



Research Paper

Organoleptic Evaluation and Physicochemical Characteristics of Powdered Plant Organs of the Traditional Medicinal Plant *Caloncoba Echinata*

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ABSTRACT

The organoleptic evaluation and physicochemical characteristics of dried powdered plant organs (leaves, stem bark and root bark) of the traditional medicinal plant *Caloncoba echinata* have been investigated. Organoleptic character refers to evaluation each of the powdered traditional medicinal plant by colour, odour, taste, texture and particle size. Physico-chemical studies such total ash, water soluble ash, acid insoluble ash, water and alcohol soluble extract, loss on drying at 105°C of dried powdered plant organs and then heated in a laboratory furnace to 1000°C were carried out. The spicy and bitter taste each of the powdered plant materials during organoleptic evaluation indicated that the plant organs investigated contained alkaloids thus supporting the use of the plant as a traditional pharmaceutical. The colour of the powdered plant organs ranges from light green for the leaves to brown for both the stem and root barks. The colour of the powdered plant material will also help who so ever wish to buy and use the plant material for medicinal purpose. It helps prevent adulteration. The moisture content in the various plant organs investigated is greater in the root bark (33.0%) than in the stem bark (16.463%) and the root bark (13.62%). The ash content in the plant organs investigated was also greater in the root bark (12.509%) than the stem bark (8.7%) and leaves bark (6.4%), thus indicating that the root bark of the plant contained more inorganic compounds. The leaves of the plant contained more water soluble (50.2%) substances than the stem bark (19.6%) and the root bark (6.4%). The root bark contained more water insoluble (93.6%) and acid soluble (84.9%) substances than the leaves and stem bark of the plant organs investigated. The pH of water soluble ash was found to be greater than 7 indicating the basicity of the extracts, with the root bark (pH = 10.70) more basic than the stem bark (pH = 9.10) and leaves (pH = 8.71) respectively. Organoleptic evaluation and physicochemical characteristics carried out on the dried powdered plant organs of the traditional medicinal plant *Caloncoba echinata* indicated that the plant is suitable for use in Traditional Medicine.

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1. Introduction

This research work was geared towards investigating the organoleptic evaluation and physiochemical characteristics of powdered plant organs of the traditional medicinal plant *Caloncoba echinata*. The plant was identified as one of the traditional medicinal plants in Sierra Leone with its organs rich in fats/oils (Burkill, 1995). Traditionally the oil extracted from the seed was reported to be used in Sierra Leone as medicines for the treatment of leprosy, cutaneous and subcutaneous parasitic infections (dermal infections), as insecticides and arachnicides, hair dressing and skin eruptions due to viral diseases such as smallpox, chickenpox, measles, and malaria (Burkill, 1995; Schlossberger, 1938; Cooper & Record, 1931; Kerharo & Bouquet, 1950; Zieger et al., 2003; Bouquet, 1974). Further research work reported that the dry seeds of the plant contained 31.5% of fat which was much higher than palm oil obtained from the Palm fruits. The structure of the oil from the seeds was confirmed by both NMR400 Bruker Bio Spin GmbH (Germany), LCMS/ GCMS analysis (China), and by McLafferty Rearrangement as d-13 (2-cyclopentenyl) tridecanoic acid commonly known as Gorli oil. Unlike other unsaturated fatty acids, the Gorli oil is solid at room temperature having a fairly high melting point (68.5 °C) and boiling point (247.5 °C) with Saponification Value (89.76) and Iodine value (99.00) supporting the use of the oil in soap making and cosmetic production (Koroma et al., 2018; Nissar et al., 2021). 3.14% of an oily substance was extracted from the powdered leaves of *Caloncoba echinata*, tested positive for terpenoids and unsaturation with Saponification and Iodine Values of 201.96 and 177.66 respectively indicating that the compound is very suitable soap production and cosmetic purposes. Wet chemical methods, spectroscopic analysis and from literature revealed the oil extracted from the dry powdered leaves plant to be Linoleic acid and used as an emollient and thickening agent in cosmetics, antioxidant and an anti-inflammatory agent in the treatment of burns, cold sores and other minor wounds (Koroma et al., 2018a; Szmelter-Jarosz et al., 2021) supporting the use of *Caloncoba echinata* plant in traditional medicine. Food tests, phytochemical screening and antimicrobial Sensitivity tests using the solvent extracts of various Plant Organs have been reported (Koroma et al., 2018b; Nozari & Ghahremani-Nahr, 2022) with the results supporting the use of the plant in traditional medicine.

