

## ESSENTIAL OIL COMPOSITION OF *Anacardium occidentale* FROM NIGERIA

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*Anacardium occidentale* L. (Anacardiaceae) is a multipurpose tree growing up to 8–10 m. It is native to the Amazon but is now dispersed in all tropical countries where it is cultivated [1]. The bark, fruit juice, and leaves of the tree are used medicinally, particularly in treating yaws and diarrhea, and the cashew nut has international appeal and market value as a food [1]. The fruit, apart from being delicious, is a richer source of vitamin C than oranges. The species is also esteemed as a reforestation species. Biological activities, including hypoglycemic [2], antimicrobial [3], molluscicidal [4], and leishmanial [5], has been reported for *A. occidentale*. The essential oil constituents of this plant growing in Brazil [6] and Malaysia [7] have also been investigated.

The results of chemical analysis of the *A. occidentale* leaf essential oil are presented in Table 1. Sixty-five compounds, which represent 98.5% of total oil, were identified. The oil is composed mainly of monoterpenes (62.6%) and sesquiterpenes (31.1%). Non-terpenoid compounds account for 5.2% of the oil. Among the monoterpenes, the hydrocarbons are represented mainly by  $\beta$ -phellandrene (42.7%) and small amounts of  $\alpha$ -pinene (4.3%), *p*-cymene (3.2%), *trans*- $\beta$ -ocimene (3.1%), and  $\alpha$ -phellandrene (2.0%) (Table 1). However, the content of oxygenated monoterpenes was smaller (4.8%), yielding  $\alpha$ -terpineol (2.1%) as the main component. In the case of the sesquiterpenes,  $\beta$ -caryophyllene (4.4%) and germacrene D (4.0%) were the major hydrocarbons, while spathulenol (1.6%) and globulol (1.0%) occurred as the major oxygenated compounds in the oil. Considering similar oils found elsewhere, (*E*)- $\beta$ -ocimene,  $\alpha$ -copaene, and  $\delta$ -cadinene predominated in the Brazilian leaf oil [8], while the flower oil consisted of a higher content of  $\beta$ -caryophyllene and a significant amount of methyl salicylate and benzyl tiglate, which were not present in leaf oil. All these compounds found in the Brazilian oil were present in relatively small quantities in the oil from Nigerian sample. The dominant compounds in cashew fruits were non-terpenoid compounds such as hydrocarbons, alcohols, aldehydes, and acids [6, 8, 9]. The monoterpene, *trans*- $\beta$ -ocimene (76%), occurred as the chief constituent of Malaysian leaf oil [7] and may be responsible for the larvicidal and cytotoxicity activities reported for this plant. This compound was present in small proportion in the Nigerian leaf oil. Also, the predominant component of the Nigerian oil,  $\beta$ -phellandrene, was not detected in the oil from Malaysian samples. It is these three chemical varieties of *A. occidentale* leaf oil that are thus far recognized. Recently published results of the essential oil of *A. occidentale* leaf from Nigeria showed limonene as the dominant compound (85.9%) [10]. However, this compound was not detected in our sample.

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TABLE 1. Composition of Essential Oil from *Anacardium occidentale* Leaf

Component	KI*	%	Component	KI*	%
$\alpha$ -Pinene	939	4.3	$\alpha$ -Humulene	1455	0.7
$\beta$ -Pinene	979	0.2	Alloaromadendrene	1460	0.5
Myrcene	991	0.8	<i>cis</i> -Muurolo-4(15),5-diene	1462	0.7
$\alpha$ -Phellandrene	1003	2.0	<i>trans</i> -Cadina-1(6),4-diene	1477	0.2
$\delta$ -3-Carene	1011	0.7	$\gamma$ -Muurolole	1480	0.8
$\alpha$ -Terpinene	1017	0.3	$\alpha$ -Amorphene	1485	0.3
<i>p</i> -Cymene	1025	3.2	<b>Germacrene D</b>	1485	4.0
<b><math>\beta</math>-Phellandrene</b>	1030	<b>42.7</b>	Selina-3,5-diene	1486	0.6
<i>trans</i> - $\beta$ -Ocimene	1050	3.1	Ledene	1491	1.9
$\alpha$ -Terpinolene	1089	0.3	Valencene	1496	0.2
Linalool	1097	0.8	$\alpha$ -Muurolole	1500	0.5
<i>trans</i> -4,8-Dimethyl-1,3,7-nonatriene	-	0.1	Eudesma-2,4(15),11-triene	1508	0.3
<i>trans</i> -Pinene hydrate	1123	0.2	<i>E,E</i> - $\alpha$ -Farnesene	1506	1.8
<i>cis</i> -3-Hexenylisobutyrate	1147	0.3	<i>Z,E</i> - $\alpha$ -Farnesene	-	0.3
Sabina ketone	1159	0.2	$\gamma$ -Cadinene	1514	1.4
<i>cis</i> -3-Hexenylbutyrate	1186	2.2	$\delta$ -Cadinene	1523	1.7
$\alpha$ -Terpineol	1189	2.1	<i>trans</i> -Cadina-1(2),4-diene	1535	0.7
<i>cis</i> -3-Hexenyl-2-methylbutanoate	-	1.2	$\alpha$ -Cadinene	1539	0.2
<i>cis</i> -3-Hexenyl- $\alpha$ -methylbutyrate	-	0.2	$\alpha$ -Calacorene	1546	0.3
Cuminal	1242	0.4	Palustrol	1569	0.3
Piperitone	1253	0.4	<i>cis</i> -3-Hexenyl benzoate	1580	0.2
Phellandral	1276	0.6	Spathulenol	1578	1.6
Dihydroedulan II	1290	0.3	Globulol	1585	1.0
<i>Z</i> -3-Hexenyltiglate	1331	0.6	Viridiflorol	1593	0.3
$\delta$ -Elemene	1338	0.4	Rosiflorol	1599	0.1
8-Hydroxylinalool	1336	0.3	5-Guaiene-11-ol	1619	0.2
$\alpha$ -Cubebene	1351	0.3	<i>iso</i> -Spathulenol	1625	0.2
3,4-Dimethoxyphenol	-	0.3	$\tau$ -Muurolole	1633	0.2
$\alpha$ -Ylangene	1375	0.3	$\alpha$ -Cadinol	1654	0.3
$\alpha$ -Copaene	1377	2.1	Grouped constituents		
Hexenyl hexanoate	1384	0.4	Monoterpene hydrocarbons		57.8
Cyperene	1399	0.5	Oxygenated monoterpenes		4.8
<b><math>\beta</math>-Caryophyllene</b>	1419	4.4	Sesquiterpene hydrocarbons		26.9
$\beta$ -Copaene	1432	0.4	Oxygenated sesquiterpenes		4.2
$\alpha$ -Maaliene	1441	0.4	Others		4.9
Aromadendrene	1447	0.9	Total identified		98.5

\*KI: kovats index on DB-5 column.

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