

Phytochemical Evaluation Of Selected Nigerian Medicinal Plants

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Abstract: *Momordica charantia*, *carica papaya* and *palisota hirsuta* leaves are often used for some medicinal purposes in traditional medicine in Nigeria. The chemical compositions of the leaves were investigated using standard analytical methods. Powdered samples of the leaves were extracted with water and ethanol respectively in order to isolate the required phytochemicals. Phytochemicals like alkaloids, tannins, flavonoids, saponins, steroids and cardiac glycosides were found present in all the leaves except saponins not present in the leaves of *Palisota hirsuta*. The study indicated the presence of chemical components that have medicinal values. Hence the results obtained in this study supported the use of *momordica charantia*, *carica papaya* and *palisota hirsuta* leaves in herbal medicine. Therefore the leaves can be further purified and used for herbal treatment of various diseases and as a potential source of useful elements for drugs formulation.

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Introduction

The World Health Organization (WHO) recognized traditional medicine or herbal medicine about 20 years ago and started exploring the possibilities to improve or popularize the herbal medicine already used by the people in developing countries of the world for thousands of years (Ali et al, 2011). Plant-derived substances have recently become of great interest owing to their versatile applications. Medicinal plants are the richest bio resource of drugs of traditional systems of medicine, modern medicines, nutraceuticals, food supplements, folk medicines, pharmaceutical intermediates and chemical entities for synthetic drugs (Ncube et al 2008). The medicinal value of these plants lies in some chemical substances that produce a definite physiological action on the human body. The most important of these bioactive constituents of plants are alkaloids, tannins, glycosides, saponins, flavonoids, and phenolic compounds. However, many of these indigenous medicinal plants are used as spices and food plants. They are also sometimes added to foods meant for pregnant and nursing mothers for medicinal purposes (Edeoga, 2005).

Momordica charantia (bitter melon) is a tropical and subtropical vine of the family cucurbitaceous widely grown in India, south Asia, China, Africa and the Caribbean. Bitter melon as fondly called has been implicated experimentally to achieve a positive sugar regulatory effect by suppressing the neural response to sweet taste stimuli and also keep the body functions operating normally. Other use of the plant include to expel intestinal gas, for tumors, wound treatment, rheumatism, malaria, vaginal discharge and the seeds

are used to induce abortion . A tea preparation from the leaf is used for diabetes. In Nigeria, Ghana and India peninsula, the root of the plant is used as an abortifacient together with the fruit as well as an ingredient in aphrodisiac preparation. The young fruits and shoots are reported to serve as supplementary or emergency food in some part of West Africa, and an effective emmenagogue to facilitate child birth in Ivory Coast (Burkil, 1985). *Carica papaya* Linnaeus, (pawpaw), belongs to the family of Caricaceae. Papaya is not a tree but an herbaceous succulent plants that possess self supporting stems. *Carica papaya* plants produce natural compounds in leaf bark and twig tissues that possess both highly anti-tumour and pesticidal properties. It was suggested that a potentially lucrative industry based simply on production of plant biomass could develop for production of anti-cancer drugs, pending Food and Drug Agency approval, and natural pesticides. The high level of natural self-defence compounds in the tree makes it highly resistant to insect and disease infestation. *Carica papaya* L. leaf tea or extract has a reputation as a tumour-destroying agent. The papaya fruit, as well as all other parts of the plant, contain a milky juice in which an active principle known as *papain* is present. Aside from its value as a remedy in dyspepsia and kindred ailments, it has been utilized for the clarification of beer. The juice has been in use on meat to make it tender. The seed is used for intestinal worms when chewed. The root is chewed and the juice swallowed for cough, bronchitis, and other respiratory diseases. The unripe fruit is used as a remedy for ulcer and impotence (Ayoola and Adeyeye, 2010). *Palisota hirsuta* K. Schum, known locally in Ghana as

somenini is one of such plants. It is a robust herb found in forest re-growths and is about 2 - 4 m high. Different parts of the plant are used for various conditions. The roots are used to treat dysentery, anemia and rheumatism. Whole plant is used as an analgesic and antiseptic, a leaf decoction for colic, juice of roasted leaves for ear ache, roots to hasten expulsion of placenta after childbirth, roots as enema for stomach pains and indigestion, and the powdered roots for gonorrhoea. Apart from work on the anti-viral properties, not much has been reported on this plant (Boakye-Gyasi et al, 2008).

