

## ANALYSIS OF THE ESSENTIAL OILS AND LARVICIDAL ACTIVITY OF *Hortia longifolia*

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*Hortia longifolia* Benth. ex Engl. (Rutaceae) is endemic to Central Amazonia [1], and previous study reported the isolation of coumarins, alkaloids, and flavonoids from its bark [2]. Significant inhibitory activity of  $\alpha$ -glucosidase,  $\alpha$ -amylase, and lipase were found after administration of an amide, coumarin, ferulic and cinnamic acids derivatives isolated from the branches of *H. longifolia* [3]. Here we report the volatile constituents of this species and their larvicidal activity against *Aedes aegypti*.

The essential oils from *H. longifolia* leaves contained nine sesquiterpenes (Table 1) composed mostly of oxygenated spathulenol, caryophyllene epoxide, and mustakone. In the branch essential oil, the sesquiterpene *trans*-nerolidol (KI 1561) was most abundant (99.35%).

The essential oils were investigated for their larvicidal activities against third-instar *A. aegypti* larvae. The branch essential oil showed larvicidal potential, with an LC<sub>50</sub> of 34.3 ± 1 µg/mL (24 h) and 32.9 ± 1 µg/mL (48 h). At a concentration of 200 µg/mL, the leaf essential oil showed low mortality (5.0%). The results suggest that *trans*-nerolidol is the active component responsible for the observed larvicidal activity against *A. aegypti*.

Chantraine et al. [4] reported that essential oils containing high concentrations of *trans*-nerolidol have larvicidal activity against *A. aegypti*. This acyclic sesquiterpene seems to have greater larvicidal activity than essential oils high in cyclic sesquiterpenes (e.g., monocyclic and bicyclic) [5, 6].

The samples of *H. longifolia* were collected in the Reserva Florestal Adolpho Ducke, Amazonas, Brazil. A voucher, No. 209963, was deposited in the Herbarium of the Instituto Nacional de Pesquisas da Amazonia (INPA), Manaus, AM. The leaves and branches were dried and subjected to hydrodistillation in a Clevenger-type apparatus for 4 h to produce oil yields of 0.3 and 0.3%, respectively. The essential oils were analyzed by GC-MS using a Shimadzu (model QP-5000) instrument equipped with a fused silica capillary column DB-5 (5% phenylmethylsiloxane; 30 m × 0.25 mm × 0.25 µm). The electron impact technique (70 eV) was used with the injector temperature at 240°C and detector at 230°C. The carrier gas was helium at the working rate of 1.0 mL/min. The column temperature was initially at 60°C, and was then gradually increased up to 240°C at the rate of 3°C/min. The components of the essential oils were identified by comparing their mass spectrum with those in the GC-MS database (NIST 62.lib), literature [7], and retention indices [8].

The essential oils were dissolved in DMSO (20 mg/mL). Aliquots of the stock solution in appropriate concentrations (25–200 µg/mL) at final volumes of 5 mL were transferred to plastic cups containing distilled water and food. Then 30 third-instar larvae of *A. aegypti* obtained from a permanent colony [6] were placed in each cup. After 24 and 48 h, the number of dead larvae was counted and the lethal percentage calculated. Each experiment was performed in triplicate with a control test (distilled water in DMSO solution).

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TABLE 1. Chemical Compositions of Essential Oils from Leaves of *Hortia longifolia*, %

Compound	KI	Leaves	Branches
$\alpha$ -Copaene	1374	2.63	
$\beta$ -Elemene	1390	3.99	
$\beta$ -Santalene	1458	1.67	
$\gamma$ -Muurolene	1474	1.75	
<i>ar</i> -Curcumene	1479	1.71	
<i>trans</i> -Nerolidol	1561		99.35
Spathulenol	1573	17.27	
Caryophyllene epoxide	1578	39.05	
Humulene epoxide II	1603	8.24	
Mustakone	1671	14.29	

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## REFERENCES

1. J. R. Pirani, *Rodriguesia*, **56**, 189 (2005).
2. D. B. Correa, O. R. Gottlieb, A. P. Padua, and A. I. Rocha, *Rev. Latinoam. Quim.*, **7**, 43 (1976).
3. D. P. K. Queiroz, A. G. Ferreira, A. S. Lima, E. S. Lima, and M. P. Lima, *Int. J. Pharm. Pharm. Sci.*, **5**, 336 (2013).
4. J. M. Chantraine, D. Laurent, C. Ballivian, G. Saavedra, R. Ibanez, and L. A. Vilaseca, *Phytother. Res.*, **12**, 350 (1998).
5. J. G. M. Costa, F. F. G. Rodrigues, E. O. Sousa, D. M. S. Junior, A. R. Campos, H. D. M. Coutinho, and S. G. de Lima, *Chem. Nat. Compd.*, **46**, 313 (2010).
6. L. A. M. Magalhaes, M. P. Lima, M. O. M. Marques, R. Facanali, A. C. S. Pinto, and W. P. Tadei, *Molecules*, **15**, 5734 (2010).
7. McLafferty; Stauffer, 1989, *The Wiley/NBS Registry of Mass Spectral Data*, John Wiley Sons, New York, NY, USA, 1989.
8. R. P. Adams, *Identification of Essential Oil Components by Gas Chromatography/Mass Spectrometry*, Allured Publishing Corp., Carol Stream, Illinois, 2007.