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Chemical Composition of Leaf and Fruit Essential Oils of *Hoslundia opposita* Vahl Grown in Nigeria

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Abstract: Hydrodistilled leaves and fruits of *Hoslundia opposita* yielded 0.54% and 0.65%v/w of essentials oils. Investigation by GC and GC-MS revealed that the bulk of the oils were constituted by oxygenated monoterpenes (81.3 and 81.4% for the leaves and fruits, respectively). The principal constituents of the leaf oil were 1, 8-cineole (72.3%), α- terpineol (7.2%), sabinene (4.5%), thymol (4.2%) and car-3-ene (3.7%).The fruit oil had abundance of camphor (69.5%), linalool (5.4%) and limonene (2.5%).

Key word: Lamiaceae · *Hoslunda opposite* · Essential oil composition · 1, 8-cineole · Camphor

INTRODUCTION

Hoslundia opposita Vahl (family Lamiaceae) is an herbaceous perennial shrub widely grown in Nigeria, where it is commonly known as Oke ota by the Igbos and Efirin odan by the Yorubas [1]. The plant is widely used in folk medicine for the treatment of abdominal pains, oral wounds, sore throats, epilepsy, mental disturbance and malaria [1, 2]. Biological activities of the plant extracts such as, antimalarial, anticonvulsant and antimicrobial activities [3-5] confirmed its use in folk medicine.

Phytochemical investigations of the plant led to the isolation of 5, 7-dimethyl-6-methylflavone, hoslundiol and euscaphic acid [6]. Four abietane-type esters, 3-O-benzylhosloppone, 3-O-cinnamoylhosloppone, 3-O-benzoylhinokol and 3-O-benzoylhosloquinone [4] were also isolated from the plant. Earlier works on the leaf essential oil of Benin, Cameroon and Ivory Coast grown *H. opposita* revealed that the oil were of germacrene D and β-caryophyllene chemotypes [7,8].

In continuation of our systematic studies of the essential oil of Nigerian grown medicinal plants, we investigated the leaf and fruit essential oils of *H. opposita* grown in Nigeria.

EXPERIMENTAL

Plant Materials: The fresh leaves and fruits of *Hoslundia opposita* were obtained in Ilorin, Kwara State, Nigeria. Identification was carried out at the herbarium of the Forestry Research Institute of Nigeria (FRIN), Ibadan where voucher specimens were deposited (Herbarium Voucher Number FH10086637-0).

Oil Isolation: Pulverized leaves and fruits of *H. opposita* were separately hydrodistilled for 3h in a Clevenger-type apparatus, according to the British Pharmacopoeia specification [9]. The resulting oils were separately collected, preserved in a sealed sample tube and stored under refrigeration until analysis.

Gas Chromatography: GC analyses 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, 25m × 0.25mm, 0.15μm film thickness) and flame ionization detector (FID). The volume injected was 0.2μL and the split ratio was 1:30. Oven temperature was programmed from 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 1.2ml/min. The MS operating conditions were: ionization voltage 70ev, ion source temperature 230°C. The GC was fitted with a 25m × 0.25mm, fused silica capillary column coated with CP-Sil 5.

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The film thickness was 0.15µm. 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 (10 - 12).

DISCUSSION

Pulverized leaves and fruits of *Hoslundia opposita* on hydrodistillation afforded oil in the yield of 0.54 and 0.65 %v/w, respectively.

Table 1 shows the retention indices, relative percentages, mass spectra data and identities of the constituents of the oils. A total of 19 and 25 compounds that represent 96.7 and 98.7% of the leaf and fruit oils were identified from their retention indices and mass spectra, respectively.

Oxygenated and Hydrocarbon monoterpenes constituted 81.3 and 9.7% of the leaf oil while the percentage composition of hydrocarbon sesquiterpenes and aromatic compounds were 2.5 and 5.2%, respectively. The oil was characterized by the abundance of oxygenated monoterpenes, with 1, 8- cineole (72.3%) as the major constituent. α- terpineol (7.2%) and terpine-4-ol (1.1%) were found in significant proportions. Linalool (0.3%), α- campholenal (0.2%), cis-sabinene hydrate (0.2%) existed as minor constituents of the oil.

