants could heal or ameliorate diseases or sufferings [8]. The effectiveness of these plants is repeatedly validated in the laboratory. Approximately, 20% of the plants in the world have been subjected to pharmacological and biological evaluation and substantial number of new antibiotics introduced in to the market is obtained from the natural or semi synthetic sources [9].

Plants materials are cheap and significantly contribute to the improvement of human health in terms of care and prevention of diseases [10]. As modern medicine increasingly unaffordable for the rural people and due to lack of availability of orthodox health care professionals in many of the developing countries, use of herbal medicine is on the rise both in urban and rural areas because of the believe that plants have a vast potentiality [11].

Therefore, the main aim of the research is to carry out the phytochemical screening of some medicinal plants found in the vicinity of quarry site and compare with the ones away from the quarry site.

2. MATERIALS AND METHODS

2.1 Study Area

The study area is quarry site situated in Demsa Local Government Area of Adamawa State, Nigeria. Fig. 1 shows the map of the study area. Demsa is a Local Government Area of Adamawa State, Nigeria. Demsa lies on the Benue River. Coordinates: 9°25'N 12°8'E. The state spans two vegetation zones namely Sudan and Sahel savannah. Effective rains start in late June and end in late October. The dry seasons start in October and end in June. The occupation of the rural community of Demsa indigenes has always been agrarian. The local government communities of these areas have been using these medicinal plants under investigation to cure various diseases for a long time.

2.1.1 Sample collection and preparation

Leave samples of *B. reticulata, P. oblonga*, *S. tomentosa*, *T. indica* and *A, leiocarpus* were collected from the Quarry site (N R C) along Numan road in Demsa L.G.A and transported to Modibbo Adama University of Technology, Yola, where they were identified and authenticated by Dr A. Jauro from forestry department. Voucher specimens of these plants were deposited at the University Herbarium.

Each of the samples was air dried under shade at room temperature. The dried leaves were then grinded mechanically using pestle and mortar. The homogenized samples were then sieved, packed in polythene bags, labeled and stored for further use.

2.1.2 Qualitative phytochemical screening

The preliminary qualitative phytochemical screening of the extracts were carried out to determine the presence of saponins, flavonoids, alkaloids, phenols, tannins, volatile oils, glycoside and steroids as described by Tijjani et al. [12].

2.1.3 Test for tannins

The solution of the extract was shaken with small quantity of ferric chloride. A blue-green precipitate was formed, which shows that tannin is present.

2.1.4 Test for flavonoids

The solution of the extract was mixed with two drops of ammonia and give yellow-brown colour signifying the presence of flavonoids.

2.1.5 Test for saponins

The solution of the extract was shaken with about 5 ml of distilled water and then heated to boil. There was a formation of frothing, which indicated the presence of saponins.

2.1.6 Test for glycosides

The solution of the extract was dissolved in some glacial acetic acid containing one drop of $FeCl_3$. The solution was underplayed with concentrated H_2SO_4. No formation of a brown ring at the inter-phase between the acetic acid layer and H_2SO_4 layer, which indicates the absence of glycosides.

2.1.7 Test for alkaloids

The solution of the extract was warmed with 1% HCl for two minutes. The mixture was filtered and few of Dragendorff's reagents were added. A reddish-brown colour and turbidity with the reagent indicated the presence of alkaloids.

2.1.8 Test for phenols

The solution of the extract was mixed with two drops of aqueous ferric chloride. There was a formation of blue-black colouration, which indicates presence of phenol.

2.1.9 Test for volatile oils

Extract was dissolved into 90% ethanol and two drops of ferric chloride were added. Green colourations were taken as an indication for the presence of volatile oils.

2.2 Quantitative Phytochemical Screening

2.2.1 Determination of total phenols by spectrophotometric method

The sample was boiled with 50 ml of ether for the extraction of the phenolic component for 15 min. 5 ml of the extract was pipetted into a 50 ml flask, then 10 ml of distilled water was added. 2 ml of ammonium hydroxide solution and 5 ml of concentrated amylalcohol were also added. The samples were made up to mark and left to react for 30 min for color development. This was measured at 505 nm.

2.2.2 Alkaloid determination

Five grams (5 g) of the sample was weighed into a 250 ml beaker and 200 ml of 10% acetic acid in ethanol was added and covered and allowed to stand for 4 h. This was filtered and the extract was concentrated on a water bath to one-quarter of the original volume. Concentrated ammonium hydroxide was added drop wise to the extract until the precipitation was complete. The whole solution was allowed to settle and the precipitated was collected and washed with dilute ammonium hydroxide and then filtered. The residue is the alkaloid, which was dried and weighed [13].

