Asian Journal of Research in Crop Science

7(1): 30-34, 2022; Article no.AJRCS.83776
ISSN: 2581-7167

Phytochemical Properties and Proximate Composition of *Asclepias syriaca*l

J. O. K. Abioye [a*], E. Manaja [a] and A. L. Olokun [a]

[a] *Department of Biological Sciences, Bingham University, P.M.B. 005, Karu, Nasarawa State, Nigeria.*

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJRCS/2022/v7i130130

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/83776

Original Research Article

Received 10 November 2021
Accepted 15 January 2022
Published 18 January 2022

ABSTRACT

Asclepias syriaca, commonly called common milkweed is a species of a flowering plant. It has a long history of folklore uses, but has not been explored for commercial purpose. Traditionally the hot water extract is used to treat typhoid fever, among other medicinal uses. Despite its numerous acclaimed uses, its full resources are yet to be tapped. This study carried out the phytochemical screening and proximate analysis of this important ancient plant so as to expose some of its potentials. Enough sample of *Asclepsias syriaca* was collected from around Bingham University campus in Karu, Nasarawa State, Nigeria. The sample was dried at room temperature (28^0C) for 2 weeks. The air-dried plant was separated into root, stem, leaves, and flower/ fruits. The dried stem was pulverized using a mechanical blender. The pulverized stem was then subjected to phytochemical screening and proximate analysis, using standard methods. The results of phytochemical screening revealed high concentration of tannins, saponins and glycosides, with alkalloids and phenols present in lesser concentrations. Proximate analysis result yielded protein (31.35%), crude fat (14.85%), carbohydrate (11.50%), moisture content (2.30%). Most of the phytochemical components found in *Asclepias syriaca* have been documented to have antimicrobial property, hence, the plant could be a potential effective and cheap cure for many infections. The proximate analysis result also confirmed the nutritive value of this multipurpose plant.

Keywords: Asclepias syriaca; phytochemical screening; proximate analysis; Bingham University.

**Corresponding author: E-mail: jabioyek@gmail.com;*

1. INTRODUCTION

Asclepias syriaca, commonly called common milkweed, butterfly flower, silkweed, silky swallow-wort and Virginia silkweed is a species of flowering plant [1]. It is native to southern Canada and much of the United States east of the Rocky Mountains excluding the drier parts the Prairies [2]. It grows in sandy soils as well as other kinds of soils in sunny areas.

Asclepias syriaca can easily be seen as one of the greatest underachiever of plants. Its potential appears great, yet until now it has never been continuously processed for commercial purposes. From the earliest of days this plant with its fragrant flowers, milky latex and stringy roots attracted much attention. Its seeds were among the first sent from New France to Paris by Louis Hebert, a Frenchman regarded as the first Canadian pharmacist. Plants from these seeds were grown and later studied by Philip Cornut, a medical doctor and botanist. His treatise*, Canadensium plantarum, aliarum quenodu* and *meditarum historica*, published in 1635 which was one of the first record on North American plants described the two popular modern day milkweeds *Asclepias syriaca* and *Asclepias incarnate* [3].

According to [4], medicinal plants are the best sources to obtain a variety of new herbal drugs. About 80% of individuals from developing countries use traditional medicine, which has substances derived from medicinal plants. Therefore, such plants should be investigated to better understand their properties, safety and efficacy [4].

A lot of plants with medicinal properties are not being explored for their use in treatment of diseases caused by microbes. *Asclepias syriaca* being one of such plants, for years it has been used traditionally to cure ailments, and even consumed as vegetable but one major problem surrounding its use is the toxicological effect which has not being properly determined. This project seeks to proffer a solution to this problem by investigating the phytochemical properties and proximate analysis of *Asclepias syriaca* in order to explore the medicinal and nutritive potentials of the plant.

2. MATERIALS AND METHODS

2.1 Area of Study

The study was carried out in Bingham University located at AutaBalefi, Karu, Nasarawa state. It has a tropical climate with two distinct seasons; rainy and dry seasons. The university covers a land mass area of 200 square meters and is geographically located at latitude $8^{o}50^{o}$N and longitude $7^{o}52^{o}$E. It is located 26km away from the capital of Nigeria, Abuja [5].

