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# The cytotoxic activity of *Annona muricata* leaf oil from Badagary, Nigeria

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**ABSTRACT**

The leaf essential oil of *Annona muricata*, collected from Badagary, Nigeria, was obtained by hydrodistillation and analyzed by gas chromatography – mass spectrometry. The leaf oil was dominated by (*E*)-caryophyllene (38.9%) and eugenol (30.2%), with lesser amounts of α-humulene (4.3%), δ-cadinene (6.0%), and caryophyllene oxide (5.0%). *A. muricata* leaf oil showed notable *in-vitro* cytotoxic activity on MCF-7 cells (99.2% kill at 100 μg/mL), which can be attributed to the major components.

**Keywords:** *Annona muricata,* Essential Oil Composition, Cytotoxicity, Caryophyllene, Eugenol.

## 1. Introduction

*Annona* is a genus of the Annonaceae, of which there are about 129 species distributed mainly in Tropical and subtropical region including part of the Caribbean, Central and South America, Africa, Asia and Australia [1]. Seven species and one hybrid are grown for domestic/commercial use [2]. *Annona muricata* L., commonly known in English speaking countries as 'soursop' and '*ebo*' in Yoruba, is an upright, low-branching tree reaching 8 to 10 meters [3-5]. The tree has green, glossy evergreen leaves, and the flowers appear anywhere on the trunk or any branch [6]. Traditionally, the leaves are used for headaches, insomnia, cystitis, liver problems, diabetes, hypertension and as an anti-inflammatory, antispasmodic and antidysenteric [7,8]. In this work, we present the chemical composition and cytotoxic activity of the leaf essential oil of *A. muricata* growing in Badagry, Nigeria.

## 2. Materials and Methods

Fresh leaves of *Annona muricata* were collected in October, 2011, from Badagary, Lagos state, Nigeria. The plant was taxonomically identified and authenticated at the Herbarium of the Department of Botany of the University of Lagos. Prior to hydrodistillation, the plant was air-dried for three days and pulverized. A sample (350 g) of *A. muricata* was subjected to hydrodistillation in a Clevenger-type apparatus (British Pharmacopoeia 1980) for 4 h. The yield of oil was 0.73% on a pulverized weight basis. The oil was dried over anhydrous sodium sulfate and stored in a sealed vial under refrigeration prior to analysis. The leaf essential oil of *A. muricata* was analyzed by GC-MS as previously described [9]. The leaf oil composition is summarized in Table 1. *In-vitro* cytotoxicity evaluation of *A. muricata* oil and essential oil components against MCF-7 human breast adenocarcinoma cells was carried out using the MTT assay as previously described [10].

## 3. Results and Discussion

GC-MS analysis of the leaf essential oil of *A. muricata* (Table 1) revealed 19 identifiable components comprising 100% of the composition. The oil was composed largely of the sesquiterpene hydrocarbons (*E*)-caryophyllene (38.9%), δ-cadinene (6.0%), and α-humulene (4.3%), as well as the phenylpropanoid eugenol (30.2%) and the sesquiterpenoid caryophyllene oxide (5.0%).

*A. muricata* from Brazil was somewhat different, dominated by spathulenol (14.3%), bicyclogermacrene (9.8%), and linalool (8.7%) [14].

The Nigerian *A. muricata* leaf oil showed notable *in-vitro* cytotoxic activity against MCF-7 human adenocarcinoma cells with 99.2±0.1% killing at 100 µg/mL. The cytotoxic activity can be attributed to the major components in the oil. (*E*)-Caryophyllene [15-18], eugenol [18,19], δ-cadinene [15], caryophyllene oxide [17,18,20], α-humulene [17,18,21,22], and β-elemene [23-25] have shown cytotoxic activity against several different cell lines. Against MCF-7 cells, (*E*)-caryophyllene, eugenol, caryophyllene oxide, and α-humulene had $IC_{50}$ values of 38.8±5.4, 97.1±11.7, 23.0±1.3, and 22.1±1.7 µg/mL, respectively.

## 4. Conclusions

*A. muricata* leaf oil from Nigeria was rich in (*E*)-caryophyllene and eugenol; the high eugenol content differentiating it from oils originating from other geographical locations. The leaf oil was cytotoxic, which is attributed to the cytotoxicities of each of the major components.

**Table 1:** Chemical composition of *Annona muricata* leaf essential oil from Nigeria.

| RI | Compound | % | | RI | Compound | % |
|---|---|---|---|---|---|---|
| 941 | α-Pinene | 0.8 | | 1453 | α-Humulene | 4.3 |
| 978 | β-Pinene | 0.3 | | 1481 | γ-Muurolene | 0.8 |
| 1024 | *p*-Cymene | 0.6 | | 1497 | Bicyclogermacrene | 2.0 |
| 1058 | γ-Terpinene | 0.4 | | 1501 | α-Muurolene | 2.1 |
| 1176 | Terpinen-4-ol | 0.2 | | 1505 | Germacrene A | 3.0 |
| 1190 | α-Terpineol | 0.4 | | 1524 | δ-Cadinene | 6.0 |
| 1356 | Eugenol | 30.2 | | 1583 | Caryophyllene oxide | 5.0 |
| 1375 | α-Copaene | 0.2 | | 1641 | τ-Muurolol | 0.7 |
| 1392 | β-Elemene | 3.5 | | 1655 | α-Cadinol | 0.7 |
| 1419 | (*E*)-Caryophyllene | 38.9 | | | Total Identified | 100.0 |

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