



Qualitative Phytochemical Screening of Bologi (*Senecio biafrae*) and Bitter Leaf (*Vernonia amygdalina*) Leaves

A. D. Olasupo^{1*}, O. V. Olagoke² and A. B. Aborisade³

¹Department of Chemistry, Ladoke Akintola University of Technology, Ogbomoso, Nigeria.

²Department of Microbiology, Obafemi Awolowo University, Ile Ife, Nigeria.

³Department of Biochemistry, Ladoke Akintola University of Technology, Ogbomoso, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Authors ADO, OVO and ABA were responsible for study designed and supervision of work. Author ADO was responsible for laboratory work. Authors ADO, OVO and ABA were responsible for data analysis and manuscript preparation. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/CSJI/2017/35753

Editor(s)

(1) T. P. West, Department of Chemistry, Texas A&M University-Commerce, USA.

(2) Francisco Marquez-Linares, Chemistry, Nanomaterials Research Group, School of Science and Technology, University of Turabo, USA.

Reviewers

(1) Paula Mendonça Leite, Universidade Federal de Minas Gerais, Brazil.

(2) Eliton da Silva Vasconcelos, Federal University of São Carlos – UFSCar, Brazil.

(3) Muhammad Shahzad Aslam, Universiti Malaysia Perlis, Malaysia.

(4) V. Y. A. Barku, University of Cape Coast, Ghana.

(5) Fabio Altieri, Sapienza University, Italy.

(6) Rosa Elva Norma del Rio Torres, Instituto de Investigaciones Químico Biológicas, Universidad Michoacana de San Nicolás de Hidalgo, Mexico.

Complete Peer review History: <http://www.sciencedomain.org/review-history/21409>

Original Research Article

Received 28th July 2017
Accepted 20th September 2017
Published 14th October 2017

ABSTRACT

The Phytochemical screening of *Senecio biafrae* and *Vernonia amygdalina* showed the presence of saponins, tanins, phlobataninss, phenol, anthraquinones, flavonoids, glycoside, steroids, terpenes, cardenolides, chalcones, quinones and terpenoids; fixed oil was also determined. The phytochemical screening was carried out using standard reference methods. The aqueous extract and crude extract of the leafy vegetables showed positive results in both solvents used for the extractions. Saponins, flavonoids, steroids and phenol were highly present in both extractions for *Senecio biafrae* while steroids, terpenoids and quinines were highly present in both extractions for *Vernonia*

*Corresponding author: E-mail: ollydap4real@yahoo.com;

amygdalina. However, steroid were highly present in both extracts, meanwhile flavonoid were highly present in *Senecio bialrae* extract (aqueous extraction) but moderately present in *Vernonia amygdalina* extract (crude extraction). The presence of high secondary metabolites in these plants are good indication that if the two plants are subjected for further research and characterization, bioactive compounds with strong medicinal activities may be identified and isolated, chemical active compounds may also be discovered.

Keywords: *Phytochemical screening; Senecio bialrae and Vernonia amygdalina extracts.*

1. INTRODUCTION

World Health Organisation (WHO) has defined medicinal plants as plants that contain properties or compounds that can be used for therapeutic purposes or those that synthesize metabolites to produce useful drugs [1]. Also, it has been generally described that medicinal plant is a plant that has similar properties as conventional pharmaceutical drugs which humans have used throughout history to either cure or lessen symptoms from an illness.

Phytochemicals are chemical compounds produced by plants, generally to help them thrive competitors, predators, pathogens and the name phytochemicals originated from Greek word (phyto, meaning "plant). They generally have biological activity in the plant host and play a role in plant growth or defense [2]. Phytochemicals are said to have accumulated in different parts of plants, such as leaves fruits, flowers, roots, stems, seeds. Wide-ranging dietary phytochemicals are found in fruit, vegetables, legumes, whole grains, seeds, fungi, herbs and spices [3].

