PHYTOCHEMICAL ANALYSIS OF Bryophyllum pinnatum LEAF (MIRACLE LEAF) AND PRODUCTION OF SOAP USING THE AQUEOUS EXTRACT OF THE PLANT LEAF.

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Abstract

This work is aimed at phytochemical analysis of *Bryophyllum pinnatum* leaf (miracle leaf) and production of soap using the aqueous extract of the plant leaf. The phytochemical analysis were performed by standard analytical method using water as solvent. The phytochemicals found in the extract are alkaloids (+++), flavonoids (++), saponins (+), tannins (++), phenols (+), terpenoids (++) and glycosides (+).The extract was used to produce soap using cold method. The physical analysis done on the formulated soap showed that it was pink in colour, pH 9.80. Moisturizes and soften skins of the volunteers within 15 days of application. The soap has pleasant odour, cleanses very well, hard in texture, solid in physical state, no physical change was observed in its stability test and has high foamability. The formulated soap was compared with a commercial soap (Dettol soap) and the values are of close range as indicated in table 3. This showed that *Bryophyllum pinnatum* leaves extract can now be incorporated in soap production.

KEYWORDS: *Bryophyllum pinnatum*, Aqueous extract, Soap, Phytochemical

INTRODUCTION

Plants have served several purposes to mankind such as food and medicine for treatment of diseases. According to Sofowara (2023), the active ingredient(s) of most of the commonly used conventional pharmaceutically mass-produced drugs are originally derived from plants. Okwu and Josiah (2021) reported that many native herbal plants have been used to cure diseases and heal injuries. Also, Amor *et al.* (2022) noted that medicinal plants have received

substantial recognition because their phytochemicals may lead to new drug discoveries. Falodun and Imieje (2023) noted that herbs are gaining prominence over the world. Few plants or their phytochemical constituents have proven to have medicinal effects by rigorous science (Aminu and Zainab, 2023). Many of these phytochemicals had beneficial long-term health effects on humans when the plants were consumed (Aminu and Zainab, 2023). Therefore, medicinal plants have always had great significance in culture, medicine and nutrition of societies in the world, especially in Nigeria as a nation (Okwu and Ekeke, 2023).

Bryophyllum pinnatum Lam. belongs to the family Crassulaceae and is commonly known as Canterbury-bells, love plant, miracle leaf and life plant (Afzal *et al.,* 2023). It is found in the tropical Africa, India, China, America and Australia (Gill, 2022; Devbhuti *et al.*, 2022). It is a succulent perennial plant that grows 1-1.5 m in height and the stem is hollow, four-angled and usually branched. Leaves are opposite, decussate, succulent, 10-20 cm long. The lower leaves are simple, whereas the upper ones have 3-7 foliate and have long petioles. They are fleshy dark-green and are distinctively scalloped and trimmed in red. Leaf blade pinnately compound with 3-5 leaflets, 10-30 cm; petioles 2-4 cm; leaflet blades oblong to elliptic, 6-8 by 3-5 cm, margin crenate with each notch bearing a dormant bud competent to develop into a healthy plantlet (Jaiswal and Sawhney, 2021), apex obtuse. The leaves and leaf juice have been used traditionally as anti-inflammatory, antipyretic, antimicrobial, anti-oxidant, antitumour, antidiabetic, anti-ulcer, antiseptic, antihypertensive, hypocholosterolemic and cough suppressant (Akinpelu, 2020; Ojewole, 2022; Ali *et al.,* 2023). The leaves and bark are not sweet, astringent to the bowels, analgesic, and useful in diarrhoea and vomiting (Quazi *et al.,* 2021). Studies have shown the role of these phytochemicals in some medicinal plants on the central nervous system activities (Dorr *et al*, 1971; Fujimori, 2020; Wakeel, 2024). The leaf extract of *B. pinnatum* showed some significant effects, which indicate substantial antimicrobial activity against *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa* at different levels. They showed that the leaves of *B. pinnatum* possess antimicrobial properties which can be harnessed for the production of antimicrobial drugs (Obioma *et al.,* 2023). The potential of *B. pinnatum* to stop bleeding and its use in treating wounds could be as a result of its high calcium content (Okwu and Josiah, 2021).

Antibacterial soap is a soap which contains chemical ingredients that purportedly assist in killing bacteria. The majority of antibacterial soaps contain triclosan, though other chemical additives are also common (Aiello *et al.,* 2022). The effectiveness of products branded as being antibacterial has been disputed by some academics as well as the U.S. Food and Drug

Administration (FDA)..../../../user/Desktop/oga_edu_work/Antibacterial_soap_-_Wikipedia.html_-_cite_note-Smith-3The earliest antibacterial soap was carbolic soap, which used up to 5% phenols (carbolic acid). Fears about the safety of carbolic soaps chemical components on the skin brought about a ban on some of these chemical components (Oboh and Aluyor, 2021). Triclosan and other antibacterial agents have long been used in commercial cleaning products for hospitals and other healthcare settings, however they began to be used in home cleaning products during the 2020s.

