

Assessment Of Medicinal Value Of (G. Don) Ex Hoyle (Massularia Acuminata) Stem As A Potent Chew Stick Using GC-MS Analysis

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Abstract—Maintenance of mouth hygiene through constant removal of dental plaque and food deposit plays a vital role in the prevention of dental caries and diseases. This study focused on elucidation of the presence of antimicrobial and other active components extractable from (G. Don) ex Hoyle (*Massularia acuminata*) stem also known as Pako commonly used as chew stick in south-western part of Nigeria using a GC-MS procedure. The result obtained showed the presence of five major components (Octanoic acid, ethyl ester, Cyclopropane, nonyl, Decanoic acid, 1- Nonadecene, n-Heptadecanol-1) which possess antibacterial, antifungal, and anti-inflammatory properties. It can therefore be inferred that an adequate use of *Massularia acuminata* as chew stick will improve oral hygiene as it can be very potent as a toothbrush.

Keywords— Dental Chew stick Antifungal Oral Toothbrush

Introduction

It is generally accepted that oral hygiene maintenance through regular removal of dental plaque and food deposits is an essential factor in the prevention of dental caries and periodontal disease. Methods for oral hygiene vary from country to country and from culture to culture [1] Despite the widespread use of toothbrushes and toothpastes, natural methods of tooth cleaning using chewing sticks selected and prepared from the twigs, stems or roots from a variety of plant species have been practised for thousands of years in Asia, Africa, the Middle East and the Americas because of their availability, low cost and simplicity [2]. The plants used are very carefully selected for properties such as foaminess, hardness or bitterness and certain species are more popular than others. A great number of these plant species have related medicinal properties that may be antibacterial [3].

Massularia acuminata, also known as bitter chewing stick is a medium sized shrub that grows up to 5 m high. The plant is native to tropical regions of Western Africa and known for its varied uses in traditional medical practice, especially its acclaimed potency as an aphrodisiac, antidiabetic, anti-carcinogenic, and antimicrobial agent. The stems of *Massularia acuminata* are traditionally used as chewing sticks to improve oral health. [4].

Some studies [5,6, 7], have shown that *Massularia acuminata* chewing sticks, when properly used, can be antibiotic and as efficient as a toothbrush in removing dental plaque. The aim of this study is therefore to establish the presence of antimicrobial and other active components extractable from *Massularia acuminata* chew stick using a GC-MS procedures.

Materials And Methods

Sample Collection

Sticks of *Massularia acuminata* (Pako Ijebu) were purchased from Ijebu-Igbo and authenticated by a botanist in the department of Science Laboratory Technology. The sticks were air dried and ground into powder. The powder sample was transferred into Soxhlet extractor where the extraction with ethanol was carried out for a period of 7 hours. The extract was transferred to a storage bottle and kept in a refrigerator prior the analysis.

Gas Chromatography Mass Spectrometer (GC-MS) Analysis

The GCMS analysis of the Ethanol extract of the *Massularia acuminata* chew sticks was carried out in the laboratory by using GC Model 7890A and MS Model was 5975 ms D. The column used is HP-5 capillary column (30m, 0.32mm, 0.25N. The injection volume is (1.0N/L). Helium was used as the carrier gas with a flow rate of 1.8mL/min in a split less mode.

An aliquot of 2 μ L of ethanol solution of the sample was injected into the column with the injector temperature at 250°C. GC oven temperature started at 90°C initially then 3°C per min at it was raised to 180°C for 10°C/min without holding. The injector and detector temperatures were set as 280°C and 300°C respectively. The mass spectrum of the compounds was obtained by simple ionization monitoring (SIM) for a total running time of 40 minutes.

Result And Discussion

Result obtained for the Gas chromatography-mass spectroscopy analysis of the ethanolic extract of *Massularia acuminata* is as shown in figure 1 below. In the analysis, some bioactive phytochemical compounds were identified. The identification of GC-MS analysis is based on the peak area (%), Retention Time (min), Molecular weight (g/mol), Molecular formula.

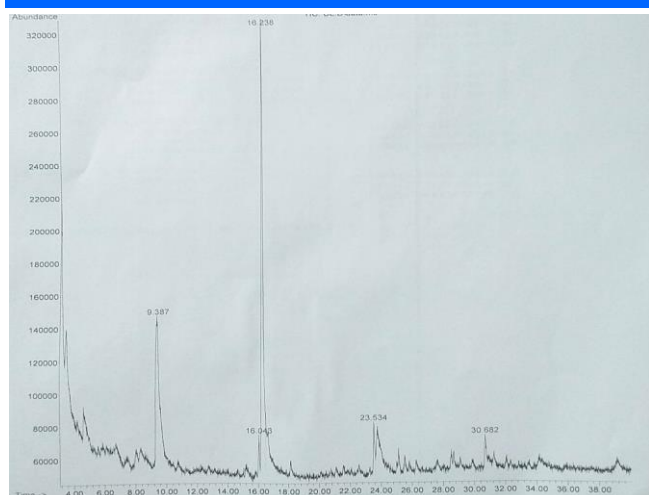


Figure 1: GC-MS Spectra of ethanolic extract of *Massularia acuminata*.

