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Research Paper

## QUALITATIVE ALKALOIDAL ANALYSES OF SOME SELECTED NIGERIAN MEDICINAL PLANTS USED IN HERBAL TREATMENT OF DISEASES

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The scientific basis for the use of herbs in treatment and cure of diseases has been studied. The emphasis here is on the alkaloidal contents of the stems, roots and leaves of paw-paw, Guava, Plantain and Orange. The reagents used for this study was Wagner, Meyer and Picric acid. Results obtained show that alkaloids are present in the stem, roots and leaves of each of these four plants. These results also show that alkaloidal fractions of these plants could be responsible for the observed medicinal uses in herbal treatment of ailments.

**Keywords:** Alkaloids, Plantain, Orange, Guava, Paw-Paw and Picric acid

### INTRODUCTION

Alkaloids are groups of naturally occurring chemical compounds that contain mostly nitrogen atoms. It could also be described as all organic bases isolated from plant, which has a pyridine ring. They are found in various parts of plant and can be isolated using organic solvents like hexane, chloroform and benzene. In addition to the elements carbon, hydrogen, nitrogen, most alkaloids contain oxygen.

Plants are considered pharmacologically active when they contain alkaloids (Ajibesin, 2005), which could be of benefit health wisely. Alkaloids obtained from plants are known as plants alkaloids or vegetable alkaloids. They occur in about 150 plant families and over 2,000 different plant types (Rehn, 1994). Some examples of families of plant where alkaloids are found are: *solanaceal*, *papaveraece*, *poperaceal* and *Rutaceae*, etc.

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They are usually found in the seed, stem, root and leaf of plants where they occur as salts of various plant acids, e.g., Acetic, citric, malic and tartaric acid. Most alkaloids are highly pharmacological, i.e., can be used as an anti-malaria, anti-inflammatory, analgesic, antifungal, etc. It is also used in hypertension and mental disorder (Khan and Sharman, 2006).

The aim of this research was to analyze and extract the alkaloidal fractions of the various parts of Paw-Paw, Guava, Orange and Plantain.

## MATERIALS AND METHODS

### Collection of Plant Materials

Samples of plant materials roots, stems and leaves were collected from trees in Oba, Anambra State Nigeria.

### Preparation of Sample Material

The collected plant parts (stems, roots and leaves) were cut into tiny pieces, cleansed and sun-dried for one-two weeks. The plants were ground into powder and stored in sealed containers to avoid contamination and spoilage.

### Equipment Used

Volumetric flask (500 ml), Conical flask, Tripod stand, Funnel/filter paper, Separating funnel, Hand gloves, Reagents bottles,  $p_H$  meter, Water bath, Measuring cylinder, Thermometer, Pipette, Beaker, Test tubes, Nose mask

### Chemicals Used

N-Hexane, Methanol, Aq.-Tartaric acid solution, Ethyl acetate,  $NH_3$ , Meyer's reagent, Wagner's reagent, Picric acid

### Extraction of Alkaloids from the Plant Parts

Alkaloids were extracted from the stem, root and

leaves of the four plants using the old method of purification from crude extract by acid-base extraction. There were basically four steps taken during the alkaloids extraction.

**De-fatting:** 10 g of each of the sample materials (stems, roots and leaves) were subjected to 50 ml of hexane to remove the fats, oils, terpenes and wax. This was done by measuring the weights of the dry pulverized sample on a weighing balance and putting it in the container, the volume of the hexane was also measured using a volumetric flask and poured into the sample, shaken gently and allowed to stay for a period of 2 days.

**Alcohol Extraction:** After de-fatting, the sample materials were subjected to alcohol extraction. Ethanol (150 ml) was added. This mixture was evaporated by low temperature heating. Hence, fumes were noticed to escape from it.

**Basification:** Here, the sample was partitioned between a dilute tartaric acid or citric acid and ethyl acetate at the  $p_H$  of 11. Making the solution basic thereby turning the alkaloids into their free base form. This stage is the separation of the total alkaloid from other substances. The ethyl acetate layer was observed to be light brown in color and below in the separating funnel and it contained neutral and weakly basic alkaloids.

**Extraction of the Free Bases:** The aqueous layer was neutralized with 500 ml  $NH_3$  and again was extracted with ethyl acetate. The organic layer (upper layer) contains basic alkaloids and collected out by opening the tap of the separating funnel and letting out the (lower layer) aqueous layer, which contains quaternary ammonium ion ( $NH_4^+$ ).

