Comparative Phytochemical Screening of Three (3) Medicinal Plant Leaves

Danjuma Amos Bako & Osuagbalende Adamu Jonah
College Of Agriculture, Basic Science,
Lafia, P.M.B 033, Nigeria.
chillabako@yahoo.com, adamujonah25@yahoo.com

ABTRACTS
Three (3) plant samples of carica papaya, psidium guajava and moringa oleifera leaves were randomly collected from staff quarters in college of agriculture Lafia, Nasarawa State, Nigeria and analysed for the phytochemical composition using ethanolic and water extract. The phytochemical analyzed reveals the presence of bioactive compounds anthraquinones, terpenoids, flavanoids, saponins, tannins, alkanoids and cardiac glycoside. Alkanoids, glycoside were presents in ethanolic extracts, anthraquinones, terpenoids, flavonoids, tannins were presence in water extracts in all the plant samples while sopanin is completely absent. The results showed that all the plant samples were rich source of phytochemicals, useful source of food and drug items and for the treatment and prevention of certain chronic diseases. It is also known to have beneficial uses in industries and medical sciences and also exhibit physiological activity.

Keywords: *Phytochemical; medicinal; therapeutic measures.*

INTRODUCTION

Plants are being used as valuables sources of food and medicine for the prevention of illness and maintenance of human health. Medicinal plants are cheap and renewable sources of pharmacologically-active substances and are known to produce certain chemicals that are naturally toxic to bacteria (Basile *et al.,* 1999). The uses of medicinal plants as possible therapeutic measures have become a subject of scientific investigation (Patward Han and Vaidya, 2004).

Some medicinal plants are believed to enhance the natural resistance of the body to infections due to their presence of polysaccharides and saponins (Atal et al, 1986). According to World Health Organization (WHO), more than 80% of the world's population relies on traditional medicines for their primary health care needs (Andy *et al,* 2008). The medicinal value of plants lies in some chemical substances that produce a definite physiological action on human body. The most important bioactive compounds plants are alkaloids, flavonoids, tannins and phenolic compounds. The phytochemical research based on ethno pharmacological information is generally considered an effective approach in the discovery of new anti-infective agent from higher plants (Duraipandiya *et al,* 2006).

In Northern Nigeria, many indigenous plants are widely consumed as food or home remedies especially in treatment or management of common diseases. The importance of plants in

medicine remain even of greats relevance with current global shift to obtain drugs from plant sources, as a result of which attention has been given to the medicinal value remedies for safety, efficacy and economy (Glombitza et al, 1993). Medicinal plants such as Moringa *oleifera* is continually being utilized as therapeutic agents in formulations for treating diseases in the traditional ethromedical system in Northern Nigeria.
However, environment, atmosphere, pollution soil, harvesting and handling are some of the factors which many play important roles in contamination at medicinal plants by metals and microbial growth (Ajasa, et al, 2004). The World Health Organization in a number of resolutions emphasized the need to ensure the quality control of plants products by using modern techniques and applying suitable standard (WHO, 1992).

Moringa oleifera and other plants products were reported to have beneficial compounds and conclusion was made to investigate the plants as a phototherapeutic agent to combat infectious agents. Moringa plants also contain minerals and fatty acids which are beneficial in promoting health (Ogbe and John, 2011). Most parts of the plants have been used in Folk medicine in African and South Asia (Fahey, 2005). Commercially, it is used as an additive in goods and as a Thickener in soft drinks and in the manufacture of pharmaceuticals; and was said to significantly increase beneficial bacterial flora in healthy human volunteers in a dose – dependent manner (Calame et al, 2008).

Psidium guajava is a small tree in myrtaceae family, traditionally used in treatment of several diseases (inflammation, diabetes, hypertension, wounds, pain and fever). The pharmacological actions and the medical uses of guava leaves in folk medicine include the treatment of various types of gastrointestinal disturbances such as vomiting, diarrhea, inhibition of the peristaltic reflex, gastroenteritis, spasmolytic activity, abdominal distention, flatulence and gastric pain (Lutterodt, 1992). The leaves contain various constituents such as fixed oil 6.0%, volatile oil 0.36% 3.15% resin, 8.50% tannin, fat, cellulose, chlorophyll and mineral salts and a number of other fixed substances (Burkill, 1997).
Walter, 2008 reported that the *carica 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. The juice has been in use on meat to make it tender, (Wilson, 1974). 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 remedy for ulcer and impotence (Elizabeth, 1994). It is in view of the above that this research was carried out to determine and compare the phytochemicals present in the three (3) plant leaves and help in determining its medicinal value which may be useful in traditional and pharmaceutical industries.

