

Crude Alkaloid from Areca Catechu Linn (Betel Nut Palm) for Pharmaceutical-Agribusiness

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Abstract

The alkaloid is nitrogen-containing compound. It is the most efficient and therapeutically significant plant substance for human health. This study determined the physical properties of Areca Catechu Linn. (Betel nut palm) Leaves, roots, and fruits extract determined the presence of alkaloid and percent yield. The preparation for the extraction of the crude alkaloid started the collection of the sample plant; physical characterization; determination of alkaloid; extraction of crude alkaloid; and percent yield determination. It showed that the leaves extract has 45% yield, roots have 35% yield, and the fruits have 40% yield. The physical properties showed that leaves extract has a boiling point 95oC roots extract 94oC, and fruits extract 96oC. The leaves extract are green in color, the roots are brown, and the fruits are white. Leaves, roots, and fruits are pleasant, acidic, less dense in water and polar. The presence of alkaloid showed leaves extract is positive. The leaves underwent alkaloid extraction using-alkali-immiscible solvent. The percent of crude alkaloid extract in trial one is 1.8%, trial two has a percent yield of 0.92, and in trial three has a 5.22% percent yield. It found that betel nut palm leaves extract positive of alkaloids and a source for pharmaceutical purposes. The researchers recommend for further study of chemical separation and purification of the active components in betel nut palm used in drugs, also, use other methods and technique for crude alkaloid extraction by using different solvent.

Keywords: Agribusiness, pharmaceutical, crude oil in Areca catechu Linn, alkaloids, alkali-immiscible solvent, Philippines

Introduction

The alkaloid is a nitrogen-containing organic compounds in the plant, have more complex cyclic structure. They rank among the most efficient and therapeutically significant plant substances, 5 500 alkaloids were known and they comprise the huge side single class of secondary plant substance which contain one more nitrogen atoms, usually in combination as part of a cyclic structure. Many alkaloids used for hundreds of years in medicine, and some are still prominent drugs today, hence this group of compounds have great prominence in many fields of scientific undertaking and continues to be of great interest today. (Margaret F. Robert and Michael wink)

Not until Alchemy involved in chemistry and medicine became more scientific, the medicinal virtues of plants and animal tissues contain the mixture of the components contained therein. The Chemist was the challenge to separate the constituents and determine by the experiment which activities could be attributed to them. In this regard, the researchers determined the presence of alkaloid from Areca catechu Linn (Betel nut palm). The purpose of this study was screening the alkaloids from the different parts of Areca catechu Linn (Betel nut palm) and isolating crude alkaloid for possible agribusiness and pharmaceutical uses.

Objectives

The objective of this study was to determine the crude alkaloid from Betel Nut palm. Specifically, it aimed to:

1. Determine the percent yield of Betel Nut leaves, roots, and fruits extract.
2. Determine the physical characteristics of leaves, roots, and fruits extract of betel nut palm regarding:
 - a. Boiling point
 - b. Color

- c. Density
 - d. Odor
 - e. pH
 - f. solubility
3. Determine alkaloids from leaves, roots, and fruits of betel nut palm.
 4. Determine the percent yield of crude alkaloid.

Methodology

The preparation for extraction of crude alkaloid conducted at the Chemistry Laboratory of the College of Science, University of Eastern Philippines, University Town, Northern Samar. The plant sample collected from Brgy. Barabud, Lao-ang Northern Samar. The researcher used the experimental design under laboratory conditions to carry out the objectives of the study. The prepared sample of 200g weighed and finely cut into small sections using a sharp knife and put into the juicer to get the pure extracts of leaves, roots, and fruits from betel nut palm. The leaves, roots, and fruits of betel nut palm extracts, placed in a clean bottle at room temperature, and used to determine its physical properties, to determine the presence of alkaloid.

