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I. Introduction

Lauraceae comprises 52 genera and approximately 3,000 species, distributed throughout tropical and subtropical regions (Chanderbali et al., 2001). Twenty four genera and about 441 spp. of this family occur in Brazil, mostly in wet forests, sandbanks and "cerrado" (a tropical savanna ecoregion of Brazil) (Quinet et al., 2015). *Aniba rosaeodora* Ducke, popularly known as "pau-rosa" (rosewood), is endemic to Brazil, and occurs in the States of Amapá, Amazonas and Pará (Quinet et al., 2013). According to Marques (2001), besides *A. rosaeodora*, 12 other species belonging to the genus *Aniba* are known as "pau-rosa", including *A. parviflora*(Meisn.) Mez. *Aniba parviflora* is locally known as "macacaporanga" and is frequently confused with *A. rosaeodora* due to the similarities of their morphological aspects. An essential oil, dominated by linalool (3,7-dimethyl-1,6-octadien-3-ol) and known as rosewood oil, is extracted by steam distillation from the trunk wood of *A. rosaeodora*, Rosewood oil is widely used in fragrances for perfumery industry, mostly due to the fragrance of linalool. When populations of *A. rosaeodora*(Syn: *A. duckei* Kostermans) from French Guiana disappeared due to destructive exploitation, Brazilian populations of *A. rosaeodora* came to meet a high market demand. The search for another oil rich in linalool, but possessing a close bouquet of rosewood oil, prompted many researchers to study the leaf oil of *A. rosaeodora* from Brazil and French Guiana (Gottlieb and Mors, 1958; Araujo et al., 1971; Ohashi et al., 1997; Maia et al., 2007; Chantraine et al., 2009; Fidelis et al., 2012; Cunha, 2011). These studies showed that *A. rosaeodora* leaf oils also were dominated by linalool. Analysis of this oil using a two-dimensional (GC x GC) analytical technique was able to separate and identify more compounds when compared to gas chromatography (GC) (Fidelis et al., 2012). Very few studies were reported dealing with the volatiles of *A. parviflora* (Syn.: *Aniba fragrans* Ducke). Leaves and fine branches oils containing limonene, linalool and spathulenol as major compounds was reported (Maia et al., 2000). A study conducted by Tranchida et al. (2008) and focused on the use of a comprehensive 2D GC methodology, led to the identification of 84 compounds in the leaf essential oil, but unfortunately, the authors did not furnish the relative percentual contribution of each compound.

The aim of this paper was to analyze the chemical composition of 35 leaf essential oils obtained from *A. rosaeodora* cultivated trees in the State of Pará, in the North Brazil. Additionally, two samples of *A. parviflora* leaf oils were analyzed.

II. Experimental Botanical Material

Thirty five samples of *A. rosaeodora* leaves (AR) were collected for essential oil extraction. Numbering followed the collections numbers. Samples AR-3 and AR-4 were collected in a smallholder rural property, in the municipality of Tomé-Açu. Samples AR-36, AR-37 and AR-38 were collected in Curuá-Una, municipality of Santarém, from of an experimental plantation cultivated since 1974. Samples AR-5 to AR-35 were collected from an experimental 17 years old plantation in the research campus of Universidade Federal Rural da Amazônia (UFRA), in the city of Belém. All samples were collected in October, 2008. Both samples of *A. parviflora* (AP-2 and AP-21) were collected in the same place of samples AR-3 and AR-4. Botanical identification was carried out by comparison with the vouchers MG-53,318 (*A. rosaeodora*) and MG-30,053 (*A. parviflora*) deposited in the Herbarium MG of MuseuParaenseEmílioGoeldi

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(MPEG). The samples were dried for 7 days in an air-conditioned room (at low humidity) and then ground.

III. Extraction of Volatile Compounds

The dry plant material was hydrodistilled for 3 h, using a Clevenger-type apparatus with refrigeration water at 15°C. The oils obtained were centrifuged for 5 min (3,000 rpm), dried over Na_2SO_4, and centrifuged again in the same conditions. A hexane solution (1 mL) containing 2 μL of the oil was submitted to GC-MS analysis. The total oil yield was expressed in percentage (volume·mass^{-1}) on the basis of dried material. The amount of water was measured using infrared light on a Marte ID-50 device.

IV. Analysis of Volatile Compounds

The oils were analyzed using a Shimadzu GC/MS Model QP-2010 Plus, equipped with a Rtx-5MS (30 m × 0.25 mm; 0.25 µm film thickness) fused silica capillary column. Chromatographic conditions included helium as carrier gas at 1.2 mL·min^{-1}; splitless injection of 1 µL of hexane solution; injector and interface temperature at 250°C; oven temperature program 60-240°C at 3°C·min $^{-1}$. EIMS: electron energy, 70 eV; ion source temperature at 200°C. Identification of the compounds were made by comparison of their GC mass and retention data with those in NIST-05 library, and cited in the literature (Fidelis et al., 2018; Adams, 2007; Qiao et al., 2008). Retention indices were calculated using *n*-alkane standard solutions (C8-C26) available from Fluka S. A., in the same chromatographic conditions.