As it is well known that plant produced these chemicals to protect them, researchers have recently demonstrated that phytochemicals have capability to protect human against disease [4]. Though they are not essential nutrients and thereby are not required by the human body for sustaining life, they have important properties to prevent or fight some common diseases as green leafy vegetables constituted an indispensable constitute of human diet in Africa [4]. Phytochemicals are also available in supplementary forms, but evidence is lacking that they provide the same health benefits as dietary phytochemicals having biological properties such as antimicrobial effect, modulation of detoxification enzymes, stimulation of the immune system, decrease of platelet aggregation and modulation of hormone metabolism and anticancer property.

In West Africa countries, Nigeria to be precise is blessed with a variety of traditional plants and different types are compound by the various ethnic groups for different reason which is part of the Nigerian's cultural heritage, playing an important role in the custom and the traditional way of feeding. The medicinal uses of Bitter leaf (*Vernonia amygdalina*) and Bologi (*Senecio bialrae*) is being focused in this research and been identified to be highly potential and economical value in the Nigeria economy [5].

Vernonia amygdalina leaf is commonly called bitter leaf in English because of its bitter taste. Leaves of this plant are used in Nigeria as a green vegetable or as spice in soups, especially in the popular "bitter leaf soup." The leaves can be taken as an appetizer and the water extract as a digestive tonic. It is well known as a medicinal plant in folk medicine as antidiabetic, anthelmintic, antimalarial, laxative/purgative, expectorant, worm expeller and fertility inducer in subfertile women, antipyretic, and recently for a non-pharmacological solution to persistent fever, headache, and joints pain associated with AIDS [6,7].

Senecio bialrae is a medicinal plant belonging to Compositae family. In Africa, it is locally named Bologi, Worowo, Rorowo among other names. The English name of this leaf is called Spinach. The plant is generally used for the treatment of wound, cough, heart-troubles, tonic, rheumatic, oedema and the plant is also considered for their high medicinal value as the juice extracted from the leaves are wholly applied to fresh wounds or cuts as styptic in the rural community for man and animal use [8].

According to the World Health Organizations (WHO) which endorses the global initiative on fruits and vegetables consumption in the sub-continent, joint WHO/FAO [5] recommended a balance diet for good health with a minimum daily intake of 400 g of fruits and vegetables for prevention of disease. WHO/FAO at their 2004 joint kobe workshop, developed a framework that

proposes ways to promote increased production, availability, access and adequate consumption of fruits and vegetables [1]. The specific objective of this study was to determine the phytochemical compounds and to validate the medicinal values of the plants extract.

2. MATERIALS AND METHODS

The *Senecio biafrae* and *V. amygdalina* were air-dried for two weeks and mashed into powder and sieved with mesh of size 0.50 mm. The leaves were collected from market in Esa-oke, Obokun local government, Osun state. The leaf samples were then stored in different clean brown bottles at room temperature and both leaves were extracted in two selected solvents such as water and acetone.

2.1 Aqueous Extraction Preparation

50 g of sample was dispensed in 500 ml of distilled water, the mixture was vigorously stirred intermittently with a magnetic stirrer and then the sample was allowed to stand for 24 hours and thereafter it was then filtered through a whatman filter paper-lined funnel into a conical flask and the sample was evaporated using rotary evaporator [9].

2.2 Crude Extraction Preparation

50 g of sample was dispensed in 500 ml of acetone in 1 L conical flask and the sample was allowed to stand for 48 hours. Thereafter, it was then filtered through a whatman filter paper-lined funnel into a conical flask and the sample was evaporated at 40°C in a water bath to obtain the solid crude extract.

The extracts of the plants were analyzed for saponin, tannin, phenol, anthraquinones, flavonoids, glycosides, steroids, terpenes, cardenolides, chalcones, phlobatannin, quinones, terpenoids and fixed oil, using methods derived by [10,9,11].

2.3 Qualitative Phytochemical Analysis

2.3.1 Test for tannins

1 ml of extract was boiled in 20 ml of water in a test and then filtered. A few drops of 0.1% ferric chloride was added and observed for a green or a blue – black coloration which confirms the presence of tannins.

2.3.2 Test for phlobatannins

2 ml of extract of each plant samples was boiled with 1% aqueous hydrochloric acid. Deposition of a red precipitate was taken as evidence for the presence of phlobatannins.