2. Materials and Methods

2.1. Collection and Preparation of Plant Materials

The plant materials of interest were collected in August, 2020 from the Gola Forest in the Eastern Province of Sierra Leone and identified with assistance of the Chief Laboratory Technician Department of Botany, Fourah Bay College, University of Sierra Leone, Freetown. Fresh plant materials were dried reduced in size by crushing it into smaller pieces using the hand and then grounded using a laboratory mill and kept in a proper container until the time of the extraction.

The plants parts to be investigated are:

- *Leaves (L)*
- *Stem bark (SB)*
- *Root bark (RB)*

Voucher specimens of the plant organs investigated [Leaves (101), Stem bark (102) and Root bark (103)] of *Caloncoba echinata* were deposited in the Herbarium of the Botany Department, Fourah Bay College, University of Sierra Leone. The dried powdered plant materials were used to carry out organoleptic evaluation and Physico-chemical investigations.



Fig. 1. Showing the leaves and fruit of *Caloncoba echinata* plant

Other materials and equipment required for this work were;

- *Laboratory Furnace*
- *Hot Air oven*
- *pH Meter*
- *Ethanol*
- *Distilled water*
- *Desiccator*
- *Dilute HNO₃*
- *Dilute HCl*
- *Digital Balance*

2.2. Standardization parameters

The various standardization parameters studied were organoleptic evaluation of plant organs, Physico-chemical investigations involving determination of moisture content, ash content, pH, and determination of physical characteristics of powdered plant parts

2.3. Organoleptic evaluation of plant organs

The Organoleptic characters of the samples were evaluated based on the method described by (Kumar, 2007; Harbornem 1998; Mochahary et al., 2022). Organoleptic evaluation refers to evaluation of the powdered plant materials by colour, odour, taste and texture etc. The results are reported in Table (1).

2.4. Physicochemical investigations

Physico-chemical investigations on the various plant organs were carried out for determination of extractive values and ash values (Pharmacopoeia, 1996; Jeevitha et al., 2021). Physico-chemical studies like total ash, water soluble ash, acid insoluble ash, water and alcohol soluble extract, loss on drying at 105°C (Singh, 2006).

2.5. To determine the moisture content of each of the plant organs

Each of the plant materials were heated in an evaporating basin using Hot Air Oven at 105°C for one hour. The percentages of moisture content in each of the plant materials were determined using the formula below;

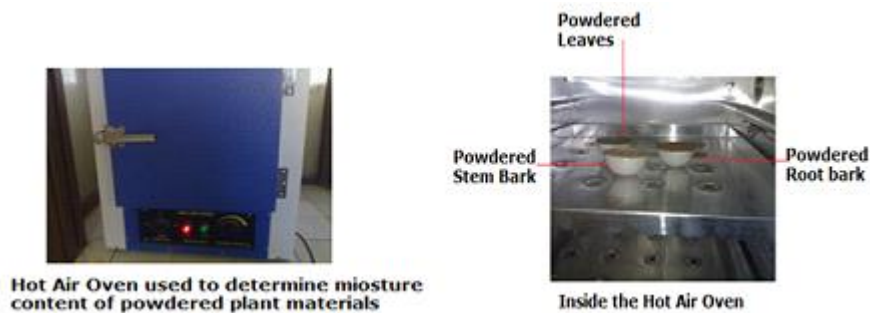


Fig. 2. Showing the determination of moisture content of powdered plant organs



Fig. 3. Showing the hot plant extracts in a desiccator after heating

The formula below was used to determine the moisture content of the plant organs investigated.

$$\text{Moisture content of plant material} = \frac{\text{mass of powdered plant material after heating}}{\text{mass of powdered plant material before heating}} \times 100 \quad (1)$$

The results of each of the tests are shown in Table (2).