2.2 Sample Collection and Processing

The plant sample was collected around the university campus and dried at room temperature for about two weeks in the Microbiology laboratory of the university. The plant sample was then separated into leaves, fruits, stem and roots. The stem parts were pounded using a pestle and mortar and further pulverized using an electric blender to reduce it to powder form; it was then stored until required for analysis.

2.3 Preparation of Plant Extracts

Three different extracts were prepared, hot water extract according to the local method used, cold water extract and methanol extract. These were carried out according to the methods described by [6].

2.4 Hot Water Extraction

200 g of the powdered stem was suspended in 1000 ml of distilled water and allowed to boil for 15 mins, it was then left to stand for about 6 hours to ensure maximum extraction of metabolites. The mixture was then sieved using a sterile sieve and subjected to freeze drying and stored in air tight containers for later use.

2.5 Cold Water Extraction

200 g of the powdered stem was weighed into a sterile jar and mixed with 1500 ml of cold water.It was left to stand for 24 hours at room temperature to allow for maximum extraction. It was then filtered using a sterile sieve and subjected to freeze drying and stored in air tight containers for later use.

2.6 Methanol Extraction

200 g of the powdered leaves were soaked in 1000 ml of methanol for 48 hours, it was then extracted using a soxhlet apparatus and subjected to drying using a rotary evaporator to evaporate the methanol leaving the extract residue behind. It was then stored in airtight containers for later use.

2.7 Phytochemical Screening

The phytochemical screening was carried out according to [7].

2.7.1 Test for alkaloids

0.1mg of the extract was added to 6mls of 1% dilute HCl and boiled, cooled and filtered. The filtrate was divided into three portions and subjected to the following tests. To the first portion, 2 drops of Drangendroff's reagent were added. The formation of a red precipitate indicated the presence of alkaloids. To the second portion, 2 drops of Meyers reagent were added. A creamy white precipitate indicated the presence of alkaloids. To the third portion, 2 drops of Wagners reagent were added. A reddish brown precipitate indicated the presence of alkaloids.

2.7.2 Test for flavonoids

1 g of the extract was boiled in ethylacetate(10mls) at 70^0C for 3 mins, filtered and cooled. Then the filtrate was shaken with 1ml of dilute ammonia solution. An intense yellow coloration indicated the presence of flavonoids.

2.7.3 Test for tannins

5 g of the extract was dissolved in 5 ml of methanol.1ml of the extract was then added to 10mls of deionized water and treated with 3 drops of 1% ferric chloride. A green brown precipitate indicated the presence of tannin.

2.7.4 Test for saponins

5 g of the extract was dissolved in 5ml of methanol, it was then diluted with 20 mls of deionized water, shaken vigorously and observed. Persistent foaming indicated the presence of saponin.

2.7.5 Test for glycosides

0.5 g of the extract was dissolved in 5ml methanol and filtered, 2 ml of the sample was added into a test tube, 1ml of glacial acetic acid was added, followed by 1 ml of $FeCl_3$ and 1ml of conc. Sulphuric acid was added. Green blue colouration indicated the presence of glycosides.

2.7.6 Test for phenols

2.5g of the sample was dissolved 10ml of methanol. To 5 ml of the aqueous solution of the extract, 1 ml of $FeCl_3$ (1%) and 1ml of1% $K_3(Fe(CN)_6)$ were added. The appearance of fresh dark bluish colour indicated the presence of phenols.

2.8 Proximate Analysis

The moisture content, crude protein, crude fat and carbohydrate of the plant sample were determined using [8] method.

