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Essential oil composition of *Caperonia palustris* (L.) A. St-Hil. (Euphorbiaceae) growing in South West, Nigeria

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Abstract
The essential oil from the aerial parts of *Caperonia palustris* was obtained by hydrodistillation and analyzed by gas chromatography – mass spectrometry. The essential oil was dominated by sesquiterpene hydrocarbons, (*E*)-caryophyllene (31.2%), germacrene-D (28.1%), α-humulene (8.9%), and β-elemene (7.9%).

Keywords: Essential oil composition, (*E*)-caryophyllene, germacrene-D, α-humulene, β-elemene.

1. Introduction
Caperonia (False croton) is a genus of unpleasant perennial weeds of the Euphorbiaceae comprised of 60 species found in tropical America and tropical Africa [1]. *Caperonia palustris* (L.) A. St-Hil., commonly known in English-speaking countries as Texasweed or Sacatrapo, is an annual dicotyledonous broadleaf plant with a glabrous stem [2, 3]. It is an erect herb ranging in height from 0.3 to 3.0 m, with coarsely pubescent stems and petioles. Leaves are alternate, range in length of 2 to 15 cm, are broadly lanceolate, and serrated on the margins [4]. *C. palustris* prevails in clay soils, which are commonly used for rice and soybean rotations [5, 6]. However, *C. palustris* has been reported to cause great yield losses in rice production [7-10]. To the best of our knowledge, nothing is known about the chemical composition of *C. palustris* essential oil. In this report we present the first detailed GC-MS analysis of the essential oil of *C. palustris* aerial parts.

2. Materials and Methods
2.1 Plant Material
Aerial parts of *Caperonia palustris* were collected in May, 2013, from Olambe – Oke Aro, Ogun State, Nigeria, and the plant species was authenticated in the Botany Department, University of Lagos, Nigeria, with Voucher number LUH 5763. A 500 g sample of *C. palustris* was hydrodistilled for 4 h in a modified Clevenger-type apparatus to yield 1.64 g light yellow essential oil [11]. The essential oil so obtained was stored in a sealed glass bottle with screw lid cover under refrigeration at 4 °C.

2.2 GC-MS Analysis
The volatile oil sample was subjected to GC-MS analysis on an Agilent system consisting of an Agilent model 6890 Gas Chromatograph, an Agilent 5973 mass selective detector (EIMS, electron energy = 70 eV, scan range = 40-400 amu, and scan rate = 3.99 scans/sec) and an Agilent Chemstation data system. The GC column was a HP-5ms fused silica capillary with a (5% phenyl)- methyl polysiloxane stationary phase, film thickness 0.25 µm, length 30 m, and internal diameter of 0.25 mm. The carrier gas was helium with a column head pressure of 7.07 psi and a flow rate of 1.0 mL/min. Inlet temperature was 200 °C and MSD detector temperature was 280 °C. The GC oven temperature program was used as follows: 40 °C initial temperature, hold for 10 min, increased at 3 °C/min to 200 °C, increased 2 °C/min to 220 °C. A 1% w/v solution of the sample in dichloromethane was prepared and 1 µL was injected using a 10:1 split ratio.

Identification of the constituents of the volatile oil was achieved based on their retention data (retention indices) determined with reference to C_9-C_{21} *n*-alkane homologous series, and by comparison of their mass spectral fragmentation patterns with those reported in the literature [12] and stored on the MS library [NIST database (G1036A, revision D.01.00) / ChemStation data system (G1701CA, version C.00.01.08)]. The chemical composition of *C. palustris* essential oil is summarized in Table 1.

3. Results and Discussion

The essential oil was obtained as a light yellow oil (0.328% of the dried plant material). The GC-MS analysis of aerial parts of *C. palustris* facilitated the identification of oil components, which are listed in Table 1. The oil was mainly composed of sesquiterpene hydrocarbons dominated by (*E*)-caryophyllene (31.2%), germacrene-D (28.1%), α-humulene (8.9%), and β-elemene (7.9%). To our knowledge this is the first report on the essential oil composition of any *Caperonia* species, so comparison within the genus is not possible. There have been some *Croton* species that have sesquiterpene-hydrocarbon-rich essential oils, however, *e.g.*, *Croton draco* [13], *Croton isabelli* [14] and *Croton campestris* [15].

Table 1: Essential oil composition of *Caperonia palustris*.

RI	Compound	%		RI	Compound	%
1375	α-Copaene	1.6		1499	Bicyclogermacrene	2.7
1385	β-Bourbonene	1.5		1504	α-Muurolene	0.2
1390	β-Cubebene	0.2		1508	Germacrene A	3.3
1393	β-Elemene	7.9		1511	(*E*,*E*)-α-Farnesene	0.5
1421	(*E*)-Caryophyllene	31.2		1518	Cubebol	1.1
1430	β-Copaene	0.3		1526	δ-Cadinene	1.3
1435	γ-Elemene	0.4		1558	Germacrene B	1.8
1455	α-Humulene	8.9		1566	(*E*)-Nerolidol	0.5
1462	Alloaromadendrene	0.8		1577	Germacrene D-4-ol	0.9
1479	γ-Muurolene	tr		1584	Caryophyllene oxide	0.9
1484	Germacrene-D	28.1		1641	τ-Cadinol	0.9
1490	β-Selinene	0.6		1654	α-Cadinol	3.0
1496	Valencene	1.4			Total Identified	100.0

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