V. Results and Discussion

GC/MS analysis of the essential oils of *A. rosaeodora* obtained from the leaves of 35 trees led to the identification of a total of 48 different compounds, while 81 compounds were identified in two oils of *A. parviflora*. Tables 1 – 3 show the identified compounds in sequence of their retention indices together with the yields. Yields of *A. rosaeodora* essential oils ranged from 1.15% to 4.21%. The samples of *A. parviflora* furnished oils with 0.92% and 1.29% yields. High yields in oil of *A. rosaeodora* were obtained from the samples collected in Curuá-Una (AR-36: 3.85%, AR-37: 3.97% and AR-38: 4.21%), followed by samples taken in Tomé-Açu (AR-3 and AR-4: 2.92% and 2.69%, respectively). Comparison of the results with those reported by Chantraine et al. (2009) for the leaf oils of *A.rosaeodora* from French Guiana (0.18% to 0.55%) reveals a great difference. The trees cultivated in the campus of UFRA (AR-3 to AR-20 and AR-22 to AR-38), all of the same age (17 years old), provided yields that ranged from 1.15% to 3.05%. These results are in accordance with Chantraine et al. (2009) that obtained yields that were practically independent of the tree ages.

The content of linalool in the 35 *A. rosaeodora* oils ranged from 38.48% to 71.05%. Other compounds identified in the leaf oils of *A. rosaeodora* in amount ≥ 1% were α-pinene, *cis*-linalool furanoxide, *trans*-linalool furanoxide, α-copaene, β-elemene, β-cayophyllene, β-selinene, α-selinene, spathulenol, cayophyllene oxide, humulene epoxide II, selin-11-en-4α-ol and benzyl benzoate. Five linalool derivatives were found (dihydro-2,6,6-trimethyl-6-vinyl-2H-pyran-3(4H)-one, *cis*-linalool furanoxide, *trans*-linalool furanoxide, *cis*-linalool pyranoxide and *trans*-linalool pyranoxide). Pyranoxide derivatives of linalool were identified only in a small percentage (traces-0.29%). Benzyl benzoate was detected in *A. rosaeodora* and in *A. parviflora*, while benzyl salicylate was identified only in *A. parviflora*. Comparison of the present results to those previously reported by Maia et al. (2007) reveals some similarities in the chemical composition, but 1,8-cineole, β-chamigrene, α-muurolol and α-cadinol were not detected. In the same way, several compounds identified by Fidelis et al. (2012) in the leaf oil of *A. rosaeodora* by gas chromatography-quadrupole mass spectrometry, such as 1,8-cineole, hotrienol, myrcenol and ocimenol, were not detected in all 35 samples. No significant qualitative differences between individual chemical components of the samples of *A. rosaeodora* taken in Curuá-Una (Samples AR-36 – AR-38) and Tomé-Açu (AR-3 and AR-4) have been observed. However, considerable quantitative variation was noted in the linalool content (48.10% to 55.91%).

Linalool was present in leaf oils of *A. parviflora* in a smaller amount (21.30% and 12.64%) when compared to those encountered in *A. rosaeodora*. Besides linalool, AP-2 and AP-21 oils were characterized by a high amount of β-phellandrene (21.06% and 23.60%). The leaf and fine branch oil of *A. parviflora* (cited as *A.fragrans*), also collected in Curuá-Una, was reported by Maia et al. (2000) to contain linalool (32.40%), spathulenol (19.1%) and limonene (14.5%) as major compounds. Limonene was not detected in both analyzed samples; spathulenol was present in a small content, as well α- and β-eudesmol. Comparison of the chemical composition of the oils of *A. parviflora* with those previously reported by Tranchida et al.[13] reveals similarity on the presence of linalool as the major compound, but in both analyzed oils, β-phellandrene, instead of α-phellandrene, was detected in a high amount.

In order to investigate the chemical variability, all identified compounds in all studied oils were included in the multivariate analysis using Minitab 14 software for Hierarchical Component Analysis (HCA). HCA led to two-well defined clusters of essential oils: Cluster I, composed by the samples from *A. parviflora* characterized by the presence of linalool and β-phellandrene, and Cluster II, composed by the samples of *A. rosaeodora*, rich in linalool (Figure 1).

A study conducted by Chantraine et al. (2009) with the essential oil of *A. rosaeodora* trunk wood revealed that the age of the trees, season and phenological stages had no influence on the amount of linalool; but yield changes considerably. A large variation in the linalool content and in yields were observed, although the majority of the samples (Samples AR-3 to AR-20, and AR-22 to AR-38) were of the same age and they were collected in the same environment, date and Amazonian climate period (dry season);additionally, all trees were free from injuries caused by microorganisms. The chemical variability in *A. rosaeodora* is particularly important due to its potential to be used by perfumery industry.

VI. Conclusions

This study shows that the leaves of *A. rosaeodora* furnish essential oils with a high variation in linalool content and yield. It also shows that the chemical composition of essential oils could be an important tool in distinguishing *A. rosaeodora* and *A. parviflora*.