2.3.3 Test for saponins

About 5 ml of the extract was boiled in 20 ml of distilled water in a water bath and filtered. 10 ml of the filtrate was mixed with 5 ml of distilled water and shaken vigorously for a stable persistent froth. The frothing was mixed with 3 drops of olive oil and shaken vigorously, then observed for the formation of emulsion which confirms a positive presence of Saponins.

2.3.4 Test of flavonoids

3 ml of 1% Aluminium chloride solution were added to 5ml of each extract. A yellow coloration was observed indicating the presence of flavonoids. 5ml of dilute ammonia solution were added to the above mixture followed by addition of concentrated H₂SO₄. A yellow coloration disappeared on standing. The yellow coloration which disappeared on standing indicates a positive test for flavonoids.

2.3.5 Test for steroids

2 ml of acetic anhydride was added to 2 ml extract of each sample followed by careful addition of 2 ml H₂SO₄. The colour change from violet to blue or green indicates the presence of steroids.

2.3.6 Test for terpenoids (Salkowski test)

5 ml of each extract was mixed with 2 ml of chloroform, and 3 ml concentrated H₂SO₄ was carefully added to form a layer. A reddish brown coloration of the interface was formed to show positive results for the presence of terpenoids

2.3.7 Test for cardiac glycosides and cardenolides (Keller – Killani test)

5 ml of each extracts was treated with 2 ml of glacial acetic acid containing one drop of ferric chloride solution. This was underplayed with 1ml of concentrated sulphuric acid. A brown ring at the interface indicates a deoxysugar characteristics of cardenolides which confirms a positive presence of cardenolides. A violet-green ring appearing below the brown ring, in the acetic

acid layer, indicates the positive presence of glycosides.

2.4 Anthraquinone

5 ml of extract was mixed with 10 ml Benzene, filtered and 5 ml of 10% NH₃ solution added to the filtrate. The mixture was shaken and the presence of pink, red or violet colour in the ammoniac (lower) phase indicated the presence of anthraquinones

2.4.1 Chalcones

2 ml of ammonia solution were added to 5 ml of extract of each plant part. Formation of a reddish colour confirmed presence of chalcones.

2.4.2 Phenol

5 ml of the extract was pipetted into a 30 ml test tube, then 10 ml of distilled water was added. 2 ml of ammonium hydroxide solution and 5 ml of concentrated amyl alcohol were also added and left to react for 30 min. Development of bluish green colour was taken as a positive presence of phenol.

3. RESULTS AND DISCUSSION

3.1 Results

The results were analysed based on phytochemical parameters obtained in both aqueous and crude leaf extracts.

3.2 Discussion

The results of the phytochemical screening are presented. The presence of secondary metabolites such as, tannins, flavonoids, phenol, anthraquinone, chalcones, cardenolides, glycosides, quinines, terpenoids, saponins and fixed oil was observed in the various plant preparations. The presence of secondary metabolites could be responsible for the biological activity of the plants.

This study shows that there is no significant change in most of the investigated parameters following the analyzing of the phytochemical constituents of the aqueous extract of both leaves compared to the study done by [12]. The result obtained from *V. amygdalina* extracts agreed with the previous usefulness claimed in the ethnotherapy of diabetes mellitus in the study

done by [13]. Plant that has medicinal activities usually contains secondary metabolites such as flavonoids, alkaloids, saponins and tannins which are chemical substances responsible for such activities [14,2].

Table 1. Phytochemical analysis/screening of aqueous and crude extracts of *Senecio biafrae*

| Test parameter | Observation <i>Senecio biafrae</i> | |
|----------------|------------------------------------|---------------|
| | Aqueous extract | Crude extract |
| Flavonoids | +++ | -- |
| Steroids | + | +++ |
| Saponins | +++ | + |
| Tannins | -- | + |
| Phenol | ++ | +++ |
| Terpenes | -- | -- |
| Challones | -- | -- |
| Cardenolides | ++ | -- |
| Glycosides | -- | +++ |
| Anthraquinones | -- | -- |
| Phlobatannins | + | -- |