For the preparation for the crude alkaloid extraction: The plant sample was sundried for two days, and then it was cut into small pieces and oven for 3 hours over 100 °C. The dried sample was ground into fine powder using the electric blender. The powdered obtained were weighed and stored at room temperature and used for crude alkaloid extraction. The boiling point determined by immersing the test tube with three mL of the extract in the oil bath. The temperature recorded when the sample starts to boil. Repeated in three trials. The color of the extract was determined by evaluating of five respondents using the sense of sight. The perceived color of the most respondents was the color of the pure extract of the sample. To test for the density, about five mL of extract weighed on Analytical balance; the weight gram (g) of the extract was recorded and divided by the volume of extract used in mL. The procedure repeated thrice, and its average density was computed. The odor of betel nut seeds extract evaluated by five respondents using their sense of smell. The perceived odor of the most respondents on the odor of leaves, roots, and fruits extract of Betel nut palm. The pH tested on the leaves, roots, and fruits extract of betel nut palm using the digital pH meter. About five mL of leaves, roots, and fruits extract contained in a beaker. Then, a digital pH meter was dipped into the extract. After a period of minute, digital pH meter read and recorded. The solubility determined using water, ethanol, and hexane as solvents. About three mL of the sample placed into three different test tubes, and the same amount also of the solvent was added.

Test for the presence of the alkaloid: Twenty milliliters (20mL) of the extract evaporated over steam bath until syrup. About five milliliters (5mL) of Hydrochloric (HCl) was added and stir for about five minutes then cool at room temperature. About 0.5 NaCl was added and filtered. The extract stirred and filtered, and the residue was washed enough with 2M HCl to bring the filtrate to 5 mL. About one mL of filtrate leaves, roots, and fruits extract placed in a test tube then it was treated with 2-3 drops of Dragendorff's reagent. An orange precipitate form is an indication of a positive result.

Another different test tube with one mL of filtrate was 2-3 drops of Mayer's reagent. A white precipitate form is an indication of a positive result. Confirmatory test for the alkaloids: The remaining three mL of the filtrate, 28% ammonia added (Caution: causes burns, vapors are extremely irritating!) until the solution's alkaline to litmus. The alkaline solution was extracted three times with the small portion of less than ten mL (Caution: carcinogenic!). The chloroform extracts were combined and the upper aqueous layer was reserved. The chloroform extract was evaporated to dryness under the hood and over a stream bath. The residue with 5 mL of 2M Hydrochloric acid was taken and stir over a stream bath for about 2 minutes. The filtrate cooled, filtrated was divided into two portions. One portion tested with Mayer's reagent and the other portion with Dragendorff's reagent.

Ten grams (10g) of the sample placed in the soxhlet extractor, and about 100 mL of Methanol was placed in the solvent flask. The sample extracted for about 2 hours. The methanol extract was filtered and evaporated over the steam bath. The residue was treated with 5% Hydrochloric acid (HCl) to pH 2 and separated using the separatory funnel to remove resin oil and fatty acid. The acidified extract was made alkaline at pH 10 with dilute NH₄OH, and the resulting mixture was extracted pure chloroform. The aqueous layer repeatedly extracted with chloroform until there was completeness of extraction. One mL of the last extract evaporated, and the residue dissolved in 0.5 mL of 5% HCl.

The resulting solution showed not more than slight turbidity in the addition of a drop of Mayer’s reagent. After that, the Chloroform (CHCl₃) was removed through evaporation over a steam bath until dryness to yield the crude alkaloid. The residue weighed. The researchers used the percentage yield determination for the amount of crude alkaloid.

Findings

Table 1 Summary of the Results for Physical Properties of Betel nut palm Leaves, Roots, and Fruits Extract

Physical Properties Results					
Sample	Boiling Point	Color	Odor	pH	Density
Leaves	95°C	Green	Pleasant	3.7	0.98g/mL
Roots	94.7°C	Brown	Pleasant	4.9	0.89g/mL
Fruits	96.7°C	White	Pleasant	5.0	1g/mL

Solubility			
Sample	Solvent		
	Water	Ethanol	Hexane
Leaves	Miscible	Miscible	Immiscible
Roots	Miscible	Miscible	Immiscible
Fruits	Miscible	Miscible	Immiscible

Table 2 Alkaloid Screening Test

Sample	Treatment w/ Dragendorff’s reagent	Treatment w/ Mayer’s reagent	Interpretation
Leaves	Orange precipitate formed	White precipitate formed	Positive
Roots	No precipitate formed	No precipitate formed	Negative
Fruits	No precipitate formed	No precipitate formed	Negative

