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Short Communication

Chemical composition of leaf oil of Nigerian grown *Aspilia africana* C. D. Adams

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Pulverized leaves of *Aspilia africana* afforded oil in the yield of 0.08% v/w. GC, GC/MS analyses of the oil revealed the abundance of sesquiterpenes (57.5%), with α-cubebene (31.1%) as the major component. Copaene (7.0%) and β-caryophyllene (4.8%) existed in appreciable quantities. Predominant monoterpenes were: α-pinene (6.7%), α-thujene (5.1%) and car-3-ene (5.0%).

Key word: *Aspilia africana*, compositae, essential oil, α-cubebene, α-pinene, β-caryophyllene, α-copaene, α-thujene.

INTRODUCTION

Aspillia africana C.D. Adams (Compositae) is a tropical shrub widely grown in Nigeria, where it is commonly known as yurinyun by the Yorubas, orangila by Igbos, tozalin by Hausas and Edemedong by Efiks (Iwu, 1993). The plant is used in traditional medicine for the treatment of several ailments in different parts of the world. Such ailments include: gonorrhea, tuberculosis, cough, rheumatic pains, stomach trouble, corneal opacity, wounds and insect bites (Iwu, 1993). Some of the therapeutic properties of this plant have been established by various workers. For instance, the non-volatile extracts of the plant are known to possess antimicrobial and anti-inflammatory activities (Adeniyi and Odufowora, 2000; Okoli et al., 2007a**)**. Its efficiency in the treatment of wounds has been reported by Okoli et al. (2007b).

Phytochemical analysis revealed the presence of alkaloids, saponins, glycosides and tannins in the plant (Adeniyi and Odufowora, 2000). Page et al. (1992) reported the presence of diterpenes; kaurenoic and grandiflorenic acids in the leaf of *A. africana*. Earlier work on the leaf essential oil of two varieties of Cameroonian grown *A. africana* has led to the identification of germacrene D, as the predominant sesquiterpene in the oils, while α-pinene and limonene were identified as the predominant monoterpenes in the oils (Kuiate et al., 1999).

In the continuation of our systematic study of the essential oils of Nigerian medicinal plants, we investigated the leaf essential oil of *A. africana*.

EXPERIMENTAL

Plant materials

The fresh leaves of *A. africana* were obtained in Ilorin, Kwara State, North-central Nigeria. Identification was carried out at the herbarium of Forestry Research Institute of Nigeria (FRIN), Ibadan where voucher specimens were deposited. (Herbarium Voucher Number FH 105352).

Oil isolation

Pulverized leaves were hydrodistilled for 3 h in a Clevenger-type apparatus, according to the British Pharmacopoeia (1980) specification. The resulting oil was collected, preserved in a sealed sample tube and stored under refrigeration until analysis.

Gas chromatography

Gas chromatography (GC) analysis were performed on an orion micromat 412 double focusing gas chromatography system fitted with two capillary columns coated with CP-Sil 5 and CP-Sil 19 (fused silica, 25 m × 0.25 mm, 0.15 µm film thickness) and flame ionization detector (FID). The volume injected was 0.2 µl and the split ratio was 1:30. Oven temperature was programmed from

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Table 1. Chemical composition (%) of the leaf oil of *A. africana.*

Compound[a]	RI[b]	Percentage composition	Mass spectra data
α-thujene	933	5.1	136, 121, 105, 91, 65
α-pinene	941	6.7	136, 121, 93, 79, 67
α-myrcene	990	1.7	136, 121, 115, 107, 93
Car-3-ene	1010	5.0	136, 121, 105, 93, 41
α-phellandrene	1030	0.2	136, 105, 93, 77, 65
Limonene	1031	2.5	136, 93, 79, 67, 53
β-ocimene	1038	1.6	136, 121, 105, 93, 79
α-cubebene	1351	31.1	204, 161, 145, 133, 119
α-copaene	1376	7.0	204, 189, 161, 145, 133
Patchoulene	1380	2.7	204, 189, 175, 161, 139
β-elemene	1391	2.1	189, 175, 161, 121, 105
α-cedrene	1410	2.0	204, 189, 161, 147, 119
Isocaryophyllene	1411	2.1	189, 175, 161, 147, 91
β-caryophyllene	1423	4.8	189, 175, 161, 147, 91
α-guaiene	1442	1.4	204, 189, 161, 147, 105
germacrene D	1554	1.2	204, 161, 147, 133, 119
Germacrene B	1556	3.1	209, 204, 161, 121, 93
β-santalol	1713	0.2	202, 173, 161, 122, 94
Total		80.5	

[a]Compounds are listed in order of elution from silica capillary column coated on CP-Sil 5; [b]retention indices on fused silica capillary column coated with CP-Sil 5.