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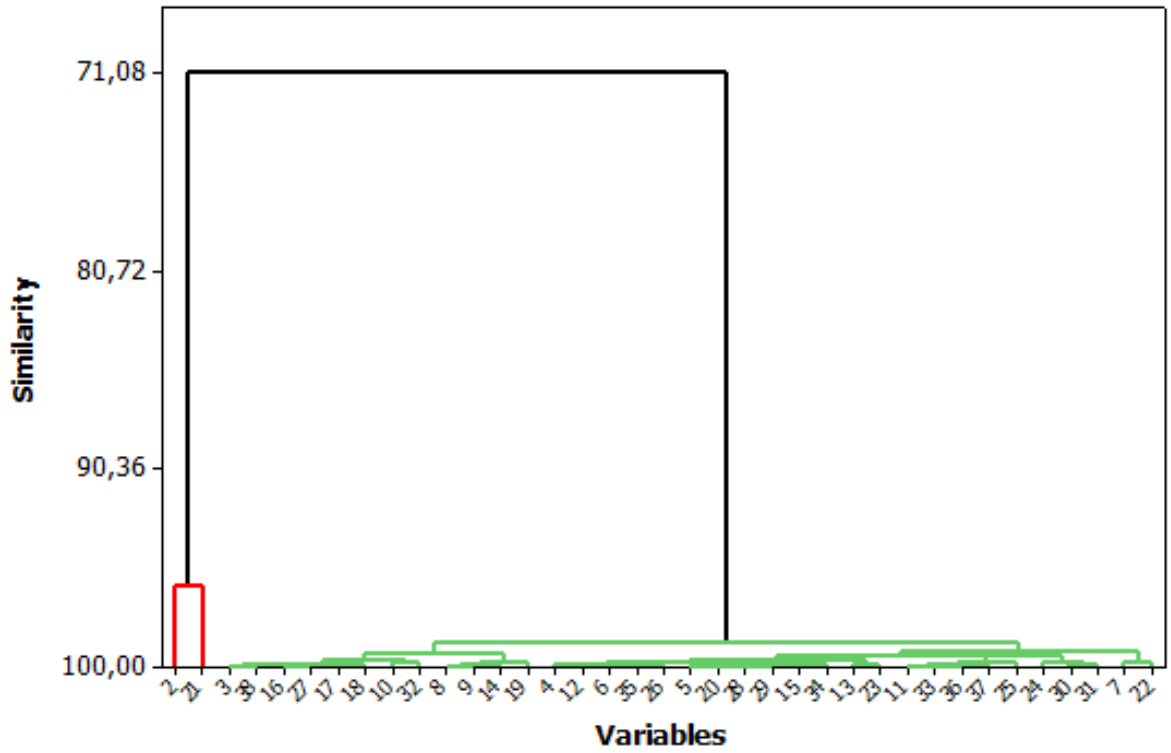

Figure 1 : Hierarchical Component Analysis (HCA) of *Aniba rosaeodora* and *A. parviflora* plants collected in the experimental plantation of Universidade Federal Rural da Amazônia, Belém, State of Pará, Brazil

Table 1 : Chemical constituents (%) identified in the essential oils of *Anibarosaeodora* leaves (AR).

Constituents/yields (%)	RI*	AR-3	AR-4	AR-5	AR-6	AR-7	AR-8	AR-9	AR-10	AR-11	AR-12	AR-13	AR-14
		2.92	2.69	2.39	2.19	1.15	1.81	1.55	2.17	2.06	1.68	2.39	2.05
(*Z*)-hexen-3-ol	857	tr	tr	tr	tr	tr	tr	-	tr	-	0.13	Tr	tr
hexanol	870	tr	tr	tr	tr	tr	tr	tr	tr	tr	0.74	Tr	tr
α-pinene	937	tr	0.87	-	tr	-	-	-	-	-	2.68	0.98	-
β-pinene	981	-	0.40	-	tr	-	-	-	-	-	0.80	0.38	-
myrcene	995	0.55	0.93	0.59	0.67	0.45	0.43	0.54	0.52	0.64	0.98	0.56	0.43
p-cymene	1027	-	-	-	-	-	-	-	-	-	-	Tr	tr
limonene	1031	0.63	0.63	tr	tr	tr	tr	tr	tr	tr	0.54	Tr	tr
(*Z*)-β-ocimene	1039	tr	-	tr	tr	tr	tr	tr	tr	tr	0.22	Tr	tr
(*E*)-β-ocimene	1050	0.31	0.42	0.27	0.31	tr	tr	0.25	tr	0.31	0.37	0.21	tr
cis-linaloolfuranoxide	1074	1.77	5.59	3.55	4.21	1.04	1.51	1.29	1.05	0.90	4.28	3.20	2.05
trans-linaloolfuranoxide	1091	1.42	4.43	2.70	3.30	0.80	1.12	0.93	0.79	0.64	2.94	2.48	1.53
linalool	1103	50.81	55.91	51.75	57.17	43.02	42.61	45.28	42.67	52.22	55.10	43.96	44.66
dihydro-2,2,6-trimethyl-6-vinyl-2H-pyran-3(4H)-one[a]	1113	0.59	0.84	0.85	0.76	0.40	0.45	0.54	tr	0.49	0.62	0.72	0.57
allo-ocimene	1131	-	tr	tr	tr	tr	tr	tr	tr	tr	tr	Tr	tr
borneol	1169	-	-	-	-	-	-	-	-	-	tr	-	-
cis-linaloolpyranoxide	1170	0.08	0.17	0.08	0.19	tr	tr	tr	tr	tr	tr	0.09	tr
trans-linaloolpyranoxide	1177	tr	0.29	0.14	0.33	0.01	0.06	tr	tr	tr	0.12	0.17	tr
α-terpineol	1194	0.24	0.3	0.15	0.18	0.12	0.16	0.16	0.15	0.14	0.47	0.21	tr