Despite extensive applications of these plants in traditional medicine, little information is available on their phytochemical constituents. The prevailing situation has provoked us to analyze the bioactive plants with reference to the selected medicinal plants in this study. Thus, this work is aimed to investigate the phytochemical composition of these plants.

Collection of Material

Fresh leaves of *momordica charantia*, *carica papaya* and *palisota hirsuta* leaves were harvested between June and August, 2013, from a home garden at Auchi, Etsako West LGA, Edo State, Nigeria. The plant was identified and authenticated by the Department of Botany, Ambrose Alli University Ekpoma, Edo State, Nigeria. The leaves were sorted out to eliminate all bad materials. The leaves were dried in a hot air oven (SD 93114624, Gallenkamp, United Kingdom) for five days at 40°C and were further processed and kept until required (Odetola and Akojenu, 2000).

Sample Preparation

The dried matter obtained was ground to a fine powder and stored at 5°C in air-tight containers prior to further analysis (Sofowora, 2006).

Preparation of Aqueous and Ethanol Extracts

Twenty grams of the dried powdered sample was soaked in 250 ml of distilled water contained in a 500 ml flask. The flask was covered with cotton plug and then wrapped with aluminium foil and shaken vigorously at 3 h interval for 48 h at room temperature. After 48 h, the crude extract was shaken vigorously and filtered using a muslin cloth and then Whatman No. 1 filter paper. The filtered samples were sterilized by passing through Millipore filter and then evaporated to dryness using rotary evaporator set at 40°C temperature. The percentage yield of the extract obtained was 13.4%. The concentrated extract was stored in airtight sample bottle until required. Similar procedure was repeated with ethanol for the preparation of ethanol extracts (Mada et al, 2013).

Phytochemical Screening

The analysis for tannin, saponins, cardiac glycosides, flavonoid, steroids and alkaloids were

carried out according to standard methods, (Sofowara, 1993; AOAC 1980).

(i) Test for alkaloids

To 0.1ml of the extract and fractions in a test tube, 2 – 3 drops of Dragendoff's reagent was added. An orange red precipitate with turbidity denoted the presence of alkaloids.

(ii) Test for flavonoids

To 4mg/ml of the extracts and fractions a piece of magnesium ribbon was added followed by drop-wise addition of concentrated HCl. A colour change from orange to red indicated the presence of flavones; red to crimson indicated the presence of flavonoids.

(iii) Test for glycosides

Ten milliliters of 50% H₂SO₄ was added to 1ml of the filtrate in separate test tubes and the mixtures heated for 15mins followed by addition of 10ml of Fehling's solution and boiled. A brick red precipitate indicated presence of glycosides.

(v) Test for saponins

Half gram of the powdered leaf was dispensed in a test-tube and 5.0ml of distilled water was added and shaken vigorously. A persistent froth that lasted for about 15 minutes indicated the presence of saponins.

(vi) Test for steroids

Two milliliters of the extracts were evaporated to dryness in separate test tubes and the residues dissolved in acetic anhydride followed by addition of chloroform. Concentrated sulphuric acid was added by means of a pipette via the side of the test tubes. Formation of brown ring at the interface of the two liquids and violet colour in the supernatant layer denoted the presence of steroids.

(vii) Test for tannins

Two milliliters of the extract/fraction was diluted with distilled water in separate test tubes, 2 – 3 drop of 5% ferric chloride (FeCl₃) solution was added. A green – black or blue colouration indicated tannin.

Result

Table 1.

Discussion

The presence of secondary metabolites such as alkaloids, saponins, tannins, glycosides, flavonoid, steroid and cardiac glycosides in the plant leaves may contribute to their medicinal value. Some of these compounds are well documented to exhibit hypoglycaemic activity in animals. Saponins inhibit Na⁺ efflux leading to higher Na⁺ concentration in cells, thereby activating a Na⁺- Ca²⁺ antiport (Schneider and Wolfing, 2004). This effect produces elevated cytosolic Ca²⁺ which strengthens the contraction of the heart muscle and thereby reducing congestive heart failure (Schneider and Wolfing, 2004). The protective and metabolic role of alkaloids