## Confirmatory Test for Alkaloids in the Sample

### Preparation of Reagent

**Meyer's reagent:** This was prepared by measuring 1.3 g of mercuric iodide on a weighing balance and 5.0 g of KI (Potassium Iodide) and dissolving both in distilled water, made up to 100 ml.

**Wayner's reagent:** This was prepared by measuring 2 g of iodine and 6 g of KI (Potassium Iodide) on a weighing balance and dissolving both in distilled water and made up to 100 ml.

## METHOD OF SCREENING

The screening was done by testing for the presence of alkaloid in the leaves, stems and roots of each of the four plants using Meyer's reagent, Wayner's reagent, and Picric acid. The extract of the various samples were prepared and the tests were carried out using these pictures or extracts.

### Preparation of the Tincture

10 g of the leaf, stem and root samples were heated in 75 ml of 50% of H<sub>2</sub>SO<sub>4</sub>. This was heated for 10 min on water bath. 20 ml of the filtrate (each of plants) was transferred into a separating funnel and made alkaloid with dilute ammonia solution (5.0 ml). The alkaloid solution was extracted with an equal volume (25 ml) of chloroform. Chloroform layer was further extracted with 10 ml dilute H<sub>2</sub>SO<sub>4</sub> and dispensed into different test tube. Twelve labeled test tubes were used, and contain thus:

Test tubes A<sub>1</sub> A<sub>2</sub> and A<sub>3</sub> (containing 1ml each extract) of stem, root and leaves of Paw-Paw respectively.

Test tubes labeled B<sub>1</sub> B<sub>2</sub> and B<sub>3</sub> (containing 1 ml each of the extract) of stem, root and leaves of Guava.

Test tubes labeled C<sub>1</sub> C<sub>2</sub> and C<sub>3</sub> (containing 1 ml of the extract) of stem, root and leaves of Orange, respectively.

Test tubes labeled D<sub>1</sub> D<sub>2</sub> and D<sub>3</sub> (containing 1 ml of extract) of stem, root and leaves of plantain, respectively.

Meyer's reagent was added drop wisely to each of test tube A<sub>1</sub> A<sub>2</sub> A<sub>3</sub>, B<sub>1</sub> B<sub>2</sub> B<sub>3</sub>, C<sub>1</sub> C<sub>2</sub> C<sub>3</sub> and D<sub>1</sub> D<sub>2</sub> D<sub>3</sub>.

Wagner's reagent was added drop wisely also to each of another set of test tubes.

Picric acid was in like manner added to each of the test tubes.

Each of the plant parts were tested with the above reagent and the results were shown below.

## RESULTS AND DISCUSSION

The study reveals that the leaf, stem, and root of the four plants show detectable amounts of alkaloid. These alkaloids could be the reason the plants have been used in numerous ethno-medicinal practices in combating of infections, diseases and other ailments. Phytochemical study reveals that Paw Paw (*Carica papaya*) contains many biological compounds of which two important ones are chymopapain and papain—which are found in the leaves and roots (Nutrition Data, 2007) and Nerah (2002). In herbal practice, a decoction of the stem, bark and root are used in the treatments of mental disorder, asthma and nervous pains. The root extract is used for the treatment of uterus, syphilis, and to remove urine concentration. Therefore,

*Carica papaya* has a wide range of medicinal benefits which include antiseptic, antimicrobial, anti-inflammatory, anti-hypertensive, chieretic, anti-hyperlipidenic, anti-diabetic and contraceptive

**Table 1: Paw Paw Result**

Test	Observation	Inference
<b>(i) Leaves</b>		
1ml of extract + Wagner's reagent	Brick red precipitate formed	Alkaloid present
1ml of extract + Mayer's reagent	Cream colour precipitate formed	Alkaloid present
1ml of extract + picric acid	Pale yellow colour observed	Alkaloid present
<b>(ii) Roots</b>		
1ml of extract + Mayer's reagent	Cream colour precipitate formed	Alkaloid present
1ml of extract + wagner's reagent	Reddish brown precipitate Was formed	Alkaloid present
1ml of extract + picric acid	Pale yellowish colour	Alkaloid present
<b>(iii) Stem</b>		
1ml of extract + Wagner's reagent	Brick red precipitate formed	Alkaloid present
1ml of extract + Mayer's reagent	Cream colour precipitate formed	Alkaloid present
1ml of extract + picric acid	Pale yellow colour observed	Alkaloid present