2.2.3 Tannins determination

500 mg of the sample was weighed into a 50 ml plastic bottle. 50 ml of distilled water was added and shaken for 1 h in a mechanical shaker. This was filtered into a 50 ml volumetric flask and made up to the mark. Then 5 ml of the filtered was pipetted out into a test tube and mixed with 2 ml of 0.1 M $FeCl_3$ in 0.I N HCl and 0.008 M potassium ferrocyanide. The absorbance was measured at 120 nm within 10 min [14].

2.2.4 Saponin determination

The samples were ground and 20 g of each were put into a conical flask and 100 cm^3 of 20% aqueous ethanol were added. The samples were heated over a hot water bath for 4 h with continuous stirring at about 55℃. The mixture was filtered and the residue re-extracted with another 200 ml 20% ethanol. The combined extracts were reduced to 40 ml over water bath at about 90℃. The concentrate was transferred into a 250 ml separatory funnel and 20 ml of diethyl ether was added and shaken vigorously. The aqueous layer was recovered while the ether layer was discarded. The purification process was repeated. 60 ml of n-butanol was added. The combined n-butanol extracts were washed twice with 10 ml of 5% aqueous sodium chloride. The remaining solution was heated in a waterbath. After evaporation the samples were dried in the oven to a constant weight; the saponin content was calculated as percentage [15].

2.2.5 Flavonoid determination

10 g of the plant sample was extracted repeatedly with 100 ml of 80% aqueous methanol at room temperature. The whole solution was filtered through whatman filter paper No 42 (125 mm). The filtrate was later transferred into a crucible and evaporated into dryness over a water bath and weighed to a constant weight [16].

3. RESULTS AND DISCUSSION

The result from Tables 1 and 2 reveals the presence of the phytochemical constituents of the plants understudy in which alkaloids, tannins, saponins, flavonoids steriods, glycosides, phenols and volatiles oil were present in all the samples found in the vicinity of the quarry site, except glycosides that is absent in *A. leiocarpus.* Also, alkaloids, tannins, saponins, flavonoids steriods, glycosides, phenols and volatiles oil were present in all the samples found away from the vicinity of the quarry site, except glycosides that is absent in *B. reticulata* and *T. indica.* The results also agreed with the findings of Boham and kocipai [17], Kubmarawa et al. [18] and Krishnaiah et al. [19].

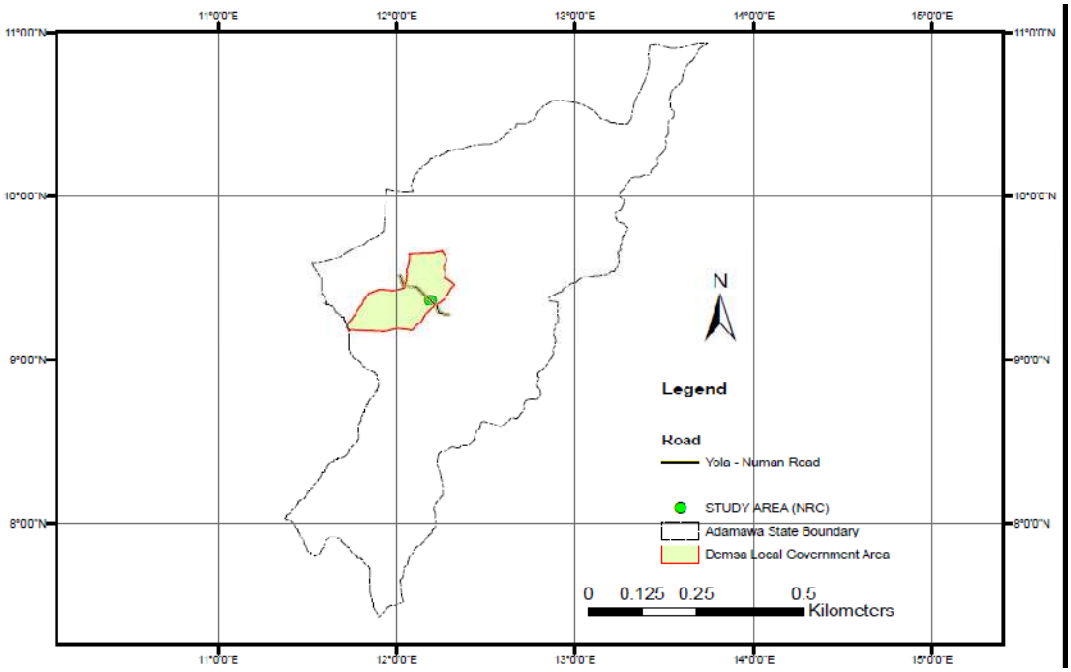

Fig. 1. Map of Adamawa State showing Demsa LGA and the study area

Table 1. Phytochemical screening of some medicinal plant leaves found in the vicinity of quarry site