in animals has been documented (Edeoga and Eriata, 2001). The plant is used by the orthodox doctors in some parts of Nigeria to cure diarrhea, further work will therefore include the investigation of the anti-diarrhoeal effects of the leaf extract of plant. Thus, phytochemical screening of the leaves extract of the plants revealed the presence of saponins, steroids, tannins, glycosides, alkaloids and flavonoids in both water and ethanol extracts (Table 1). These compounds are known to be biologically active and therefore aid their antimicrobial activities. These secondary metabolites exert antimicrobial activity through different mechanisms. For instance, tannins have been found to form irreversible complexes with proline rich protein resulting in the inhibition of cell protein synthesis. (Bakare et al, 2010) reported that tannins are known to react with proteins to provide the typical tanning effect which is important for the treatment of inflamed or ulcerated tissues. It was also reported that tannins are used for treating disorders such as diarrhea and dysentery. These observations therefore support the use of the leaves in curing some

ailments caused by the tested bacteria. Alkaloids were also detected in the leaves of *M. Charantia*, *C. Papaya* and *P. hirsuta*; alkaloids are toxic against cells of foreign organisms. These activities have been widely studied for their potential use in the elimination and reduction of human cancer cell lines. Bakare et al, (2010) reported the inhibitory effect of saponins on inflamed cells and this has supported the usefulness of this plant in managing inflammation. Quinlan et al. (2000) worked on steroidal extracts from some medicinal plants which exhibited antibacterial activities on some bacterial isolates. Neumann et al. (2004) also confirmed the antiviral property of steroids. Similarly flavonoids were also reported to exhibit antimicrobial, anti-inflammatory, anti-angiogenic, analgesic, anti-allergic, cytostatic and antioxidant properties (Bakare et al, 2010). The presence of these secondary metabolites in the leaves of *M. charantia* has justified the claim by the local communities in Auchi and environs for the use of this plant in the treatment various ailments.

Table 1: Phytochemical screening of *momordica charantia* leaf, *carica papaya* leaf and *palisota hirsuta* leaf.

Constituents	<i>M. charantia</i> extr	<i>C. Papaya</i> extr	<i>P. hirsuta</i> extr	Water Ethanol	Water Ethanol	Water Ethanol
Alkaloid	+	++	-	++	-	-
Tannins	+++	+++	+	+++	+++	+++
Saponins	+++	+	+	-	-	-
Flavonoids	+	++	+	+++	+	++
Glycosides(cardiac)	+	-	-	-	++	+
Steroids	+	+++	-	++	-	++
Terpenoids	++	+	-	-	-	+
Phlobatanins	+	-	+	-	-	-

+ = present in low concentration ++ = present in moderate concentration +++ = present in high concentration - = below detectable limit

The Phytochemical analysis of the *carica papaya* leaves (Table 4.1) showed that the leaves contained saponins, cardiac glycosides, and alkaloids. The presence of saponins supports the fact that pawpaw leaf has cytotoxic effects such as permealization of the intestine as saponins are cytotoxic, (Bakare et al 2010). It also gives the leaves the bitter taste. Another important action of saponins is their expectorant action through the stimulation of a reflex of the upper digestive tract. Alkaloids are the most efficient therapeutically significant plant substance. They show marked physiological effects when administered to animals. The presence of alkaloids in the leaves shows that these plants can be effective anti-malaria, since alkaloids consist of quinine, which is anti-malaria. The cardiac glycosides therapeutically have the ability to increase the force and power of the heart-beat without increasing the amount of oxygen needed by the heart muscle. They can thus increase the efficiency of the

heart and at the same time steady excess heart beats without strain to the organ (Bakare et al, 2010).

Conclusion

This investigation found that *M. Charantia*, *C. Papaya* and *P. hirsuta* leaves contain secondary metabolites such as alkaloids, tannins, steroids, saponins, flavonoids and glycosides which could be responsible for the antimicrobial activity observed. We concluded that *Momordica charantia*, *C. Papaya* and *P. Hirsuta* are a potential herb in the world.

Recommendation

In view of the results obtained in this work, it is recommended that further work should be to:

- Isolate and identify the active compound(s) present in the ethanol extract and fractions.

- Determine the toxicity level of both crude extract and the active compound(s).
- Screen more plants view of finding alternative treatments to microbial infections.
- Further studies are required to find many more activities of this plant.
- Cultivate these plants for both medicinal benefits. This will help to reduce cost of expenses on drugs and increase the social economic well-being of the populace.

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