**Table 2: Orange Result**

Test	Observation	Inference
<b>(i) Leaves</b>		
1ml of extract + Mayer's reagent	Brick red precipitate formed	Alkaloid present
1ml of extract + Wagner's reagent	Cream colour precipitate formed	Alkaloid present
1ml of extract + picric acid	Pale yellow colour observed	Alkaloid present
<b>(ii) Roots</b>		
1ml of extract + Mayer's reagent	Cream colour precipitate formed	Alkaloid present
1ml of extract + Wagner's reagent	Reddish brown precipitate Formed	Alkaloid present
1ml of extract + picric acid	Pale yellowish colour observed	Alkaloid present
<b>(iii) Stem</b>		
1ml of extract + Mayer's reagent	Cream colour precipitate formed	Alkaloid present
1ml of extract + Wagner's reagent	Brick-red precipitate formed	Alkaloid present
1ml of extract + Wagner's reagent	Pale yellow colour observed	Alkaloid present
1ml of extract + picric acid	Pale yellowish colour formed	Alkaloid present

<b>Table 3: Guava Result</b>		
Test	Observation	Inference
<b>(i) Leaves</b>		
1ml of extract + Mayer's reagent	Cream colour precipitate formed	Alkaloid present
1ml of extract + Wagner's reagent	Reddish brown colour formed	Alkaloid present
1ml of extract + picric acid	Pale yellow colour formed	Alkaloid present
<b>(ii) Stem</b>		
1ml of extract + Wagner's reagent	Brick red precipitate formed	Alkaloid present
1ml of extract + Mayer's reagent	Cream colour precipitate formed	Alkaloid present
1ml of extract + Picric acid	Pale yellow colour observed	Alkaloid present
<b>(iii) Roots</b>		
1ml of extract + Wagner's reagent	Brick-red precipitate formed	Alkaloid present
1ml of extract + Mayer's reagent	Cream colour precipitate formed	Alkaloid present
1ml of extract + Picric acid	Pale yellow colour observed	Alkaloid present

<b>Table 4: Plantain Result</b>		
Test	Observation	Inference
<b>(i) Leaves</b>		
1ml of extract + Mayer's reagent	reddish brown colour precipitate observed	Alkaloid present
1ml of extract + Wagner's reagent	Cream colour precipitate formed	Alkaloid present
1ml of extract + Picric acid	Pale yellow colour observed	Alkaloid present
<b>(ii) Stem</b>		
1ml of extract + Wagner's reagent	Brick red precipitate formed	Alkaloid present
1ml of extract + Mayer's reagent	Cream colour precipitate formed	Alkaloid present
1ml of extract + Picric acid	Pale yellow colour observed	Alkaloid present
<b>(iii) Roots</b>		
1ml of extract + Wagner's reagent	Brick red precipitate formed	Alkaloid present
1ml of extract + Mayer's reagent	Cream colour precipitate formed	Alkaloid present
1ml of extract + Picric acid	Pale yellow colour observed	Alkaloid present

activity. Looking at guava, it can also be seen that it's extracts are implicated in therapeutic

mechanism against cancers, ulcer, bacterial infections, inflammation and pain, traditional

treatment against diabetes (leaves), cure for diarrhea, dysentery and stomach upset (roots) (Konkela, 2006). The extract (alkaloid) can also be seen to promote menstruation, constrict blood vessels, anti-allergy anti-cough, anti-diabetic and anti-oxidants, etc.

A study by Dr. Jerry McLaughlin reveals that plantain contains alkaloid in all the three part (roots, stems, and leaves). They function against rheumatism, inflammation, diabetic, hypertension, diarrhea, bronchitis and cough. The root extracts are known to arrest hemophilic and possess strong astringent and anti-hermitic properties. It can also be used in the treatment of burns, asthma, diabetes, excess menstrual flow, fever, headache, hemorrhage, inflammation, insomnia, syphilis, tuberculosis and reduction of high blood pressure, etc.

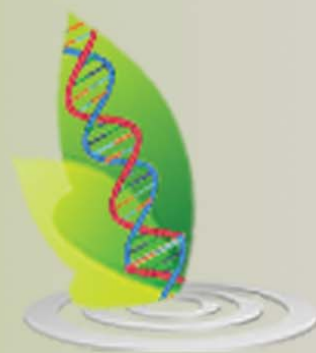
## CONCLUSION AND RECOMMENDATION

From this study a conclusion can be drawn that guava (*Psidium guajava*), orange (*Citrus sinensis*), paw-paw (*Carica papaya*), and plantain (*Musa paradisiaca*) contain alkaloids. Although these alkaloids are harmful, if wrongly used, they are very important in the pharmacological/food industries and its benefits are almost inexhaustible. It can also be said that the efficacy of these plant alkaloids are not well known due to illiteracy of indigenes. It is recommended that

government should look into the availability of these plants, encourage their proper harvesting and large-scale cultivation for the health benefits of man.

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