2.6. To determine the ash content, each of the plant materials

Each of the plant materials were weighed in a crucible and placed in a Laboratory Furnace. The crucibles were heated to a temperature of 1000° C for ten minutes. The Furnace was shut down and allowed to cool down over night. The crucibles were then reweighed and the weights of the ashes of each of the plant materials determined as per the WHO guide lines. The percentages of ash content for each of the plant materials were determined using the formula below;

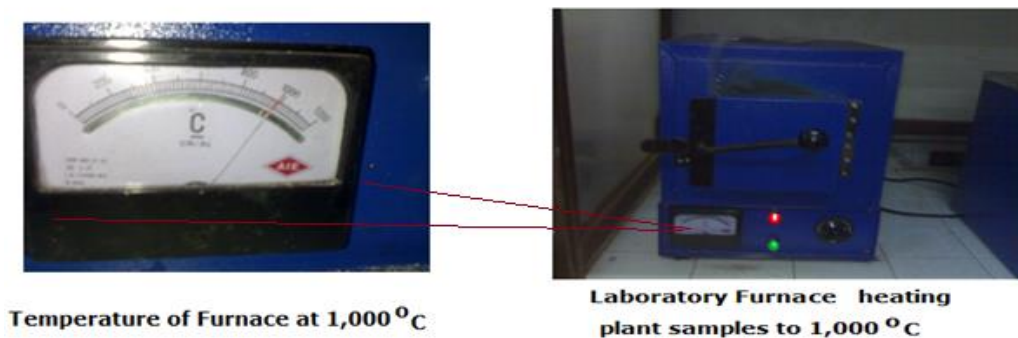


Fig. 4. showing Laboratory furnace



Fig. 5. Showing the ashes of plant samples from the Furnace

$$\text{Ash content of plant material} = \frac{\text{mass of Ash of the powdered plant materials}}{\text{mass of powdered plant material}} \times 100 \quad (2)$$

The results of each of the tests are reported in Table 3.

2.7. Determination of pH of ash solutions, water soluble ash and acid soluble ash and the percentage by mass

The ash obtained from each of the plant organs were dissolved in 50ml of distilled water and the original pH of the solutions determined using a digital pH-meter. The mixtures obtained were filtered, the filtrate dried and weighed to obtain the water soluble ash. 2M HNO₃ was added to the water insoluble ash, filtered, pH of the filtrate determined, evaporated to dryness again and weighed. The results of each of the tests are reported in Table (4).

3. RESULTS AND DISCUSSIONS

3.1. Organoleptic evaluation

The results of organoleptic evaluation are shown in Table (1), below.

Table 1. Showing the results of organoleptic evaluation on the powdered plant organs of *Caloncoba echinata*

PLANT ORGAN	COLOUR	ODOUR	TASTE	TEXTURE	PARTICLE SIZE
Powdered leaves	Light Green	Characteristics	Bitter	Smooth	100 # wire gauge
Powdered stem bark	Brown	Spicy	Bitter	Smooth	100 # wire gauge
Powdered root bark	Brown	Spicy	Bitter	Smooth	100 # wire gauge

The spicy and bitter taste each of the powdered plant materials indicated that the plant organs investigated contain alkaloids thus supporting the use of the plant as a traditional pharmaceutical.



Fig. 6. Images of powdered plant organs of *Caloncoba echinata*

The colour of the powdered plant organs ranges from light green for the leaves to brown for both the stem and root barks. The colour of the powdered plant material will also help who so ever wish to buy and use the plant material for medicinal purpose. It helps prevent adulteration.

3.2. Physicochemical investigation of powdered plant materials of *Caloncoba echinata*

The percentages of moisture content in each of the plant materials are shown in Table (2).