Table 1: Chemical composition (%) of the fruit and leaf oils of *Hoslundia opposita*

		%Composition		
Compound[a]	RI[b]	Fruit	Leaf	Mass spectra data
α- thujene	926	0.6	0.2	152,135,109,93,67,55
α- pinene	933	1.2	-	136,121,105,93,79,67
Sabinene	971	0.7	4.5	136,121,107,93,77,69
β- pinene	976	3.4	0.1	136, 121,93,79,67,51
Myrcene	990	0.4	-	136,121,105,93,69,53
Car-2-ene	1001	-	0.3	136,121,93,79,65,53
Car-3-ene	1009	-	3.7	136,121,93,79,67,55
Limonene	1027	2.5	-	136,121,93,67,53,44
Benzyl alcohol	1028	1.2	-	108,91,79,77,65,53
1,8 - cineole	1029	1.2	72.3	154,139,108,93,81,43
Cis ocimene	1035	0.1	-	136,121,105,93,79,67
Cis-β-ocimene	1040	-	0.7	136,121,105,93,79,67
Trans ocimene	1045	1.2	-	136,125,105,91,79,67
γ- terpinene	1057	1.1	-	136,125,105,93,77,65
Terpinolene	1087	-	0.2	136,121,105,93,79,51
Linalool	1098	5.4	0.3	139,121,93,71,55,43
α- campholenal	1124	-	0.2	119,108,93,79,67,55
Camphor	1140	69.5	-	152,137,108,95,69,51
Borneol	1162	1.0	-	136,121,110,95,67,55
Terpine-4-ol	1175	0.6	1.1	154,136,111,93,71,45
α- terpeneol	1188	0.6	7.2	136,121,111,95,67,55
Cis-sabinene hydrate	1198	-	0.2	154,136,121,111,93,43
Linalyl acetate	1127	0.7	-	136,121,93,80,67,55
Neral	1238	1.2	-	135,119,109,95,69,53
Geranial	1268	1.2	-	139,123,111,93,69,53
Thymol	1290	-	4.2	150,135,111,91,79,65
Carvacrol	1298	-	1.0	150,135,111,91,79,65
Eugenol	1354	0.7	-	164,149,121,91,65,51
β- cubebene	1390	-	1.1	204,164,121,91,79,69
β- elemene	1391	0.3	-	161,139,121,105,67,53
Caryophyllene	1418	-	0.7	204,189,133,105,91,43
Cis-β- farnesene	1456	-	0.5	204,161,139,91,69,55
Germacrene D	1479	0.8	-	204,147,105,91,79,67
β- bisabolene	1509	-	0.1	204,161,105,91,67,41
δ- cadinene	1523	-	0.1	204,161,119,105,81,
Acetyleugenol	1525	0.4	-	207,167,149,131121,115
Gossonorol	1637	0.7	-	208,157,135,119,105,77
Total		96.7	98.7	

[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.

Hydrocarbon monoterpenes that were found as principal constituents of the oil were; sabinene (4.5%) and car-3-ene (3.7%). β- thujene (0.2%), β- pinene (0.1%), car-2-ene (0.3%) were found as minor constituents.

The most abundant hydrocarbon sesquiterpene in the oil was β- cubebene (1.1%), caryophyllene (0.7%), cis-β-farnescene (0.5%), β- bisabolene and δ-cadinene existed as minor constituents. The two aromatic compounds in the oil; thymol (4.2%) and carvacrol (1.0%) were found in significant proportions.

Oxygenated and hydrocarbon monoterpenes constituted 81.4 and 11.2% of the fruit oil, while the percentage composition of hydrocarbon sesquiterpene and aromatic compounds were 1.1 and 3.0% respectively. The fruit oil was also characterized by the abundance of oxygenated monoterpenes with camphor (69.5%) as the most abundant compound. Linalool (5.4%), 1, 8-cineole (1.2%), geranial (1.2%), neral (1.2%) and borneol (1.0%) were found in significant proportions. Meanwhile, α-terpineol (0.6%), linalylacetate (0.7%), terpine-4-ol (0.6%) existed as minor constituents.

β- pinene (3.4%), limonene (2.5%), α-pinene (1.2%), trans-ocimene (1.2%) and γ- terpinene (1.1%) were the principal hydrocarbon monoterpenes in the oil. Sabinene (0.7%), myrcene (0.4%) and cis-ocimene (0.1%) were found as minor constituents. The two hydrocarbon sesquiterpenes, α-elemene (0.3%) and germacrene D (0.8%) were not among the principal constituents of the oil. However, the most abundant aromatic compound in the oil was benzylalcohol. It constituted 1.2% of the oil. Eugenol (0.7%), acetyleugenol (0.4%) and gossonorol (0.7%) were found as minor constituents.