Table 3 Confirmatory Screening Test for Alkaloid

Sample	Treatment w/ Dragendorff’s reagent	Treatment w/ Mayer’s reagent	Interpretation
Leaves	Orange precipitate formed	White precipitate formed	Positive
Roots	No precipitate formed	No precipitate formed	Negative
Fruits	No precipitate formed	No precipitate formed	Negative

Table 4 Percentage Yield of Crude Alkaloid from powdered Leaves of Betel Nut Palm

Trial	Weight of powdered leaves (grams)	Weight of crude extract (grams)	Percent Yield (%)
1	10	0.1771	1.8
2	10	0.920	0.92
3	10	0.5220	5.22

Conclusions

Based on the findings of the study, the following are derived:

1. The *Betel nut* leaves extract a higher percentage yield of 45% than fruits with 40%, roots with 35%;
2. The physical properties showed that fruits extract a highest boiling point of 96°C than leaves extract with a 94°C. The leaves extract is green in color, the roots extract is brown, and fruits extract in white color. Leaves, roots, and fruits are pleasant in odor, acidic, less dense in water and polar;
3. The betel nut leaves extract positive in alkaloids for Pharmaceutical manufacture for a low-cost value, and for Agribusiness;
4. The percent yield for crude alkaloid extract yielded from trial 1, 2, and 3 has an average of 2.6%.

Recommendations

From the conclusion of the study, the researchers had drawn the following recommendations:

1. Use other methods and technique for crude alkaloid extraction;
2. Use other solvent as extracting solvent for alkaloid extraction;
3. Conduct further study of this plant and test for some possible secondary metabolites;
4. Conduct further study using the other parts of the plant like bark.

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References

- Bennix P.** Interior 2015. Phytochemical Screening of *Cynodon Dactylon* (L) pers (Bermuda grass) leaf extract. College of Science. BS major in Chemistry. Thesis. UEP, University Town, N. Samar.
- Domingo A. Madulid.** 1995. A pictorial Cyclopedia of Philippines Ornamental Plants. Copyright ©1995 by Domingo a Madulid and bookmark, Inc.
- Gonzales, Maria Victoria M., Tolentino, Angelina G.** Extraction and Isolation of the Alkaloid from the *Samanea* (Acacia) Bark: Its antiseptic potential. International Journal of Scientific and Technology research Volume 3, issue 1, January 2014. ISSN 22778616.
- Grolier's International Encyclopedia.** Volume 1. Copyright©1997 by Grolier Incorporate.
- Guevera, Beatrice Q.** 2005. A Guide Book to Plant Screening Phytochemical and Biological. Revised ed. España, Manila University of Santo Tomas Publishing House.
<http://www.britannica.com/science/alkaloid>.Retrived.01/06/17
<http://www.drugs.com/npc/betel-nut.html>.Retrived.09/29/16
<http://www.drugs.com/npc/betel-nut.html>.Retrived.11/19/16
<http://www.neurosoup.com/areca-nnut-betel-nut>.Retrived.09/23/16
<http://www.novapublishers.com/catalog/product>.Retrived.10/16/16
<http://www.stuartxchange.com/bunga.html>.Retrived.10/11/16
<http://www.zamnesia.com/content/406-what-is-etel-nut>.Retrived.09/11/16
- JC Kurian.** The Amazing Healing Plants. Volume 1. Printed by Philippines Publishing House Manila, Philippines 1996.
- Romelita L.** Interior 2001. Alkaloid content of betel nut (*Areca nut*). College of science. BS major in Chemistry. Thesis. UEP, University Town, N. Samar.
- Zahraa Abdul-Elah Al-Naqqash, Abdul-Lalif M. Jawad, AyyadWajeihRaaof.** Evaluation of the Activity of Crude Alkaloids extract of *ZingiberOfficinale* Roscoe, *Thymus vulgaris* L. and *Acacia Arabica* L. as Coagulant agent in lab mice. Iraq Journal of Science, Volume 55, 2014 No.1, p