Crude fat: Crude fat was determined by defatting 5 g of the sample in 25 ml petroleum ether for 30 minutes. The supernatant was decanted into weighed crucibles and oven dried for 45 minutes at 103 °C.

$$\%\ \text{of crude fat} = \frac{\text{weight of original sample} - \text{weight of defattened sample}}{\text{Weight of original sample}} \times 100$$

Moisture content: 10 g of the extract was dried at 103 °C to a constant weight in an oven.

$$\%\ \text{of moisture content} = \frac{\text{weight of original sample} - \text{weight of residue after drying}}{\text{Weight of sample used}} \times 100$$

Crude protein determination: Weigh 2.5 g of the extract, add 25 ml of conc H_2SO_4, allow standing for 2 hrs and 200 ml of water, allow to boil, then slowly add 100 ml of 50% NaOH. Heat until all ammonia has passed over into standard acid. Collect approximately 150ml.

$$\%\ \text{nitrogen} = \frac{(\text{A} - \text{B})\ \text{X}\ 1.4007}{\text{Weight of sample}} \times 100$$

A= vol of std HCL X normality of std HCL
B= vol of std NaOH X normality of std NaOH
% protein= %nitrogen x 6.25

Carbohydrate content determination: 45 g of the sample extract was diluted in 450 ml of distilled water. 1ml of the diluted filtrate was pipetted into a test tube as blank while and 1ml of glucose into a test tube as standard. To each of the test tubes, 5 ml of freshly prepared anthrone reagent was added and mixed thoroughly. Each tube was labeled and put in a test tube rack which was placed in a water bath of 30^oC for 12mins. It was then removed and read on a spectrophotometer at 630nm against

the blank. Total available carbohydrate in sample as percentage glucose is calculated as:

$$\text{Glucose (\%)} = \frac{25A1}{X \times A2} \times 100$$

Where A1= absorbance of diluted liquid
A2= absorbance of diluted standard
X = Weight of sample(g)

3. RESULTS

3.1 Phytochemical Screening

The preliminary phytochemical test carried out in this study revealed the major phytochemical constituents in *Asclepias syriaca* as listed in the table below. These phytochemicals were found to be relatively present in varying degrees.

Table 1. Phytochemical composition of *Asclepias syriaca*

Parameters	Methanolic Extract
Alkaloids	+
Flavonoids	–
Tannins	+++
Saponins	++
Glycosides	++
Phenols	+

Keys:
+ = Positive at low concentration
++ = Positive at moderate concentration
+++ = Positive at high concentration
- = Absent

3.2 Proximate Content Analysis

The ground samples were used for proximate analysis in this study. Moisture, fat, carbohydrate and protein contents of the studied samples were determined and recorded in the table below are the results.

Table 2. Proximate content analysis of *Asclepias syriaca*

Parameters	Composition (%)
Carbohydrate	11.50
Crude Protein	31.35
Crude Fat	14.85
Moisture Content	2.30

4. DISCUSSION, CONCLUSION AND RECOMMENDATIONS

4.1 Discussion

From table 1 the phytochemical screening revealed the presence of alkaloids, tannins, saponnins, glycosides and phenols but the absence of flavonoids. These compounds are known to exhibit great antibacterial/antifungal activities. The Alkaloids are known to have microbiocidal and antidiarrheal effects [9]. Tannins are responsible for many human physiological activities, such as stimulation of phagocytic cells, host-mediated tumor activity, and a wide range of anti-infective actions, tannins can also be toxic to filamentous fungi, yeasts, and bacteria [10]. Saponins are good candidates for treating fungal and yeast infections due to their ability to ward off microbes hence; they serve as natural antibiotics, which help the body to fight against infections and microbial invasions [11]. Phenols on the other hand have antioxidant properties and protect cells from oxidative damage [11]. The presence of this phytochemical suggests that the plant could have antimicrobial properties since almost all the phytochemicals isolated in this work are reported to have antimicrobial activity. The plant could also be used for other medicinal purposes, for instance the leaves are also described as having an anticancer effects, wound healing, diuretic, anti-asthmatic, is also used to treat bronchitis, pneumonia, rheumatism, and kidney stones [12]. Also the stems can be cooked and applied as a poultice on rheumatic joints.

The root is anodyne, diaphoretic, diuretic, emetic, expectorant and purgative. It has been used in the treatment of asthma, kidney stones and venereal disease [13].