nerol	1231	tr	0.08	tr	tr	tr	tr	tr	tr	tr	0.08	Tr	tr
geraniol	1257	0.11	0.17	0.12	0.14	0.09	0.11	0.12	0.10	0.11	0.19	0.11	0.09
δ-elemene	1340	0.05	-	tr	-	-	tr	tr	0.06	tr	-	Tr	-
α-cubebene	1353	tr	-	tr	-	tr	tr	tr	-	tr	-	Tr	tr
α-copaene	1380	1.57	1.67	3.39	2.33	3.10	2.77	2.80	1.96	2.59	0.95	3.51	2.23
β-elemene	1395	1.68	0.32	0.41	0.29	0.50	1.06	0.78	1.52	1.07	0.20	0.60	0.79
β-caryophyllene	1424	0.75	tr	0.53	0.30	0.35	0.94	0.95	2.43	1.48	tr	0.35	0.42
α-guaiene	1443	0.19	0.08	0.09	0.12	0.14	0.21	0.22	0.38	0.15	0.08	0.17	0.13
α-humulene	1458	0.20	tr	0.11	tr	0.06	0.17	0.16	0.44	0.24	tr	0.08	0.11
allo-aromadendrene	1467	-	-	-	-	-	-	-	-	-	tr	-	-
4,5-di-*epi*-aristolochene	1474	0.17	0.11	0.15	0.11	0.24	0.21	0.21	0.19	0.13	0.11	0.22	0.23
γ-selinene[b]	1489	0.89	0.53	0.59	0.52	0.85	0.92	0.89	0.81	0.78	0.40	0.91	0.97
β-selinene	1492	4.35	3.43	3.79	3.37	5.84	5.23	5.11	4.88	4.24	3.34	5.25	5.40
α-selinene	1501	4.06	2.63	2.75	2.58	4.19	4.26	4.11	4.13	3.53	2.2	4.24	4.49
α-muurolene	1505	-	-	-	-	-	-	-	-	-	0.01	-	-
α-bulnesene	1510	0.23	-	tr	-	-	0.21	0.20	-	0.19	-	0.20	0.21
γ-cadinene	1519	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr
7-*epi*-α-selinene	1522	0.14	0.09	0.09	0.09	0.16	0.16	0.15	0.14	0.12	0.08	0.16	0.17
δ-cadinene	1527	0.13	0.11	0.21	0.14	0.21	0.19	0.18	0.18	0.14	0.08	0.23	0.13
(*E*)-nerolidol	1563	0.28	0.20	0.31	0.34	0.28	0.49	0.42	0.42	0.26	tr	0.22	0.24
spathulenol	1580	4.46	2.67	3.82	3.92	4.46	3.32	3.01	7.20	1.48	4.25	3.51	1.33
caryophyllene oxide	1585	0.75	0.28	1.1	1.33	1.05	1.45	1.26	2.45	1.41	0.30	0.93	1.08
guaiol	1597	-	-	0.51	-	-	0.51	-	0.61	0.47	-	0.51	0.71
humuleneepoxide II	1611	0.86	0.56	0.84	0.66	0.87	0.96	0.92	1.02	0.75	0.53	0.86	0.91
selina-6-en-4-ol	1616	0.48	0.35	0.40	0.30	0.48	0.53	0.50	0.41	0.29	0.34	0.50	0.53
iso-spathulenol	1631	0.16	0.16	0.29	0.16	0.37	0.38	0.34	0.28	0.15	0.25	0.37	0.37
caryophylla-4(12),8(13)-dien-5-ol[c]	1641	0.53	0.13	0.38	0.40	0.46	0.55	0.48	0.87	0.32	0.18	0.42	0.27
selina-3,11-dien-6α-ol	1651	0.34	0.25	0.34	0.24	0.46	0.53	0.50	0.42	0.40	0.24	0.42	0.57
selin-11-en-4α-ol	1660	2.09	1.35	1.76	1.37	2.58	2.35	2.19	2.08	1.57	1.60	2.20	2.46
n.i.	1717	2.45	1.70	2.08	1.77	3.00	3.28	3.16	2.63	3.18	1.69	2.59	3.49
n.i.	1728	3.61	2.80	3.81	3.16	6.14	5.87	5.69	4.81	5.40	3.59	4.49	6.06
n.i.	1732	4.41	3.35	4.23	3.58	6.45	6.49	6.24	5.33	5.98	3.92	5.12	6.87
benzylbenzoate	1773	1.16	0.60	1.47	0.77	3.49	1.04	1.04	0.99	1.01	1.26	1.21	0.85

**RI on HP-5MS; [a]Ref. 10; [b]Ref 14; [c]Correct isomer not characterized; tr = traces (< 0.01%); RI = 1717, m/z (rel. int.): 220 [M⁺](39), 202(27), 187(41), 173(12), 159(45), 145(81), 133(100), 119(61), 105(84), 93(93), 79(43), 67(30), 55(34), 41(46); RI = 1728, m/z (rel. int.): 220 [M⁺](21), 205(47), 202(42), 187(28), 177(13), 165(19), 159(52), 145(48), 133(53), 119(61), 105(90), 93(100), 79(70), 67(56), 55(50), 41(57); RI = 1732, m/z (rel. int.): 220 [M⁺](61), 205(23), 202(16), 187(32), 177(19), 159(47), 145(46), 133(50), 121(64), 107(81), 93(100), 81(88), 71(73), 55(55), 43(65).*

Table 2 : Chemical constituents (%) identified in the essential oils of Anibarosaeodora leaves (AR)