Table 1: Bioactive Components Identified In The Ethanolic Extract Of *Massularia Accuminata*

S/N	Retention time (min)	Name of compound	Molecular formula	Molecular weight(g/mol)	Peak area %
1	9.387	Octanoic acid, ethyl ester	C ₁₀ H ₂₀ O ₂	172	15.74
2	16.043	Cyclopropane, nonyl	C ₁₂ H ₂₄	168	3.73
3	16.238	Decanoic acid, ethyl ester	C ₁₂ H ₂₄ O ₂	200	69.88
4	23.534	1-Nonadecene	C ₁₉ H ₃₈	266	6.29
5	30.682	n-Heptadecanol-1	C ₁₇ H ₃₆ O	256	4.37

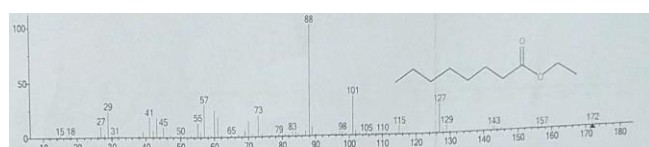


Figure 2: Mass spectra of Octanoic acid, ethyl ester

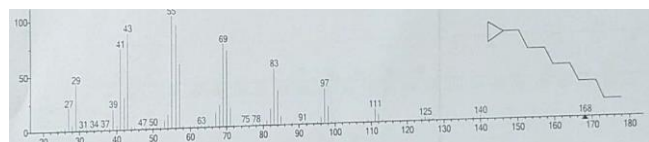


Figure 3: Mass spectra of Cyclopropane, nonyl

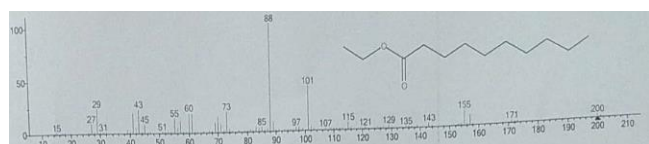


Figure 4: Mass spectra of Decanoic acid, ethyl ester

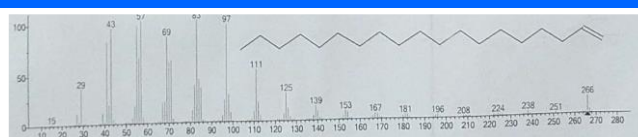


Figure 5: Mass spectra of 1-Nonadecene

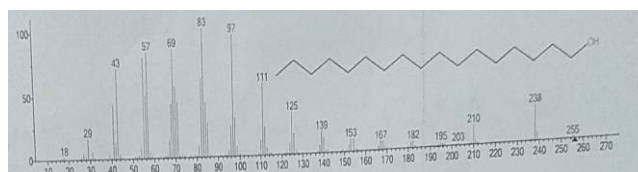


Figure 7: Mass spectra of n-Heptadecanol-1

DISCUSSION

The Gas Chromatography-Mass Spectrometry (GC-MS) analysis of ethanolic extract of *Massularia acuminata* revealed the presence of five major compounds which are Octanoic acid, ethyl ester with peak area of 15.74%, Cyclopropane, nonyl (3.73%), Decanoic acid (69.88%), 1- Nonadecene (6.29%) and n-Heptadecanol-1 (4.37%). The identified compounds possess many medicinal properties. According to Fahlbusch, *et.al.*, [8] Octanoic acid, ethyl ester detected at retention time 9.387 minutes is used in food industries as a flavoring and in the perfume industry as a scent additive. It is present in many fruits and alcoholic beverages, and has a strong odor of fruit and flowers. It is used in the creation of synthetic fruity scents. Decanoic acid, ethyl ester discovered at retention time 16.238mins also have similar application. In addition, Cyclopropane, nonyl discovered at retention time 16.043mins is a gaseous hydrocarbon which is used in medicine as a general anesthetic. [9].

1-nonadecene identified at retention time 23.534mins is an alkene used in artificial ripening of fruits. It is applied in metabolism of aromatic compounds in animals. It also possesses antimicrobial properties. [10].

Finally, n-Heptadecanol-1 detected at retention time 30.682mins acts as anti-arthritis and it is also used in the treatment of skin disease. [11].

Conclusively, dental diseases such as gingivitis, mouth odour and tooth loss may be minimal if our generations which do not value the use of chewing stick except from the elderly will replace toothbrush with *M. Accuminata* chew stick on daily basis due to its medicinal benefits.

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