Plant species	Alkaloids	Tannins	Saponins	Flavonoids	Steroids	Glycosides	Phenols	Volatile oils
A. leiocarpus	+	+	+	+	+	-	+	+
B. reticulata	+	+	+	+	+	+	+	+
P. oblonga	+	+	+	+	+	+	+	+
S. tomentosa	+	+	+	+	+	+	+	+
T. indica	+	+	+	+	+	+	+	+

Key: + = Present, - = Absent

Table 2. Phytochemical screening of some medicinal plant leaves away from the vicinity of quarry site (control area)

Plant species	Alkaloids	Tannins	Saponins	Flavonoids	Steroids	Glycosides	Phenols	Volatile oils
A. leiocarpus	+	+	+	+	+	+	+	+
A. reticulata	+	+	+	+	+	-	+	+
P. oblonga	+	+	+	+	+	+	+	+
S. tomentosa	+	+	+	+	+	+	+	+
T. indica	+	+	+	+	+	-	+	+

Key:+ = Present, - = Absent

Table 3. Quantitative analysis of some phytochemical constituents of plants in the quarry site

Plants	Alkaloids % w/w	Flavonoids % w/w	Saponins % w/w	Tannins %w/w	Phenols %w/w
A. leiocarpus	4.8	10.8	25.6	0.05	0.13
A. reticulata	10.4	42.8	39.6	0.09	0.18
P. oblonga	31.2	46.8	22.0	0.09	0.42
S. tomentosa	14.8	19.6	35.2	0.01	0.21
T. indica	13.2	22.4	34.8	0.05	0.09

Table 4. Quantitative analysis of some phytochemical constituents of plants away from the quarry site (control area)

Plants	Alkaloids % w/w	Flavonoids % w/w	Saponins % w/w	Tannins %w/w	Phenols %w/w
A. leiocarpus	19.2	35.2	12.0	0.05	0.44
B. reticulata	7.6	21.6	30.8	0.01	0.02
P. oblonga	28.0	37.6	30.0	0.05	0.03
S. tomentosa	14.8	22.4	37.2	0.05	0.06
T. indica	8.8	29.2	40.8	0.10	0.03

The quantitative estimation of the percentages of crude chemical constituents in these medicinal plants studied is reported in Tables 3 and 4 (above), which showed that the leaves of *P. oblonga* plant have the highest percentage of 31.2% value of alkaloids in the quarry site and *A. leiocarpus* with the least value of 4.8%. Also, *P. oblonga* have 46.8% as the highest value of flavonoid content and *A. leiocarpus* with 10.8% as the least. *B. reticulata* have highest percentage value content of 39.6% for Saponins while *P. oblonga* with least value of 22%. Tannins content is higher with value of 0.09% in *P. oblonga* and *B. reticulata* respectively while *S. tomentosa* has the least value of 0.01% in the quarry sample. Phenols content is higher in *P. oblonga* with value of 0.42% while *T. indica* has the least value of 0.09% in quarry samples.

From Tables 3 and 4, alkaloid was found to be more in *P. oblonga* leaves with 31.2% of the quarry site samples and 28.0% for the control sample and low in *A. leiocarpus* leaves of the quarry samples with 4.8% and 7.6% for *B. reticulata* in the control sample respectively.

The flavonoid was found to be 46.8% and 37.6% of *P. oblanga* leaves of the quarry site and control sample respectively and low with 10.8% and 19.6% in *A. leiocarpus* and *S. tomentosa* of quarry site samples which is much high than the result obtained by Krishnaiah et al. [19].

The saponins contents of the plants was found to be higher in *T. indica* leaves with 40.40% and low in *B. reticulata* leaves with 12.0% of both samples away from the quarry site, which is not in contrast with the findings of Nkafamiya et al. [3], Mustapha et al. [11], and Kubmarawa et al. 18]. The phenolic content of various plants studied showed significant contents in all the plants using spectroscopic method. The phenolic content of the ethanolic plants extract was found with 0.42% of quarry sample and low with 0.02% for *B. reticulata* plant for the samples away from the quarry, as observed in the Tables 3 and 4, respectively; which agreed with findings of [19]. The tannin was found to be higher with 0.10% of *T. indica* of samples away from the quarry site and have the least value of 0.05% for *S. tomentosa* as well too.

4. CONCLUSION

The plants studied here can be seen as potential sources of useful drugs. Apart from glycoside which is absent in some plants, almost all the other bioactive constituents tested were present in the samples studied. This attest to the fact that the leaves of these plants contains bioactive compounds of potentially therapeutic significance and thus could be a promissory candidate for drug development and validates folkloric claim by the traditional healers.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
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