Constituents/yields (%)	IR	AR-15	AR-16	AR-17	AR-18	AR-19	AR-20	AR-22	AR-23	AR-24	AR-25	AR-26	AR-27
		2.25	2.85	1.63	3.04	2.72	2.04	1.22	2.47	2.34	2.20	2.90	3.52
(*Z*)-hexen-3-ol	857	tr	-	-	tr	tr	-	-	-	-	-	-	-
hexanol	870	tr	tr	-	0.55	0.23	-	tr	tr	-	tr	-	tr
α-pinene	937	1.71	-	-	-	-	-	-	1.57	0.82	1.11	0.38	-
β-pinene	981	0.85	-	-	-	-	-	-	0.68	0.54	0.51	0.24	-
myrcene	995	0.87	0.58	0.55	0.52	0.38	0.42	0.45	0.55	0.72	0.97	0.70	0.67
p-cymene	1027	-	-	-	-	-	-	-	-	-	-	tr	tr
limonene	1031	0.55	tr	tr	0.22	0.22	tr	tr	tr	0.62	0.69	0.45	tr
(*Z*)-β-ocimene	1039	0.21	tr	tr	0.13	0.11	tr	tr	-	-	tr	tr	tr
(*E*)-β-ocimene	1050	0.34	0.27	0.24	0.23	0.18	tr	tr	0.21	0.31	0.42	0.30	0.31
cis-linaloolfuranoxide	1074	4.79	1.21	1.90	2.96	1.09	2.84	2.66	3.68	1.15	2.43	2.86	1.73
trans-linaloolfuranoxide	1091	3.75	0.89	1.41	2.34	0.80	2.21	2.01	2.84	0.90	1.81	2.21	1.32
linalool	1103	56.29	52.72	46.90	49.24	38.48	47.49	45.41	45.99	57.22	64.26	52.68	49.93
dihydro-2,2,6-trimethyl-6-vinyl-2H-pyran-3(4H)-one[a]	1113	1.14	0.62	0.56	0.46	0.44	0.63	0.62	0.59	0.81	1.25	0.73	0.61
allo-ocimene	1131	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	-	tr
borneol	1169	tr	tr	-	-	-	-	-	tr	tr	tr	-	-
cis-linaloolpyranoxide	1170	0.14	tr	tr	0.09	0.02	0.10	0.09	0.13	tr	tr	0.09	0.06
trans-linaloolpyranoxide	1177	0.25	tr	tr	0.16	0.03	0.17	0.17	0.23	tr	0.07	0.14	tr
α-terpineol	1194	0.36	0.18	0.18	0.14	0.08	0.14	0.19	0.28	0.17	0.25	0.17	0.14
Nerol	1231	0.07	0.06	-	0.04	0.03	tr	tr	tr	tr	0.07	0.06	0.05
Geraniol	1257	0.17	0.16	0.15	0.10	0.07	0.12	0.10	0.12	0.10	0.16	0.12	0.13
δ-elemene	1340	-	-	-	0.01	0.01	-	0.01	-	-	-	-	-
α-cubebene	1353	-	tr	tr	0.03	0.03	tr	tr	tr	-	tr	tr	0.01
α-copaene	1380	3.37	2.46	2.26	3.45	2.21	3.20	3.65	5.06	5.48	3.27	1.51	2.64
β-elemene	1395	0.13	0.85	0.43	0.59	0.91	0.34	0.45	0.35	0.76	0.10	0.29	1.20
β-caryophyllene	1424	0.19	0.38	0.37	0.39	0.96	0.47	0.27	0.11	0.18	0.11	0.15	0.63
α-guaiene	1443	0.14	0.20	0.17	0.22	0.21	0.13	0.20	0.11	0.20	0.11	0.15	0.18
α-humulene	1458	tr	0.17	0.11	0.13	0.19	0.10	0.07	0.06	0.17	-	0.07	0.16
allo-aromadendrene	1464	tr	tr	tr	0.04	tr	tr	tr	tr	tr	tr	tr	tr
4,5-di-*epi*-aristolochene	1474	0.10	0.15	0.21	0.14	0.31	0.15	0.16	0.15	0.07	0.08	0.16	0.13
γ-selinene[b]	1480	0.55	0.80	0.86	0.72	1.24	0.69	0.64	0.70	0.52	0.49	0.75	0.71
β-selinene	1497	3.07	4.00	4.92	4.09	6.41	4.02	4.31	4.04	2.21	2.68	4.19	3.89
α-selinene	1501	2.39	3.69	4.07	3.44	5.58	3.10	3.10	3.17	2.27	2.11	3.46	3.19
α-muurolene	1505	-	-	-	0.07	tr	tr	tr	tr	tr	tr	tr	tr
α-bulnesene	1510	-	0.19	0.23	0.19	0.18	0.17	0.11	0.09	0.24	0.12	0.19	0.25
γ-cadinene	1519	tr	tr	tr	tr	tr	tr	0.08	tr	0.10	tr	tr	tr
7-*epi*-α-selinene	1522	0.08	0.13	0.16	0.13	0.23	0.11	0.13	0.11	0.09	0.06	0.12	0.12
δ-cadinene	1527	0.19	0.21	0.2	0.23	0.15	0.20	0.30	0.36	0.29	0.15	0.12	0.16
(*E*)-nerolidol	1563	0.12	0.33	0.22	0.23	0.45	0.37	0.28	0.30	0.14	0.12	0.23	0.46
spathulenol	1580	3.87	5.12	4.53	6.47	1.54	2.79	4.70	2.62	6.53	3.26	4.56	4.44
caryophyllene oxide	1585	0.22	0.55	0.84	0.94	1.59	1.26	0.59	0.36	0.35	0.19	0.39	0.88
guaiol	1597	0.11	0.71	0.58	0.33	0.24	0.47	0.39	0.34	0.44	0.11	0.47	0.61