Table 2. Phytochemical analysis/screening of aqueous and crude extracts *V. amygdalina*

| Test parameter | Observation <i>V. amygdalina</i> | |
|----------------|----------------------------------|---------------|
| | Aqueous extract | Crude extract |
| Flavonoids | -- | ++ |
| Steroid | -- | +++ |
| Tannins | -- | -- |
| Terpenoids | +++ | +++ |
| Quinines | +++ | +++ |
| Fixed oil | -- | -- |

Key - Highly present +++
 - Moderately present ++
 - Slightly present +
 - Completely absent --

This study shows that saponins were highly present in aqueous extract of *Senecio biafrae* compared with crude extract one. Studies done by [15] reported that high presence of saponins component in *Senecio biafrae*, possess hemolytic effect on red blood cells; moreover, saponins possess both beneficial cholesterol-lowering, deleterious properties and also exhibit structure dependent medicinal activities.

The usefulness of flavonoids as hypoglycemic and antidiabetic has been recorded and documented [16]. Meanwhile, epidemiological studies have shown that heart diseases are

inversely related to flavonoids intake thereby reducing the risk of development of atherosclerosis by preventing the oxidation of Low Density Lipoprotein [12]. This study shows that saponins and flavonoids were the most highly present in *Senecio bialfrae* while steroids, terpenoids and quinines were the most highly present in *V. amygdalina*. However, the comparison of both extracts (*Senecio bialfrae* and *V. amygdalina*) shows that the flavonoid were highly present in *Senecio bialfrae* while moderate in *V. amygdalina*.

Tannins are useful in promoting wound healing while steroids are used as the main treatment of certain inflammatory condition such as systemic vasculitis (inflammation of blood vessels) and [Myositis (Inflammation of Muscles)

Cardiac glycosides have a strong and direct action on the heart, help in supporting strength and the rate of contraction when it is failing [17]. This study also shows that glycosides and steroids were both highly present in the crude extracts of *Senecio bialfrae*.

Recent studies have actually demonstrated that phytochemical can protect human against diseases [12,4].

It has been reported that flavonoids and phenolics are free radical scavengers that prevent oxidative cell damage, and have strong anticancer activities [18,19] and they can also induce mechanism that affect cancer cells and inhibit tumor invasion [20]. These activities could be attributed to their ability to neutralize and quench free radicals [21,18,19]. It can also be due to their redox properties, presence of conjugated ring structures and carboxylic group which have been reported to inhibit lipid peroxidation [22].

This study shows that *V. amygdalina* and *Senecio bialfrae* leaves are rich in phytochemicals and that their utilization should be strongly recommended for good health. *V. amygdalina* and *Senecio bialfrae* leaves are reservoirs for free radical scavenging molecules such as vitamins, alkaloids, tannins, terpenoids, phenolic acids, flavonoids and other metabolites, which are basically rich in antioxidant activities. The aqueous extract and crude extract of the leafy vegetables showed positive results in both solvents used for the extractions. However, steroids were highly present in both extracts. Meanwhile, flavonoids were highly present in

Senecio bialfrae extract (aqueous extraction) but moderately present in *Vernonia amygdalina* extract (crude extraction). Additionally, the DNA copy or gene(s) responsible for the expression of these metabolites could be cloned and inserted into other edible crops for ease of consumption by end users. This implies that it might be unnecessary to go over the counter medicine stores to buy synthetic drugs to this respect.

4. CONCLUSION

From our study, it can be concluded that leafy vegetables extracts of *Senecio bialfrae* and *Vernonia amygdalina* contain some phytochemical compounds or components which may show hypoglycaemic, anti-diabetic properties as well as potentially active against other degradative diseases if subjected to further medicinal and toxicity tests which may confirmed the leaves safe for consumption as food or as herbal medicine without plausible toxicity to body organs and tissues.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. World Health Organization. Medicinal plants—guidelines to promote patient safety and plant conservation for a US\$ 60 billion industry; 2004.
2. Molyneux RJ, Gardner ST, Panter KE, James LF. Phytochemical the good, the bad and the ugly phytochemistry. 2007; 68(22-24):2973–85. DOI: 101016/J.phytochemical 2007.09.004 PMID: 17950388
3. Mathai. Medicinal plant in Nigeria, University of Ibadan, Nigeria. 2000;139.
4. Narasinga Rao. Handbook of African medicinal plant crs press Boca Reton Floride United State of America; 2003.
5. World Health Organization. Monographs on selected medicinal plants. Geneva. 2003;2:375.
6. Adedapo AA, Aremu OJ, Oyagbemi AA. Anti-oxidant, anti-inflammatory and antinociceptive properties of the acetone leaf extract of *Vernonia amygdalina* in some laboratory animals. Adv Pharm Bull. 2014;4(Suppl2):591–8. (PMC free articl)([PubMed)

