



Characterization of the Ethanolic Extract of *Randiaaccuminata* (OKOK-EDI) Stem Using FTIR Spectrophotometer

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ABSTRACT

Characterization of the ethanolic extract of *Randiaaccuminata* stem (chewing stick) was carried out using Fourier Transform Infrared (FTIR) Spectrophotometer. The result of the analysis showed that the stem of *Randiaaccuminata* contain primary and secondary amines, aliphatic amine, alkyl halide, aromatic amine, nitro compounds, alkyne, alkanes, chloride and fluoride ions. The chloride and fluoride ions present in this plant is responsible for its cleaning property. It also prevents tooth decay, remove tooth stain, eliminates tooth aches and also promote cleaner teeth.

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Introduction

Tooth cleaning twigs can be obtained from a variety of tree species and although many trees are used in the production of teeth cleaning twigs, some are better suited to clean and protect the teeth. This is because of the chemical composition of the plant part that is used. (Staugard, 2005). Chewing stick (*Randiaaccuminata*) is a woody shrunk of small tree of the Rubiaceae family, it is native to India but is extensively cultivated as an annual crop in tropical and subtropical region for its good oral hygiene and its wide medicinal use. The use of chewing stick has been documented since ancient times. This kind of tooth brushing has been used by Babylonians some 7000 years ago (7000BC) and has ultimately spread throughout the Greek and Roman Empires, Pakistan, Middle East, Ethiopia, Tanzania and Nigeria (Stauffness *et al.*, 2002).

Furthermore, since dentists are scarce in some part of Africa, *Randiaaccuminata* are still in used in some part of Africa, particularly West Africa. Even when people prefer toothbrushes, they do not have access to use the toothpaste due to high cost or remoteness. Some Africa chewing sticks have been reported to contain fluoride ions, saponin, silicon, tannic acid, sodium bicarbonate, and other natural plaque inhibiting substances that can reduce bacterial colonization and plaque formation (Al-sadhen *et al.*, 2009). The concentration of free active substances in Africa chew-twig does not exceed the World Health Organization lethal dose. Therefore, despite the medicinal properties, much work has to be done to examine the anti-microbial effects of some of the Nigeria chewing sticks (Dorner, 2001).

Randiaaccuminata plant is a large neotropical genus of shrubs or small trees of up to 9m high (Basu, 2004). The leaves usually fasciated on the suppressed branches 3.3-5.7cm by 2-3.3cm, obviate, obtuse, wrinkled shining above more or less pubescent above and on the nerves, on the beneath (especially when young), petioles 3-1mm long, densely pubescent, stipules and ovate. The flower at the end of short leaf-bearing branch lets, fragrant, solitary or 2 (rarely 3) together precludes short, calyx 1.3cm long, ovate-oblong subs acute, often with small white, afterward becoming yellow

with tube 5-6mm long, ovate-oblong rounded at apex, pubescent outside, spreading fruit like a small crab apple yellowish globose or broadly ovoid, smooth or obscurely longitudinal ribose, crowned with large carlyx-limb 1,2 called glabrous, pericarp thick seed many flat imbedded in pulp (Stauffness *et al.*, 2002).

Randiaaccuminata is a very good teeth cleaning twig because it clan and protect the teeth due to the chemical composition of the plant part is slow to formation of plaque, and also for its antiseptic properties and is comparable to other oral disinfectants and anti-plaque agent (Staugard, 2005). The roots of *Randiaaccuminata* are considered as insect repellent (Nackarni, 2004). The see are used as tonic to induce appetite. The bark is astringent and is given in diarrhea and dysentery. An infusion of the bark is used as an emetic that treat antipyretic, carminative, laxiteric and cures abscesses, ulcers, inflammation, tumors, skin disease, and snake bites (Staugard, 2005). The fruit is considered as a good remedy in skin disease, gastro-intestinal tract disease, and wound (Gustapassion *et al.*, 2002). *R. accuminata* is generally used for a longer period of time than is a modern toothbrush and the cleaning is usually implemented for 5-10 min each time. The plant fibers remove plaque and simultaneously massage the gums. Cleaning efficacy of *R. accuminata* is attributed to the mechanical effect of its fiber, release of beneficial chemicals or a combination of both. Further it stimulates salivation and thus there may be a better cleansing effect.