MATERIALS AND METHOD

(a) Description of the Study Area

The plants samples were carefully collected at staff quarters in College of Agriculture Lafia, Nasarawa State. The research was carried out in the month of July to September, 2015. Lafia is the Nasarawa State Capital in North central Nigeria. Lafia is located with the Guinea Savannah ecological zone on 0.8^0 N and longitude 0.8^0 E of the Greenwich meridian. Lafia is known for its agricultural activities mainly the production of yam, maize, millet, melon, rice, cassava, groundnut and rearing of domestic animals. It has an annual mean temperature of 32^oC, with a maximum temperature of 35^oC and minimum temperature of $21 – 24^oC$ annually.

The mean annual rain distribution in Lafia is 101.6cm – 127cm with temperature of 21 – 24^{o}C. It is bounded by Obi Local Government Area in the South, Doma Local Government Area in the west, Nassarawa Eggon Local Government Area in the north and Quanpan Local Government Area of Plateau State in the East. The Local Government Area has a land area of about 27, 373km and the main occupation of the city dwellers are farming, rearing of animals and trading.

(b) Collection and extraction of plant materials

The plant materials (leaves) of moringa oleifera, carica papaya and psidium guajava were handpicked randomly at different locations. They were washed and air dried at room temperature (26^0C) for two (2) weeks, after which it was grinded to a uniform powder using mortar and pistle in the Laboratory as described by Mukhtar and Tukur (1999). The ethanol extracts were prepared by soaking 100g each of the powdered plant materials in 1L of ethanol and 100g of the dried powder plant materials in 1L of water at room temperature for 48 hrs. The mixture were filtered through a filter paper No. 42 (125mm) and then through cotton wool placed in a separating funnel and allow to separate both the ethanol and water before collection in separate beakers. The extracts were concentrated using a rotary evaporator with a water bath set at 40^0C. The percentage yield of extracts ranged from 4-5.7% w/w.

(c) Phytochemical screening

(i) Test for anthraquinones

To 0.5g of the extracts was boiled with 10ml of sulphuric acid (H_2S0_4) and filtered while hot. The filtrate was shaken with 5ml of chloroform. The chloroform layer was pipette into another test tube and 1ml of dilute ammonia was added. The resulting solution was observed for coloured changes.

(ii) Test for terpenoids

Four milligrams of extract was treated with 0.5 ml of acetic anhydride and 0.5 ml of chloroform. Then concentrated solution of sulphuric acid was added slowly and red violet color was observed for terpenoids.

(iii) Test for flavonoids

4ml of extract solution was treated with 1.5 ml of 50% methanol solution. The solution was warmed and metal magnesium was added. To this solution, 5-6 drops of concentrated hydrochloric acid was added and red color was observed for flavonoids and orange color for flavones.

(iv) Test for saponins

Saponins were detected using the froth test. 1g of the sample was weighed into a conical flask in which 10ml of sterile distilled water was added and boiled for 5 minutes. The mixture was filtered and 2.5 ml of the filtrate was added to 10 ml of sterile distilled water in a test tube. The test tube was stoppered and shaken vigorously for about 30 seconds. It was the allowed to stand for half an hour. Honeycomb froth indicated the presence of saponins.

(v) Test for tannins

To a portion of the extract diluted with water, 3-4 drops of 10% ferric chloride solution is added. A blue colour is observed for gallic tannins and green colour indicates for catecholic tannins.

(vi) Test for alkaloids

2ml of extract was measured in a test tube to which picric acid solution was added. An orange coloration indicated the presence of alkaloids

(vii) Test for glycosides

25ml of dilute sulphuric acid was added to 5ml extracts in a test tube and boiled for 15 minutes, cooled and neutralized with 10% NaOH, then 5ml Fehling solution added. Glycosides are indicated by a brick red precipitate.

RESULTS AND DISCUSSION

Both the water and ethanolic extracts of the plant materials were obtained and measured in percentage weight per weight. 100g of moringa oleifera, psidium guajava and carica papaya yield 4.00% w/w and the ethanoic extract yield 5.7% w/w.

Weight of powder plant materials = 100g
Weight of extracts = 4g
Percentage yield of water extract

$$\frac{4}{100} \times 100\% = 4\%\ w/w$$

Weight of powder plant materials = 100g
Weight of extracts = 5.7g
Percentage yield of ethanolic extracts

$$\frac{5.7}{100} \times 100\% = 5.7\%\ w/w$$

The phytochemical tests performed were of qualitative type. The water and ethanoic extracts were evaluated for the presence of the following metabolites: anthraquinones, terpenoids, flavonoids, soponins, tanins, alkaloid and cardiac glycoside.

