

# Bioactive compounds behind the free radical scavenging ability of *Psidium guajava*

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**ABSTRACT:**This paper studied the structures of bioactive compound in *Psidium guajava* to see the structure activity relationship between the bioactive compounds that act as antioxidants and free radical scavengers. *Psidium guajava* leaf was extracted with 96% ethanol and subjected to column chromatography using a 50:50 volume/ volume mixture of n-hexane and ethyl acetate as eluent. The eluates collected were analyzed with gas chromatography and mass spectrometry. Two of the compounds discovered from the GC-MS analysis of the leaf of *Psidium guajava* are phenolic compounds namely: 1,3,5-benzenetriol, and 2,5-Bis(1,1-dimethylbutyl)-4-methoxyphenol. Research has shown that among the major bioactive compounds that confer antioxidant properties to medicinal plants are Phenolic compounds. Phenolic compounds has been proven to inhibit diabetes, upper respiratory tract infections, cancer, osteoporosis and cardiovascular diseases. Therefore the free radical scavenging ability of *Psidium guajava* comes largely from 1,3,5-benzenetriol, and 2,5-Bis(1,1-dimethylbutyl)-4-methoxyphenol.

**KEYWORDS:** Free radicals, antimicrobial, phenolic compounds.

## I. INTRODUCTION

*Psidium guajava* commonly known as guava belongs to the family of Myrtaceae. The leaf of guava contains many antibacterial and phytochemical compounds which are active against *Pseudomonas aeruginosa*, *Escherichia coli*, *Staphylococcus aureus*, *Streptococcus pneumoniae* and *Klebsiella pneumoniae*[1].

Guava leaf is traditionally used in Africa to treat throat infections and some sexually transmitted diseases. Some locals even use its water extract for vaginal douching after childbirth to constrict the walls of their vagina. The leaf of *Psidium guajava* has been used medicinally to treat muscle spasm, cough, diarrhea, and diabetes. It also possesses anti-inflammatory, antitumor, anticancer and antimicrobial capabilities [2, 3].

Many biochemical reactions in the human body generate free radicals which cause oxidative stress, an imbalance between the rate of production of free radicals and the rate of their elimination. Free radicals in the human body attack the dna, rna, lipids and tissue proteins causing such diseases as cancer, coronary heart disease and osteoporosis.

Peroxy, hydroxyl, and alkoxy radical are some of the free radicals that degrade the macromolecules in the human body. Antioxidants are substances that delay or prevents oxidative stress [4, 5].

This paper aims at studying the structures of bioactive compound in *Psidium guajava* to see the structure-activity relationship between the bioactive compounds that act as antioxidants and free radical scavengers.

## II. EXPERIMENTAL

Two hundred grams of *Psidium guajava* leaf was washed with clean water and sun dried for 7 days after which it was oven dried at 50° for 4 hours. The sample was ground into fine powder with a mechanical grinder and mixed with 400ml of 96% ethanol in a beaker and stirred intermittently for 72 hours. Afterwards it was filtered, first with a muslin

cloth, and then with a Wathman No1 filter paper [6]. The extract was heated in a steam bath at 78.5° to evaporate the ethanol and recover the crude extract. Various volume ratios of n-hexane and ethyl acetate were prepared and used as mobile phase for thin layer chromatography. TLC plates were stained with a drop of the crude extract and placed in glass jars containing various volume ratios of n-hexane and ethyl acetate as mobile phase. They were left for about 30 minutes to allow for the sample to travel through the mobile phase. Afterwards the various plates were brought out and allowed to dry. The plates were then observed and the spots on the plates were noted. After observing the various plates it was found that the plate that was eluted with 25:75 volume ratio of n-hexane and ethyl acetate mixture has a more effective separation. The

chromatographic column was packed with silica gel mixed together with the eluent mixture to form the stationary phase. Chromatographic tube was clamped to a retort stand and wet packed using the eluent mixture (25:75 volume ratio of n-hexane and ethyl acetate). A conical flask was placed just underneath the chromatographic tube to collect the eluates. After wet packing the stationary phase, 10ml of the sample extract was thoroughly mixed in with 10ml eluent and pipetted on top of the stationary phase. After the sample was introduced, the tube was then gradually filled with the eluent, the stopper was opened and elution started, after the sample had eluted, the first, second and third fractions of the eluates were then collected and sent for GC-MS analysis [7].

### III. RESULTS AND DISCUSSION

Table 1: Library IDs of the GC-MS analysis of Psidium guajava Leaf Extract

1,3,5-Benzenetriol
1,2-Benzenedicarboxylic acid,
n-Hexadecanoic acid
(Z,Z)-9,12-Octadecadienoic acid
Phthalic acid, di(hept-3-yl) ester
cis-muurolo-3,5-diene
alfa-Copaene
Menthol, 1-(butyn-3-one-1-yl)-,1R,2S,5R)
2,5-Bis(1,1-dimethylbutyl)-4-methoxyphenol
Phytol
Octadecanoic acid
Androstane-3,17-diol
Phthalic acid, di(hept-3-yl) ester
2-Furanmethanol, 5-ethenyltetrahyd
Conhydrin
3-Dodecen-1-ol
11-Bromoundecanoic acid
(9Z,12Z,15Z)-octadeca-9,12,15-trienoic acid
Sebacic acid, geranylisoheptyl ester
1-methyl-1-indanol

Several teams of researchers have discovered that among the major bioactive compounds that confer antioxidant properties to medicinal plants are Phenolic compounds. Phenolic compounds has been proven to inhibit diabetes, upper respiratory tract infections, cancer, osteoporosis and cardiovascular diseases [3]. Table

1.1 contains the list of some Library identities of the GC-MS analysis of the leaf of Psidium guajava. Two of the compounds listed in table 1 are phenolic compounds namely: 1,3,5-benzenetriol, and 2,5-Bis(1,1-dimethylbutyl)-4-methoxyphenol.

Computational Studies by some researchers have shown that phenolic compounds have free Radical-Scavenging Properties [8].

#### IV. CONCLUSION

After working on the Antioxidant Principles of compounds Isolated from *Psidium guajava*, and other plants and vegetables, a group of researchers concluded that Phenolic compounds are majorly responsible for the antioxidant and free radical- scavenging capabilities of medicinal plants. (Suganya, et al., 2007). The fact that 1,3,5-benzenetriol, and 2,5-Bis(1,1-dimethylbutyl)-4-methoxyphenol, both of which are phenolic compounds, are present in the GC-MS library identity of the result shown in table 1 supports that assertion. It also suggests that *Psidium guajava* owes its anti-inflammatory, antitumor and anticancer properties mainly to those two phenolic compounds.

In addition, the inductive effect of the ortho 1,1-dimethylbutyl group in 2,5-Bis(1,1-dimethylbutyl)-4-methoxyphenol will make it a better free radical radical scavenger than 1,3,5-benzenetriol since it will give the compound an increased stability [9]. Therefore the use of medicinal plants in the treatment of diseases and health management cannot be overemphasized.

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