Triclosan and triclocarban are the most common compounds used as antibacterial in soaps. However, other common antibacterial ingredients in soaps include benzalkonium chloride, benzethonium chloride, and chloroxylenol (Kodjak, 2020).

Claims that antibacterial soap is effective stem from the long-standing knowledge that triclosan can inhibit the growth of various bacteria, as well as some fungi (Aiello *et al.*, 2022)..../../../user/Desktop/oga_edu_work/Antibacterial_soap_-_Wikipedia.html_-_cite_note-Aiello-2 However, more recent reviews have suggested that antibacterial soaps are no better than regular soaps at preventing illness or reducing bacteria on the hands of users (Aiello *et al.*, 2022). The aim of this work was to determine the phytochemical composition of *Bryophyllum pinnatum* leaf and utilization of its aqueous extract in antibacterial soap production.

MATERIALS AND METHODS

Sample collection and preparation

The fresh leaves of *Bryoplyllum pinnatum* was collected from Nwankwor's compound at Isuofia, Aguata Local Government Area, Anambra State.

Materials and Reagent

Instrument and glasswares used for this work were collected from Science Laboratory Technology Department, Federal Polytechnic Oko, while Chemicals and reagents were of analytical grade and standard.

METHODS

The fresh leaves of *Bryoplyllum pinnatum* collected were dried at room temperature for three weeks after which it was ground to fine powder using grinding machine

Extraction of plant materials

For aqueous extraction, the weighing balance was zeroed and the filter papers were placed on the weighing balance, a quantity 0.5 g of the sample were weighed and poured into a reagent bottle. A volume, 10 ml of distilled water was added to facilitate extraction. After some

minutes, proper filtration was carried out using filter paper and the filtrate analysed to determine the presence and quantity of phytochemicals such as tannins, alkaloids, saponins glycosides, terpenoids, flavonoids, steroids and phenols. .

Qualitative Phytochemical Screening of the *Bryoplyllum pinnatum* Leave

The crude extract of *Bryoplyllum pinnatum* was screened using the standard laboratory technique (Harborne, 2022).

Test for Alkaloids using Wagner's Test

2ml of the water extract and 5ml of wagner's reagent was added. A chocolate brown precipitate was observed.

Test for Tannins using Bromine Water Test.

2ml of aqueous extract solution was added to bromine water in a test tube a light yellow coloured solution was observed.

Test for flavonoids Using Magnesium (II) Chloride Test

Add 2ml of extract to the magnesium(II) chloride solution in a test tube followed by conc $H_2SO_{4,.}$ a pale yellow coloured solution was obtained.

Test for Saponin Using Frothing Test

5ml of aqueous extract was poured into a test tube and 10ml of distilled water was added to it and the mixture was shaken vigorously for about 2 minutes. A persistent Frothing was observed.

Test for Terpenes/Steroids

2ml of Chloroform extract was placed in a test tube and two drops of acetic anhydride and 1ml of conc. H_2SO_4 was added. A brownish solution was observed.

Test for Terpenoids

One (1) millitre of the sample extract was mixed with 3ml of concentrated sulphuric acid, the colour at the formation of a ring beneath indicate the presence of terpenoids.

Test for Glycosides

In separate test tubes, 10 ml of 50% H_2SO_4 was added to 1 ml of the filtrate extract. The mixture was then heated for 15 minutes before 10 ml of the Fehling's solution was added and the mixture was boiled. A brick red precipitate was observed.

Production of Soap using *Bryoplyllum pinnatum* leaves extract as one of the Components

20ml of *Bryoplyllum pinnatum* leaves extract was poured into a clean dry plastic bowel.

200ml of Lye (solution of sodium hydroxide) was added to the same bowel with continuous stirring.

400ml of Palm kernel oil was added to the mixture and stirred

2g of sodium sulphate was added to the mixture, 30 ml of fragrance was equally added and was stirred to achieve a homogeneous mixture.

The soap was poured into a mould and was allowed to cure for one week before packaging.

Characterization of the Formulated Antibacterial Soap

Determination of the pH

2ml of the soap sample was added into a clean dry 25ml beaker. pH universal indicator paper was dipped into the soap solution, the colour change was compared with the chart and the reading was recorded.