Table 2. Showing the percentage of moisture content of powdered plant organs

Description	Dried Leaves	Dried Stem bark	Dried Root bark
Mass of empty Basin	16.142g	17.876g	16.463g
Mass of Basin + Powdered material	20.958g	25.072g	20.561g
Mass of Basin +Ashes	20.302g	23.870g	19.207g
Mass of dried material before heating	4.816g	7.196g	4.098g
Mass of dried material after heating	0.656g	1.202g	1.354g
Percentage moisture content	13.62%	16.463%	33.0%

Table 2, showed that the moisture content in the various plant organs investigated is greater in the root bark (33.0%) than in the stem bark (16.463%) and the root bark (13.62%).

3.3. Determination of Ash content

The results of the ash content in each of the plant materials are shown in Table (3).

Table 3. Showing the ash content of the plant organs investigated

Description	Dried Leaves	Dried Stem bark	Dried Root bark
Mass of empty crucible	30.352g	28.471g	28.082g
Mass of crucible + Powdered material	38.825g	39.908g	34.741g
Mass of crucible +Ashes	30.894g	29.469g	28.915g
Mass of dried material	8.473g	11.437g	6.659g
Mass of ash obtained	0.542g	0.998g	0.833g
Percentage ash content	6.4%	8.7%	12.509%

Table 3 showed that the ash content in the plant organs investigated was greater in the root bark (12.509%) than the stem bark (8.7%) and leaves bark (6.4%). This indicated that the root bark of the plant contained more inorganic compounds.

3.4. Results determination of pH of ash solutions, water soluble ash and acid soluble ash and the percentage by mass

The results of water soluble ash, pH of aqueous ash solutions, acid soluble ash in percentage by mass are shown Table (4).

Table 4. Showing the percentages of solubility of ash in distilled water, pH determination and in Acid solutions

No.	Parameters investigated	Percentages of extractives		
		Leaves	Stem bark	Root bark
1	Ash content	6.4	8.7	12.4
2	Water Soluble	50.2	19.6	6.4
3	Water insoluble	49.8	81.4	93.6
4	Acid Soluble	72.3	82.5	84.9
5	Acid insoluble	27.7	17.5	15.1
6	pH in distilled water	8.71	9.10	10.70
7	Particle size (mess size)	100	100	100

Table 4 showed that the leaves of the plant contained more water soluble (50.2%) substances than the stem bark (19.6%) and the root bark (6.4%). The root bark contained more water insoluble (93.6%) and acid soluble (84.9%) substances than the leaves and stem bark of the plant investigated. The pH of water soluble ash was found to be greater than 7 indicating the basicity of the extracts, with the root bark (pH = 10.70) more basic than the stem bark (pH = 9.10) and leaves (pH = 8.71)

4. Summary and Conclusion

4.1. Summary

The organoleptic evaluation and physiochemical characteristics of dried powdered plant organs of the traditional medicinal plant *Caloncoba echinata* have been investigated. Organoleptic character refers to evaluation each of the powdered traditional medicinal plant by colour, odour, taste, texture and particle size. Physico-chemical studies such total ash, water soluble ash, acid insoluble ash, water and alcohol soluble extract, loss on drying at 105°C of dried powdered plant organs and then heated in a laboratory furnace to 1000°C were carried out.

The spicy and bitter taste each of the powdered plant materials during organoleptic evaluation indicated that the plant organs investigated contained alkaloids thus supporting the use of the plant as a traditional pharmaceutical. The colour of the powdered plant organs ranges from light green for the leaves to brown for both the stem and root barks. The colour of the powdered plant material will also help who so ever wish to buy and use the plant material for medicinal purpose. It helps prevent adulteration.

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5. Conclusion

Organoleptic evaluation and physiochemical characteristics carried out on the dried powdered plant organs of the traditional medicinal plant *Caloncoba echinata* indicated that the plant is suitable for use in Traditional Medicine. Further research works is needed in order to carry out antimicrobial sensitivity testing of solvent extracts, isolate plant metabolites, characterize them and compare their mode of action to existing drugs.

Conflict of Interest

The authors have declared that no competing interests exist.

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