Comparison of the composition pattern of the leaf and fruit oils of *H. opposita* revealed significant qualitative and quantitative differences. For instance, the principal constituents of the leaf oil, such as car-3-ene, thymol, carvacrol and β-cubebene were not detected in the fruit oil. On the other hand, γ-terpinene, limonene, camphor, neral, geranial, borneol and benzylalcohol that constituted sizeable proportions of the fruit oil were not identified in the leaf oil. Furthermore, 1, 8- cineole, the most abundant constituent of the leaf oil occurred in small amount in the fruit oil. Meanwhile, linalool that constituted a sizeable proportion of the fruit oil also existed as minor constituent of the leaf oil. From the analysis, the oils were of different chemotype. Thus, the leaf and fruit oils were of 1, 8-cineole and camphor chemotypes respectively.

The composition pattern of the leaf oil also differs from the leaf oil of Benin, Cameroon and Ivory Coast grown *H. opposita*. For instance, the leaf oil was characterized by the abundance of oxygenated monoterpenes while that of Benin and Cameroon were characterized by the abundance of hydrocarbon sesquiterpenes[7].

Furthermore, the leaf oil of Nigeria grown *H. opposita* was of 1, 8-cineole chemotype while the oils from the three countries were of germacrene D chemotypes except the oil from Bouake centre in Ivory Coast which was of β-caryophyllene chemotype [8]. Variations in the composition pattern of the leaf oils can be attributed to agroclimatic and geographical conditions.

REFERENCES

1. Iwu, M.M., 1993. Handbook of African Medicinal Plants. CRP Press, BOCa Raton, Florida, pp: 192.
2. Watt, J.M. and M.G. Breyer-Brandwijk, 1962. Medicinal and poisonous plants of Southern and Eastern Africa, E & S Livingstone, Edinburg, pp: 1457.
3. Olajide, O.A., S.O. Awe and J.M. Makinde, 1999. Central nervous system depressant effect of *Hoslundia opposita* Vahl. Phytother, Res., 13(5): 425-6
4. Anchebach, H., R. Waibel, H.H.M. Nkunya and H. Weenen, 1992. Antimalarial compounds from *Hoslundia opposita*. Phytochemis., 31(11):3781-3784.
5. Gundiza, G.M., S.G. Deans, K.P. Svoboda and S. Mavi, 1992. Antimicrobial activity of essential oil from *Hoslundia opposita*. Cent, Afr. J. Med., 38(7): 290-3.
6. Mujovo, S.F., A.A. Hussein, H.H. Marion Meyer, B. Fourie, T. Muthivhi and N. Lall, 2008. Bioactive compounds from *Lippia javanica* and *Hoslundia opposita*. Nat. Prod. Res., 22(12): 1047-1054.
7. Ayeodun, M.A., B.S. Adeoti, J., Setondji, F. Tchoumbougnang, J.R. Kuiate, P.H. Amvam Zollo, C. Menut, G. Lamaty and J.M. Bessiere, 1999. Aromatic plants of Tropical West Africa. XII. Essential oils of *Hoslundia opposita* Vahl. growing in Benin and Cameroon. Flav and Frag J., 22(12): 1047-1054.
8. Tonzibo, Z.F., A. Ahibo Coffy, J.C. Chalachat and Y.T. N'guessan, 2005. Chemical composition of essential oils of *Hoslundia opposita* Vahl. from Ivory Coast. Flav and Frag J., 21(5): 789-791.

9. British Pharmacopoeia II. 1980. 109, H M, Stationary Office, London.
10. Adams, R.P., 1995. Identification of Essential Oil Components by Gas Chromatography and Mass Spectrometry. Allured Publ. Corp., Carol IL. Stream,
11. Jennings, W., I. Shibamito, 1980. Qualitative Analysis of Flavour Volatiles by Gas Capillary Chromatography. Academic Press, New York.
12. Joulain, D., W.A. Koenig, 1998. The Atlas of Spectra Data of Sequiterpene Hydrocarbons. E.B. Verlag Hamburg, Germany.