The stem has a good quality of fibre and carbohydrate which can also be obtained from the inner bark of stems, it is long and quite strong, but brittle. It can be used in making twine, cloth, paper etc [13].

From table 2: the proximate analysis of the *Asclepias syriaca* revealed a crude protein of 31.35%, carbohydrate content of 11.50%, moisture content of 2.30% and a crude fat of 14.85% [8]. From this analysis the plant proves to be highly nutritious, rich in protein, carbohydrate and fats. It can be explored as a vegetable [14], but this is subject to toxicological studies on the plant.

4.2 Conclusion

In view of the numerous acclaimed uses ascribed to *Asclepias syriaca* the plant leaves were screened for phytochemicals and proximate contents. The leaf sample was found to contain

Tannin, Saponin and Glycoside in a considerable amount, as well as Alkalloid and Phenol at low concentration. Most of the phytochemicals above have been documented to possess antimicrobial properties. The proximate analysis result also revealed the presence of protein, fat and carbohydrate in adequate amount. From the results of this study, *Asclepias syriaca* can be seen as a potential candidate to provide a cheap and readily available remedy for many ailments, as well as having nutritive values that could recommend it as a nutritive vegetable in homes.

4.3 Recommendation

While recommending the plant *Asclepsias syriaca* for the treatment of various infections, as well as a rich delicacy vegetable, a toxicological study of the plant is equally recommended to ascertain its safety.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Stevens, Michelle. "Plant guide for common milkweed (*Asclepias syriaca*)" (PDF). United States Department of Agriculture: Natural Resources Conservation Service: National Plant Data Center. 2021;5:1-3
2. Duke JA. Medicinal plants of the world. Computer index with more than 85,000 entries. Handbook of Energy Crops. 1983;3:1.
3. Erica EG. The history and use of milkweed (*Asclepiassyriaca*) Economic botany. 1979;33(2):119-123.
4. World Health Organisation WHO. WHO guideline for the assessment of herbal medicines. WHO Expert Committee on specification for pharmaceutical preparation. Technical Report series N° 863.World Health Organisation, Geneva; 1996.
5. Maikenti JI, Egah RG, Adogo LY and Koggie AZ. Isolation and Antifungal Effects of Plants Extracts on Malassezia species Isolated from Scalps of Primary School Pupils and Bingham University Students. Annual Research & Review in Biology. 2021;36(1):36-43.
6. Akrourn S, Satta D, Lalaoui K. Antimicrobial, Antioxidant and Cytotoxic Activity and Phytochemical screening of some Algerian Plants. European Journal of Scientific Research. 2009;31(2):289-295.
7. Trease GE, Evans WC. Pharmacognosy. 15th Ed. London: Saunders Publishers; 2002;42–44,221–229, 246–249, 304–306,
8. Association of Official Analytical Chemists AOAC. Official Methods of Analysts of the Association of Official Analytical Chemists.2nd Vol 15ed. Washington DC; 2004.
9. Phillipson JD, O'Neill MJ. New leads to the treatment of protozoal infections based on natural product molecules. Acta Pharmaceutical Nordica. 1987;1:131–144.
10. Stern JL. Hagerman AE, Steinberg PD and Mason PK. Phlootannin-protein interactions. Journal of Chemical Ecology. 1996;22:1887–1899.
11. Rajakaruna, N, Harris SC, Towers GHN. Antimicrobial Activity of Plants Collected from Serpentine Outcrops in Sri Lanka. Department of Botany, University of British Columbia, Vancouver, Canada. Pharmaceutical Biology. 2002;3(40):235-244.
12. Anarosu EA. Asclepias syriaca, an underexploited industrial crop for energy and chemical food stuff. Romanian Biotechnological Letters. 2011;16(6).
13. Bhowmilk PC. Biology and control of common milkweed (*Asclepias syriaca*) Weed science society of America. 1994;6:227-250.
14. Brower LP. Ecological Chemistry Science American Journal. 1969;220**:**22-29.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/83776