7. Egedigwe CA. Effect of dietary incorporation of *Vernonia amygdalina* and *Vernonia colorata* on blood lipid profile and relative organ weights in albino rats (Thesis) Nigeria: Department of Biochemistry, MOUAU; 2010
8. Dairo FAS, Adanlawo IG. Nutritional quality of *Grassocephalum crepidioides* and *Senecio bialfrae*. Pakistan Journal of Nutrition. 2007;6(1):35-39.
9. Sofowora A. Medicinal plant and traditional medicine in Africa. 3rd edition Spectrum Books Limited Ibadan. 1999;172–188.
10. Ogukwe CE, Oguzie EE, Uneagbu C, Okolue BN. Phytochemical screening of the leaves of *Samsevieria trifasciata*. Journal of chemical society Nigeria. 2004;29:8–1003h.
11. Trease GE, Evans WC. Phenols and phenol glycosides in trease and evans pharamcognsy and Biliere Tindall London, 1996;832.
12. Ajiboye BO, Ibukun EO, Edobor G, Ojo AO, Onikanni SA. Qualitative and quantitative analysis of phytochemical in *Senecio bialfrae* leaf; 2013.
13. Ashokkumar D, Mazumder UK, Gupta M, Senthilkumar GP, Selvan VT. Evaluation of antioxidant and free radical scavenging activities of *Oxystelma esculentum* in various *in vitro* models. J Comp Integ Med. 2008;5(1):1-6.
14. Harborne JA, Jeffrey B, Baxten Herbert, Mosp, Gerard P. General introduction phytochemical dictionary a handbook of bioactive compound from plants (2nd edition) London: Taylor & Francis. 1999;vii. ISBN: 9780203483756
15. Osagie AU. Mineral elements in plant foods. In nutritional quality of plant find Ambic press Benin City, Edo State Nigeria. 1998;8:14–43and 86.
16. Tarko Y, Yaro HA, Isa M, Yerima M, Saleh IA, Mohammed A. Toxicological and hypoglycaemic studies on the leaves of *Cissampelos mucronata* (*Menispermaceae*) on blood glucose levels of streptozotocin – induced diabetic wistar rats. Journal of Medicinal Plant Research. 2007;1:113 –116.
17. Persinos GJ, Uuimby MW. Nigerian plants III. Phytochemical screening for alkaloids, saponius, tanins. Journal of Pharmacy Science. 1967;56:1512.
18. Pourmorad F, Hosseininelir SJ, Shahabimajd N. Antioxidant activity, phenol and flavonoid content of some selected Iraninan medicinal plants. Africa Journal of Biotechnology. 2006;5:1142-1145.
19. Ugwu Okechukwu PC, Nwodo Okwesili FC, Joshua Parker E, Bawa Abubakar, Ossai Emmanuel C, Odo Christian E. Phytochemical and acute toxicity studies of *Moringa oleifera* ethanol leaf extract. International Journal of Life Sciences Biotechnology and Pharmacological Research. 2013;2:66-71.
20. Rafat HS, Cillard BS, Cilliad NT. Hydroxyl radical scavenging activity of flavonoids. Journal of Phytochemistry. 2008;26:2489-2491.
21. Omale J, Okafor PN. Comparative antioxidant capacity, membrane stabilization, polyphenol composition and cytotoxicity of the leaf and stem of *Cissus multistriata*. Africa Journal of Biotechnology. 2008;7:3129-3133.
22. Rice-Evans CA, Miller NJ, Bolwell PG, Bramley PM, Pridham JB. The relative activities of plant-derived polyphenolic flavonoid. Free Radical Research Journal. 1995;22:375-383.

© 2017 Olasupo et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<http://sciencedomain.org/review-history/21409>