The findings of phytochemical investigation results were depicted in the respective tables. Table 1, 2 and 3 presents the results of phytochemical analysis of carica papaya, moringa oleifera and psidium guajava leaves in ethanolic and water extracts while table 4 and 5 presents the results of the comparative analysis of the three (3) plants samples. It was observed that all the plant samples contain alkanoids and glycosides in ethanolic extract and anthraquinones, terpenoids, flavonoids, tannins in water extract while saponins is compleletly absent in all the samples in water extract. Moringa oleifera leaves water extract shows the presence of anthraquinones, terpenoids, flavonoids, tannis, alkaloids and cardiac glycoside while carica papaya and psidium Guajava shows the presence of anthraquinones, terpenoids, flavonoids, saponins tannis, alkaloids and cardiac glycosides. Alkanoids compound that are medicinal in nature such as ephedra alkaloids and scopolamine are analgesics (Sofowora, 1978). Antispaomotic for the treatment of hypertension and also for pupil dilation and mental disorders (Trease and Evans, 1998). Flavonoids are groups of naturally occurring compounds widely distributed as secondary metabolites in the plant kingdom. The presence of flavonoids in the sample has also been reported to possess anti-oxidant and anti-radical properties. Tannin was only detected in ethanolic extract of guajava but is present in all the plant samples of water extract. Tannins have been reported to possess antibacterial properties which act by different mechanisms, including enzyme inhibition, reduction in oxidative phosphorylation and iron deprivation amongst others (Parekh and Chanda, 2007). The presence of saponins in carica papaya and psidium guajava in ethanolic extracts may be better source for the industrial production/extraction of these phytochemicals which may serve ethnobothanical uses. It also supports the fact the leaves has cytotoxic effects such as permealization of the intestine as saponins are cytotoxic (Okwu &

Okwu, 2004). It also gives the leaves the bitter taste. Saponin has relationship with sex hormones like oxytocin. Oxytocin is a sex hormone involved in controlling the onset of labour in women and the subsequent release of milk (Okwu and Okwu, 2004). Another important action of saponins is their expectorant action through the stimulation of a reflex of the upper digestive tract (Ayoola & Adeyeye, 2010). 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 (Ayoola & Adeyeye, 2010).

CONCLUSION

Photochemical in plants have long been studied in the prevention of certain chronic diseases besides the maintaining freshness in fruits and prolonging food storage. The plants samples can be used to treat common diseases but a few use it for preventing and treating malnutrition especially moringa oleifera leaves. The presence of photochemical indicates possible preventive and curable properties of the plants. The various phytochemical compounds are known to have beneficial uses in industries and medical sciences and also exhibit physiological activity. There is need to carry out more pharmacological studies to support the uses of the plants and medicinal plants should also be screened and compared to find out the alternate treatments method to various microbial infections.

Table 1*:* Result of the phytochemical analysis of ethanolic and water extract of carica papaya

Test sample	**CPLEE**	**CPLWE**
Anthraquinones	-	+
Terpenoids	+	+
Flavonoids	+	+
Saponins	+	-
Tanins	-	+
Alkaloids	+	+
Cardiac Glycoside	+	-

+ Present; CPLEE: carica papaya leaves ethanolic extract
- Absent; CPLWE: carica papaya leaves water extract

Table 2: Result of the phytochemical analysis of ethanolic and water extract of moringa oleifera

Test sample	**CPLEE**	**CPLWE**
Anthraquinones	+	+
Terpenoids	+	+
Flavonoids	-	+
Saponins	-	-
Tanins	-	+
Alkaloids	+	+
Cardiac Glycoside	+	-

+ Present; CPLEE: carica papaya leaves ethanolic extract

- Absent; CPLWE: carica papaya leaves water extract

Table 3: Result of the phytochemical analysis of ethanolic and water extract of psidium guajava

Anthraquinones	+	+
Terpenoids	-	+
Flavonoids	+	+
Saponins	+	-
Tanins	+	+
Alkaloids	+	-
Cardiac Glycoside	+	+

+ Present; PGLEE: carica papaya leaves ethanolic extract
- Absent; PGLWE: carica papaya leaves water extract

Table 4: Comparative phytochemical analysis of carica papaya, moringa oleifera and psidium guajava in ethanolic extract

Extract	anthraquinones	terpenoids	Flavonoids	saponins	tanins	alkaloids	glycoside
C. *papaya*	-	+	+	+	-	+	+
M. *oleifera*	+	+	-	-	-	+	+
P. *guajava*	+	-	+	+	+	+	+

+ presen; - absent

Table 5: result of the comparative phytochemical analysis of carica papaya, moringa oleifera and psidium guajava in water extract

Extract	anthraquinones	terpenoids	flavonoids	saponins	tanins	alkaloids	glycoside
C. *papaya*	+	+	+	-	+	+	-
M. *oleifera*	+	+	+	-	+	+	-
P. *guajava*	+	+	+	-	+	-	+

+ present; - absent

REFERENCE

Andy I.E, Eja, M.E. and Mboto C.I. (2008). An evaluation of the Antimicrobial Potency of Lasianthera Africana (BEAUV) and Heinsia crinata (G. Taylor) on Escherichia coli, Salmonella typhi, Staphylococcus aureus and Candida albicans. Malaysian journal of microbiology. 4(1):25-29.