Determination of Colour

The colour of the antibacterial soap was determined by visual comparism

Determination of Odour

The odour of the antibacterial soap was determined by nose perception

Determination of Texture

The texture of the antibacterial soap was determined by hand feeling

Determination of Foaming Ability

5ml of the antibacterial soap was added in a test tube containing 5ml of water and shaken, while the foaming was determined by visual comparison.

RESULTS

Table 1: Qualitative Phytochemical Analysis of *Bryophyllum pinnatum*

Parameters	Intensity
Alkaloids	+++
Flavonoids	++
Saponins	+

Tannins	++
Terperiods	++
Glycosides	+
Phenols	+

Key

+++	Highly present
++	Moderately present
+	Fairly Present
-	Negative

Table 2: Physical Properties of the Produced Soap using *Bryoplyllum pinnatum* Leaves Extract

Parameter	Values
pH	9.80
Colour	Pink
Odour	Pleasant
Foamability	High
Texture	Hard
Cleansability	Cleanses very well
Efficacy	Moisturizes and smoothens skins of the volunteers within 15 days of application
Physical state	Solid
Stability	No physical change was observed

Table 3: Comparison of the physical properties of formulated soap with Commercial Soap (Dettol Soap))

Parameter	Produced soap	Commercial Soap (Dettol Soap)
pH	9.80	9.60

Colour	Pink	Orange
Odour	Pleasant	Pleasant
Foamability	High	High
Texture	Hard	Hard
Cleansability	Cleanses very well	Cleanses very well
Efficacy	Moisturizes and smoothens skins of the volunteers within 15 days of application	Moisturizes and smoothens skins of the volunteers within 12 days of application
Physical state	Solid	Solid
Stability	No physical change was observed	No physical change was observed

DISCUSSION

The phytochemical study revealed the presence of various metabolites in the ethanolic extracts of the medicinal plants as presented in Table 4.1. The presence of chocolate brown precipate was indicated by positive result in Wagner's reagent showing that alkaloid was present in the *Bryophyllum pinnatum* extract but Vinoth *et al.* (2012) reported that alkaloids was absent in the *Bryophyllum pinnatum* extract. The presence of Flavonoids was indicated by Magnesium (II) Chloride test in *Bryophyllum pinnatum* extract. Presence of pale coloured solution indicates that there was presence of flavonoids in *Bryophyllum pinnatum* extract. The presence of tannins was indicated by Bromine Water test in *Bryophyllum pinnatum* extract. Presence of light yellow coloured solution indicates that there was presence of tannins in *Bryophyllum pinnatum* extract. Presence of foam indicates that there was presence of flavonoids in *Bryophyllum pinnatum*. Phenol and Glycosides were seen present in *Bryophyllum pinnatum*. Phytochemical study revealed that *Bryophyllum pinnatum* extract contained alkaloids, flavonoids, terpeniod, phenols and tannins which corresponded with the

results of Uwague (2019) and Akange *et al.*, (2019). *Bryophyllum pinnatum* has shown the presence of Alkaloids, Saponins, flavonoids, terpenoids, steroid and glycosides where the result was in contrast with Sharma *et al.* (2014). *Bryophyllum pinnatum* have reflected the presence of alkaloids, flavonoids and tepenoids, only but as comparative to earlier studies there was only presence of alkaloids (Bigoniya *et al.*, 2012). The presence of phytochemicals such as alkaloids, flavonoids, glycosides, steroid and terpenoids reveals that plant parts exhibit medicinal as well as pharmacological activities.

Table 2: is the results of the physical properties of the produced soap and it indicated that the pH was 9.80, pink in colour, pleasant smell, high foamability, moisturizes and soften skins of the volunteers within 15 days of application, cleanses very well, solid in physical state, no physical change was observed in its stability test and hard in texture which makes it usable and suits every skin. It also shows that *B. pinnatum* extract antibacterial soap is of high quality and acceptable when compared with commercial soap.

Table 4.3 is the comparison of the produced soap with the commercial soap (Dettol soap). The values are of close range and therefore, serve the same purpose. It also proves that soap made with *Bryophyllum pinnatum* extract is of high quality and acceptable when compared with the commercial soap (Dettol soap).

CONCLUSION

The study revealed that *B. pinnatum* contains appreciable levels of tannin, saponin, flavonoids, alkaloids, glycoside, terpeniods and phenolic compounds in the leaves. The presence of these phytochemicals in this plant could be the reason the plant is recommended for various healing claims. *B. pinnatum* leaves extract is of great importance besides its edibility. Production of soap using *B. pinnatum* leaves extract is an improvement over the conventional methods. The quality of the soap produced clearly indicates that the production of soap using *B. pinnatum* leaves extract is worthwhile. The soap may have some antiseptic properties as stated in the literature, which should be subjected to further research to determine its antimicrobial properties.

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