humuleneepoxide II	1611	0.42	0.67	0.80	0.82	1.04	0.88	0.77	0.72	0.89	0.38	0.69	0.76
selina-6-en-4-ol	1616	0.26	0.41	0.52	0.39	0.63	0.42	0.46	0.41	0.23	0.23	0.25	0.34
iso-spathulenol	1631	0.13	0.24	0.33	0.26	0.32	0.26	0.39	0.34	0.20	0.08	0.22	0.25
caryophylla-4(12),8(13)-dien-5-ol[c]	1641	0.24	0.71	0.51	0.58	0.35	0.55	0.52	0.26	0.99	0.26	0.50	0.56
selina-3,11-dien-6α-ol	1651	0.16	0.33	0.41	0.36	0.56	0.45	0.40	0.40	0.25	0.14	0.33	0.40
selin-11-en-4α-ol	1660	1.21	2.07	2.33	1.51	2.59	1.90	1.94	1.84	0.80	1.15	1.99	1.64
n.i.	1717	1.24	2.43	2.74	2.21	3.84	2.97	2.10	2.51	1.54	1.12	2.26	2.73
n.i.	1728	2.18	3.87	4.88	3.40	5.66	5.23	4.37	4.40	2.43	2.04	3.77	4.67
n.i.	1732	2.57	4.51	5.40	4.32	7.12	5.53	4.69	5.10	2.81	2.34	4.54	5.39
benzylbenzoate	1773	2.61	1.91	2.30	0.88	0.85	1.58	6.25	1.96	1.59	2.38	0.96	1.36

**RI on HP-5MS; [a]Ref. 10; [b]Ref 14; [c]Correct isomer not characterized; tr = traces (< 0.01%); RI = 1717, m/z (rel. int.): 220 [M⁺](39), 202(27), 187(41), 173(12), 159(45), 145(81), 133(100), 119(61), 105(84), 93(93), 79(43), 67(30), 55(34), 41(46); RI = 1728, m/z (rel. int.): 220 [M⁺](21), 205(47), 202(42), 187(28), 177(13), 165(19), 159(52), 145(48), 133(53), 119(61), 105(90), 93(100), 79(70), 67(56), 55(50), 41(57); RI = 1732, m/z (rel. int.): 220 [M⁺](61), 205(23), 202(16), 187(32), 177(19), 159(47), 145(46), 133(50), 121(64), 107(81), 93(100), 81(88), 71(73), 55(55), 43(65).*

Table 3 : Chemical constituents (%) identified in the essential oils of Anibarosaeodora (AR) and A. parviflora (AP) leaves

Constituents/yields (%)	IR	AR-28	AR-29	AR-30	AR-31	AR-32	AR-33	AR-34	AR-35	AR-36	AR-37	AR-38	AP-2	AP-21
		1.78	2.77	1.85	2.19	3.05	2.23	1.96	2.71	3.85	3.97	4.21	0.92	1.29
(*Z*)-hexen-3-ol	857	-	-	-	-	-	tr	tr	-	-	-	-	-	-
hexanol	870	tr	-	tr	-	tr	tr	tr	tr	-	-	-	-	-
α-thujene	928	-	-	-	-	-	-	-	-	-	-	-	0.30	0.36
α-pinene	937	0.88	tr	2.61	1.37	-	-	1.74	-	-	-	-	2.53	1.61
camphene	951	-	-	-	-	-	-	-	-	-	-	-	1.95	0.90
β-pinene	981	0.35	0.23	1.39	0.74	-	-	0.81	-	-	-	-	1.54	0.76
myrcene	995	0.95	0.50	1.03	1.01	0.63	0.90	1.10	1.47	1.01	0.92	0.51	3.66	3.53
α-phellandrene	1009	-	-	-	-	-	-	-	-	-	-	-	7.25	2.26
α-terpinene	1020	-	-	-	-	-	-	-	-	-	-	-	0.02	0.25
p-cymene	1027	-	-	-	-	-	-	-	-	-	-	-	0.01	0.01
limonene	1031	0.60	tr	0.80	tr	tr	-	0.43	0.38	tr	0.68	tr	-	-
β-phellandrene	1033	-	-	-	-	-	-	-	-	-	-	-	21.06	23.60
(*Z*)-β-ocimene	1039	-	-	-	-	-	-	0.28	0.41	-	-	-	-	-
(*E*)-β-ocimene	1050	0.40	tr	0.36	tr	0.29	0.45	0.45	0.75	0.50	0.46	0.24	2.95	2.12
γ-terpinene	1061	-	-	-	-	-	-	-	-	-	-	-	0.75	0.78
cis-linaloolfuranoxide	1074	3.18	2.81	2.79	1.29	1.62	2.24	3.13	3.35	2.27	2.24	1.69	0.25	0.13
trans-linaloolfuranoxide	1091	2.29	2.21	2.14	1.06	1.32	1.66	2.38	2.60	1.91	1.71	1.35	-	-
terpinolene	1092	-	-	-	-	-	-	-	-	-	-	-	0.66	0.27
linalool	1103	51.87	54.36	71.05	70.3	43.66	50.32	48.39	61.96	55.09	55.93	48.10	21.30	12.64
dihydro-2,2,6-trimethyl-6-vinyl-2H-pyran-3(4H)-one	1113	0.95	0.83	1.10	0.57	tr	0.71	0.83	-	0.62	0.77	0.63	-	-
cis-p-menth-2-en-1-ol	1124	-	-	-	-	-	-	-	-	-	-	-	0.15	0.28
allo-ocimene	1131	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	0.11	0.04
trans-p-menth-2-en-1-ol	1142	-	-	-	-	-	-	-	-	-	-	-	0.10	0.17
borneol	1169	-	-	-	-	-	-	-	-	-	-	-	0.84	0.21
cis-linaloolpyranoxide	1170	0.07	0.08	tr	tr	0.08	tr	0.08	0.09	tr	tr	0.05	-	-