Ajasa, A, O., Bello, M, O. Ibrahim, A.O., Ogunwande, I.A and Olawore N.O. (2004). Heavy trace metals and Macronutrients status in herbal plants of Nigeria. Food Chem. 5: 67-71.

Atal, C.K; Sharma, M.L. and Khajurjya, A. (1986). Immunomodulating agents of plant origin preliminary screening. Journal of Ethnopharmacol. Vol. 21, P. 41185-41192.

Ayoola P.B & Adeyeye, A (2010). Phytochemical and nutrient evaluation of *carica papaya* (pawpaw) leaves. IJRRAS 5 (3).

Basile A. Giordano, Lopez-saez, J. A. and Cobianchi, R. C. (1999). Antibacterial activity of pure flavonoids isolated from moses. Phytochemistry. 52:1479-1482.

Burkill, I.H (1997). The useful plants of west tropical Africa. Families M-R Royal Botanic Gardens Kew. Edition 2 vol. 4.

Calame, W., Weseler, A. R., Viebke, C., Flynn, C. and Siemensma, A.D. (2008). Gum Arabic establishes Prebiotic functionalityin health human volunteers in a close-dependent manner. British Journal of Nutrition, December 2008, volume 100, Issue 6, pp.1269 1275.

Duraipandiyan,V., M.Ayyanar, and S. I. Suthu (2006). Asia journal of microbiology.5:334-337.

Elizabeth kafaru, (1994). Immense help from nature workshop. 1st Ed. Elikaf health services Ltd. Ikeja, lagos. Pp:207-209.

Fahey, T.W. (2005). Moringa Oleifera: A review of the medical evidence for its nutritional, therapeutic and Prophylactic properties. Trees for life Journal, Vol. 1. PP. 5.

Glombitza, K.W., Mahrau, G.H, Mirhon, Y.W., Michael, K.G. and Motawi TY.K. (1993). Hypoglycemic and Antihypergly effects of Zizyphus Spinachristi in rats. Plantamed 60:244-247.

Lutterodt, G.D. (1992). Inhibition of microlax-induced experimental diarrhea with narcotic-like extracts of Psidium guajava leaf in rats. Journal of ethno pharmacol. 37(2), 151-157.

Mukhtar, M. D. and Tukur, A. (1999): In-vitro screening for activity of Pistia stratiotes extracts. NISEB Journal 1(1):51 – 60.

Ogbe, A.O. and John P.A. (2011). Proximate study, minerals and anti – nutrient composition of Moringa Oleifera leaves harvested from Lafia, Nigeria: potentials benefits in poultry nutrition and health. Journal f microbiology and food Sciences, 1(3): 296-308.

Okwu, D. E, and Okwu, M.E., (2004). Chemical composition of Spondia mombin plants. J. Sustain Agric. Environ. 6: 140-147.

Parekh J and Chanda S. *In vitro* antibacterial activity o the crude methanol extract of *Woodfordiafruticosa*Kurz flower (Lythaceae). Brazilian J. Microbiol. 2007; **38:** 204-207.

Partwardhan B., Vaidya A.B.D and Chorghade, M. (2004). Ayurveda and natural products drug discovery current science. 86:789-799.

Sofowora, A. (1987): Medicinal plants and Traditional Remedies University of Ife press, Nigeria Pp. 1-23.

Trease E.G. and Evans, W.C (1998) A Test book, Harcourt Brase and company Asia PTE Limited, India Pp 144-213.

Walter Last. (2008). Cancer remedies. www.health-science-spirit.com/cancer6-remediesKirtikar K. R, Bashu B.D. (1998). Indian medicinal plants. Vol. 1. International Book Distributors

dehradun,1045-1048.
Wilson Popenoe (1974). Papaya manual of tropical and subtropical fruits. Hafsner press.facsimile of the 1920 Ed. Pp: 225-240.
WHO (1992). World Health Organization: Expert Committee on Specification for Pharmaceutical preparation Report series 823. Pp. 44-76.