The research object of this work is to identify the chemical compounds present in *Randiaaccuminata* using FTIR Spectrophotometer.

Materials and Methods

Collection, Treatment and Storage of Sample

The stems of *Randiaaccuminata* were collected from a farm in Ibesikpo Asutan Local Government Area, Akwa Ibom State. The stem were cut into small pieces and air dried for 15days, and then pounded with mortar and pestle into powder form. The powdered materials were stored in air tight containers for the analysis.

Preparation of ethanolic extract of *Randiaaccuminata*

The powdered sample was soaked in ethanol in a large container with lid and was allowed to stand for 72 hours at room temperature. The filtrate was concentrated using a water bath at 40°C to obtain the crude extract.

Fourier Transform Infrared (FTIR) analysis

FTIR analysis of the stem of *R. accuminata* was carried out using FTIR-84s, Spectrophotometer Shimadzu, Japan series. The sample was prepared using potassium Bromide (KBr) and the analysis was carried out by scanning the sample through a wave number range of 400-4000cm⁻¹.

Result and Discussion

The FTIR Analysis result of *Randiaaccuminata* (stem) are shown in Table 1.

Table 1. FTIR result of *Randiaaccuminata* stem (okok-edi).

| Wave number (cm ⁻¹) | Assignment | Compounds identified |
|---------------------------------|------------------------|-----------------------------|
| 1041.60 | C-N Stretch | Aliphatic amine |
| 1293.06 | C-H wag | Alkyl halide |
| 1327.07 | C-N stretch | Aromatic amine |
| 1519.96 | N-O asymmetric stretch | Nitro compound |
| 1643.41 | N-H bend | Primary Amine |
| 2129.48 | C=H stretch | Alkane |
| 2823.88 | C-H stretch | Alkane |
| 2885.60 | C-H stretch | Alkane |
| 2978.19 | C-H stretch | Alkane |
| 3356.25 | N-H stretch | Primary and secondary amine |

The FTIR analysis of the stem of *Randiaaccuminata* confirmed the presence of primary and secondary amines, alkyl halide, chloride and fluoride, nitro compounds, alkyne, alkane, and aromatic amines. The presence of primary and secondary amines indicates the presence of alkaloids. Amines are precursors of alkaloids. Alkaloids are pharmacologically active compounds used as local anesthetics, stimulants and analgesics. The presence of alkaloids exerts bactericidal effect in the oral cavity and is responsible for the mild bitter taste which stimulates the flow of saliva and is antiseptic (Alma, 2003).

The alkyl halide in the sample indicates the presence of both fluoride and chloride ions. The presence of chloride helps in removing stains from the teeth. The fluoride wets the tooth enamel and protects the teeth from cavity causing bacteria. Fluorides are highly toxic to bacteria. It also protect

the teeth from soft decay area and progressive decay that can lead to the death of the teeth cavities and dental caries. It also helps to release fresh breath.

Saponin is any class of steroid and terpenoid glycosides which foams when shaken with water. Saponin is responsible for the foam formation of the *Randiaaccuminata* stem. This helps to protect the mouth against viruses and bacteria and also produces a pungent flavour. In the course of chewing this stick, when the secreted saliva is swallowed, it helps to reduce the risk of cancer because of its antitumor and anti-mutagenic activities (Alma, 2003).

Conclusion

In conclusion, *Randiaaccuminata* stem which is used as a chewing stick contains amines, alkylhalide, chlorides, fluorides, alkyne, and nitro compounds. These compounds help in strengthening gum, preventing tooth decay, removing tooth stain and eliminating toothaches. It also prevent further decay that might had set in. it is reputed to create a fragrance in the mouth, eliminate bad breath, improve sensitivity of taste-buds and promote cleaner teeth.

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