50° - 230°C respectively. Qualitative data were obtained by electronic integration of FID area percents without the use of correction factors.

Gas chromatography/mass spectrometry

A Hewlett Packard (HP 5890A) GC interfaced with a VG Analytical 70-250S double focusing mass spectrometer was used. Helium was the carrier gas at 1.2 ml/min. The MS operating conditions were: ionization voltage 70 ev, ion source temperature 230°C. The GC was fitted with a 25 m × 0.25 mm, fused silica capillary column coated with CP-Sil 5. The film thickness was 0.15 µm, the GC operating conditions were identical with those of GC analysis. The MS data were acquired and processed by online desktop computer equipped with disk memory. The percentage compositions of the oil were computed in each case from GC peak areas. The identification of the components was based on the retention indices (determined relative to the retention times of series of n-alkanes) and mass spectra with those of authentic samples and with data from Literature (Adams 1995; Joulain et al., 1998; Jennings et al., 1980).

RESULTS AND DISCUSSION

Oil yield from pulverized leaves of *A. africana* was 0.08% v/w. The yield compared favourably with the yield from Cameroonian grown *A. africana* (Kuiate et al., 1999).

Table 1 shows the retention indices, relative percentages and the identities of the constituents of the oil. A total of 18 compounds representing 80.5% of the leaf oil were identified from the retention indices and mass spectra. Monoterpenes and sesquiterpenes constituted 22.8 and 57.5% of the oil, while the amount of oxygenated sesquiterpene was 0.2%.

The oil was characterized by the abundance of sesquiterpenes (57.5%). Predominant sesquiterpenes in the oil were: α-cubebene (31.1%), copaene (7.0%) and β-caryophyllene (4.8%). Germacrene B (3.1%), patchoulene (2.7%), β-elemene (2.1%), cedrene (2.0%) and isocaryophyllene (2.1%) were found in appreciable amounts in the oil. Each of the following sesquiterpenes constituted less than 2.0% of the oil: α-guaiene (1.4%) and germacrene D (1.2%). Santalol (0.2%), the only oxygenated sesquiterpene existed as a minor constituent. α-pinene (6.7%), α-thujene (5.1%) and car-3-ene (5.0%) were the predominant monoterpenes in the oil. Other monoterpenes that existed in significant proportions in the oil were: limonene (2.5%), α-myrcene (1.7%) and β-ocimene (1.6%). Phellandrene (0.2%) existed as one of the minor constituents of the oil.

The qualitative composition of the oil was found to be quite similar to the oils obtained from Bafoussam and Yaounde grown *A. africana* in Cameroon. However, marked differences were observed in the quantitative composition of the oils. For instance, the percentage of sesquiterpenes and monoterpenes identified in this investigation were 57.5 and 22.8% respectively. On the otherhand, 88 and 12% of sesquiterpenes and monoterpenes were found in the oil of Bafoussam grown *A. africana* in Cameroon, while in the oil of Yaounde grown *A. africana*, 37 and 63% sesquiterpenes and monoterpenes were identified. The most abundant con-

stituent, α-cubebene, in the oil of Nigerian grown *A. africana* existed as minor constituent in the oils of *A. Africana* from the two locations in Cameroon. Indeed, the oil of Nigerian grown *A. africana* was of α-cubebene chemotype. Meanwhile, germacrene D, the most abundant compound in the oil of Bafoussam grown *A. africana* existed in appreciable amount in the oil of Nigerian grown *A. africana.* Hence, the oil obtained from Bafoussam grown *A. africana* was of germacrene D chemotype.

α-pinene, the most abundant monoterpene in the oil of Nigerian grown *A. africana,* was found to be the most predominant constituent in the oil of Yaounde grown *A. africana.* Thus, the oil of Yaounde grown A. africana was of α-pinene chemotype. Variations in the quantitative compositions of the oils may be due to their agroclimatic and geographical conditions.

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