trans-linaloolpyranoxide	1177	0.13	0.13	0.09	tr	tr	tr	0.13	0.13	0.08	tr	0.10	-	-
terpinen-4-ol	1181	-	-	-	-	-	-	-	-	-	-	-	0.66	1.09
cryptone	1190	-	-	-	-	-	-	-	-	-	-	-	0.17	0.33
α-terpineol	1194	0.24	0.14	0.27	0.21	0.13	0.12	0.26	0.13	-	-	-	-	2.30
α-phellandreneepoxide (tent)	1205	-	-	-	-	-	-	-	-	-	-	-	0.17	0.12
trans-piperitol	1211	-	-	-	-	-	-	-	-	-	-	-	0.04	0.10
trans-carveol	1222	-	-	-	-	-	-	-	-	-	-	-	0.01	0.02
nerol	1231	0.07	tr	tr	tr	0.05	0.06	0.07	0.11	0.07	0.06	0.01	0.05	-
cuminaldehyde	1243	-	-	-	-	-	-	-	-	-	-	-	-	0.03
carvone	1248	-	-	-	-	-	-	-	-	-	-	-	-	0.02
geraniol	1257	0.16	-	0.10	0.11	0.11	0.14	0.16	0.22	0.13	0.13	0.08	0.05	-
piperitone	1258	-	-	-	-	-	-	-	-	-	-	-	-	0.10
phellandral	1279	-	-	-	-	-	-	-	-	-	-	-	0.04	0.07
δ-elemene	1340	tr	tr	tr	tr	0.06	-	tr	-	-	-	tr	1.62	0.76
α-cubebene	1353	tr	0.06	tr	tr	tr	-	-	tr	0.09	tr	0.04	0.07	0.03
α-ylangene	1376	-	-	-	-	-	-	-	-	-	-	-	0.08	-
isoledene	1377	-	-	-	-	-	-	-	-	-	-	-	-	0.24
α-copaene	1380	2.46	3.95	2.90	2.07	2.92	2.88	3.73	0.82	2.82	1.65	1.80	0.22	0.07
hexylhexanoate	1388	-	-	-	-	-	-	-	-	-	-	-	-	0.04
β-elemene	1395	0.28	0.38	0.10	0.20	1.10	1.66	0.27	0.43	0.74	0.37	1.24	0.64	0.52
methyleugenol	1408	-	-	-	-	-	-	-	-	-	-	-	0.02	-
α-gurjunene	1415	-	-	-	-	-	-	-	-	-	-	-	0.06	0.24
β-caryophyllene	1424	0.20	0.15	0.18	0.39	0.54	0.85	0.13	0.20	0.78	0.72	0.79	2.55	3.84
β-gurjunene	1433	-	-	-	-	-	-	-	-	-	-	-	-	0.27
β-copaene	1434	-	-	-	-	-	-	-	-	-	-	-	0.20	-
γ-elemene	1438	-	-	-	-	-	-	-	-	-	-	-	0.07	0.87
α-guaiene	1443	0.07	0.11	0.13	0.23	0.34	0.12	0.07	0.11	0.17	0.09	0.19	-	-
aromadendrene	1445	-	-		-	-	-	-	-	-	-	-	0.69	3.08
(Z)-β-farnesene	1447	-	-	-	-	-	-	-	-	-	-	-	0.23	-
α-humulene	1458	-	0.06	tr	0.14	0.26	0.18	-	tr	0.19	0.14	0.22	0.46	0.89
allo-aromadendrene	1467	-	-	-	-	-	-	-	-	-	-	-	-	0.53
4,5-di-*epi*-aristolochene	1474	0.16	0.15	-	-	0.28	0.14	0.13	0.10	0.16	0.13	0.19	0.03	-
γ-selinene	1480	0.63	0.68	0.27	0.46	1.23	0.74	0.52	0.52	0.89	0.68	0.97	-	0.01
γ-muurolene	1486	-	-	-	-	-	-	-	-	-	-	-	0.37	0.20
germacrene D	1487	-	-	-	-	-	-	-	-	-	-	-	1.08	-
β-selinene	1497	4.12	4.13	1.74	2.31	6.29	4.22	3.55	3.10	4.49	3.79	4.81	0.44	2.72
cis-β-guaiene	1497	-	-	-	-	-	-	-	-	-	-	-	0.08	-
δ-selinene	1497	-	-	-	-	-	-	-	-	-	-	-	-	0.24
α-selinene	1501	2.89	3.11	1.36	2.14	5.79	3.50	2.54	2.49	4.14	3.18	4.51	-	-
bicyclogermacrene	1504	-	-	-	-	-	-	-	-	-	-	-	4.31	3.42
α-muurolene	1505	tr	tr	tr	-	tr	tr	0.05	tr	tr	tr	tr	tr	tr
α-bulnesene	1510	-	-	-	0.19	0.28	0.01	-	0.18	0.20	-	0.24	-	-
(*E,E*)-α-farnesene	1511	-	-	-	-	-	-	-	-	-	-	-	0.63	-
α-curcumene	1515	-	-	-	-	-	-	-	-	-	-	-	-	0.33

γ-cadinene	1519	tr	tr	tr	tr	tr	tr	tr	tr	tr	tr	0.07	0.11	0.08
7-*epi*-α-selinene	1522	0.11	0.10	-	-	0.23	0.12	0.09	0.09	0.15	0.10	0.19	-	0.37
δ-cadinene	1527	0.15	0.20	0.13	0.13	0.24	0.17	0.25	0.08	0.15	0.09	0.17	0.32	0.35
selina-3,7(11)-diene	1546	-	-	-	-	-	-	-	-	-	-	-	0.44	0.19
elemol	1552	-	-	-	-	-	-	-	-	-	-	-	-	1.16
germacrene B	1561	-	-	-	-	-	-	-	-	-	-	-	0.04	0.32
(*E*)-nerolidol	1563	0.28	0.38	0.06	-	0.23	0.41	0.32	0.11	0.23	0.21	0.27	0.88	0.54
palustrol	1570	-	-	-	-	-	-	-	-	-	-	-	-	0.42
spathulenol	1580	2.63	2.36	3.73	6.2	6.18	0.56	3.15	3.75	1.99	0.55	4.62	3.75	4.73
caryophyllene oxide	1585	0.42	0.29	0.20	0.36	1.31	0.69	0.45	0.30	0.88	2.11	0.90	1.19	2.88
globulol	1594	-	-	-	-	-	-	-	-	-	-	-	0.26	0.79
guaiol	1597	-	-	-	0.21	0.70	0.36	0.10	0.01	0.39	0.42	0.33	0.26	1.37
rosifoliol	1602	-	-	-	-	-	-	-	-	-	-	-	0.09	0.94
humuleneepoxide II	1611	0.64	0.61	0.26	0.35	0.97	0.75	0.74	0.52	0.72	0.73	0.95	-	0.58
selina-6-en-4-ol	1616	0.43	0.33	0.12	0.15	0.55	0.35	0.42	0.29	0.33	0.36	-	-	-
10-*epi*-γ-eudesmol	1623	-	-	-	-	-	-	-	-	-	-	-	0.19	-
iso-spathulenol	1631	0.25	0.16	-	-	0.30	0.22	0.31	-	0.11	0.18	-	-	-
γ-eudesmol	1636	-	-	-	-	-	-	-	-	-	-	-	-	1.35
caryophylla-4(12),8(13)-dien-5-ol[c]	1641	0.28	0.24	0.26	0.76	0.72	0.18	0.28	0.26	0.24	0.21	0.62	-	-
selina-3,11-dien-6α-ol	1651	0.36	0.29	0.09	0.12	0.37	0.38	0.49	0.21	0.24	0.21	0.41	-	-
β-eudesmol	1657	-	-	-	-	-	-	-	-	-	-	-	0.71	2.05
α-eudesmol	1660	-	-	-	-	-	-	-	-	-	-	-	0.92	2.30
selin-11-en-4α-ol	1660	1.68	1.60	0.63	0.67	2.53	1.64	1.77	1.19	1.48	1.67	2.29	-	-
7-*epi*-α-eudesmol	1664	-	-	-	-	-	-	-	-	-	-	-	0.13	-
bulnesol	1674	-	-	-	-	-	-	-	-	-	-	-	0.23	1.07
(*Z*)-α-santalol	1678	-	-	-	-	-	-	-	-	-	-	-	0.22	0.48
eudesm-7(11)-en-4-ol	1705	-	-	-	-	-	-	-	-	-	-	-	-	0.08
n.i.	1717	2.17	2.24	0.65	0.80	2.47	2.98	2.30	1.55	2.42	2.66	2.90	-	-
n.i.	1728	4.21	4.16	1.24	1.34	3.98	5.04	4.68	2.57	3.39	4.10	4.32	-	-
n.i.	1732	4.75	4.70	1.45	1.63	4.88	5.65	5.19	2.99	4.43	5.11	5.23	-	-
benzylbenzoate	1773	1.6	2.35	1.15	0.49	0.85	0.90	1.38	0.83	0.62	0.79	0.50	0.48	0.66
benzylsalycilate	1878	-	-	-	-	-	-	-	-	-	-	-	0.06	-

**RI on HP-5MS; [a]Ref. 10; [b]Ref 14; [c]Correct isomer not characterized; tr = traces (< 0.01%); RI = 1717, m/z (rel. int.): 220 [M$^+$](39), 202(27), 187(41), 173(12), 159(45), 145(81), 133(100), 119(61), 105(84), 93(93), 79(43), 67(30), 55(34), 41(46); RI = 1728, m/z (rel. int.): 220 [M$^+$](21), 205(47), 202(42), 187(28), 177(13), 165(19), 159(52), 145(48), 133(53), 119(61), 105(90), 93(100), 79(70), 67(56), 55(50), 41(57); RI = 1732, m/z (rel. int.): 220 [M$^+$](61), 205(23), 202(16), 187(32), 177(19), 159(47), 145(46), 133(50), 121(64), 107(81), 93(100), 81(88), 71(73), 55(55), 43(65).*

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