LARVICIDAL AND ANTI-PLASMODIAL COMPOUNDS FROM *DERRIS TRIFOLIATA*, *LONCHOCARPUS ERIOCALYX* AND *ERYTHRINA SACLEUXII*

BY

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2006

THIS IS MY ORIGINAL WORK AND HAS NEVER BEEN PRESENTED FOR A DEGREE IN ANY UNIVERSITY

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This thesis has been submitted for examination with our approval as university supervisors

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ABSTRACT

The family Leguminosae is known to synthesize a wide range of flavonoids and isoflavonoids with insecticidal and antimicrobial activities. The insecticidal activities of plants of this family are associated with the rotenoids which are mainly found in the genera *Tephrosia, Derris, Millettia* and *Lonchocarpus*. Anti-microbial and anti-plasmodial activities have been observed in some of the flavonoids and isoflavonoids found in the genus *Erythrina*. In this study the larvicidal and anti-plasmodial activities of crude extracts and pure compounds obtained from *Erythrina sacleuxii* (root bark), *Lonchocarpus eriocalyx* (root bark) and *Derris trifoliata* (seeds) have been investigated.

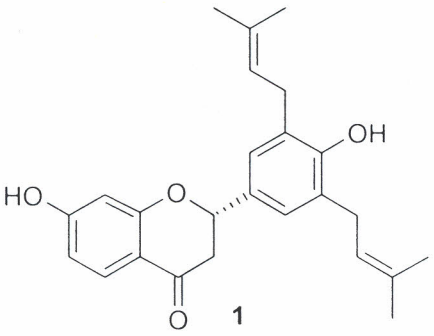
The dried and ground root bark of *Erythrina sacleuxii* was extracted with CH_2Cl_2 by cold percolation for 24 hrs at room temperature. The crude extract showed anti-plasmodial activity against chloroquine-sensitive (W2) and chloroquine-resistant (D6) strains of *Plasmodium falciparum* with IC_{50} value of 4.34 ± 0.2 and 0.96 ± 0.1 μg/ml respectively. This extract also showed larvicidal activity against mosquito larvae of *Aedes aegypti* with LC_{50} value of 18.23 ± 0.3 μg/ml.

Chromatographic separation of the CH_2Cl_2 extract led to the isolation of eight compounds. These were identified as the flavanones, abyssinone IV (**1**) (7,4'-dihydroxy-3',5'-diprenylflavanone) and abyssinone V-4'-methyl ether (**6**) (5,7-dihydroxy-4'-methoxy-3',5'-diprenylflavanone); the pterocarpans, erythrabyssin II (**2**) (3,9-dihydroxy-2,10-diprenylpterocarpan) and 3,9-dihydroxy-4-prenylpterocarpan (**3**); the arylbenzofuran, 6-hydroxy-2',5'-dimethoxy-2-arylbenzofuran (**4**); the isoflav-3-ene, 7,4'-dihydroxy-2',5'-dimethoxyisoflav-3-ene (**5**); the cinnamoyl ester derivative, erythrinasinate A (**7**) and the the steroid stigmasterol (**8**). The occurrence of flavanones, pterocarpans and isoflav-3-enes in the genus *Erythrina* has been reported, however the arylbenzofuran, 6-hydroxy-2',5'-dimethoxy-2-arylbenzofuran (**4**) is a rare compound and this is only the second report of its occurrence in nature. The identification of these compounds was based on spectroscopic evidence including ^1H NMR, ^{13}C NMR, HMBC, HMQC, COSY and MS. Abyssinone IV (**1**) showed the highest antiplasmodial activity against chloroquine-sensitive (D6) strain

with IC_{50} value of 0.69 ± 0.1 μg/ml while abyssinone V-4'-methyl ether (**6**) was less active with IC_{50} of 4.56 ± 1.3 μg/ml. Erythrabyssin II (**2**) showed moderate activity against chloroquine-sensitive (D6) and chloroquine-resistant (W2) strains of *Plasmodium falciparum* with IC_{50} values of 5.79 ± 0.8 and 14.68 ± 5.0 μg/ml respectively while 3,9-dihydroxy-4-prenylpterocarpan (**3**) had an IC_{50} value of 4.10 ± 0.8 μg /ml against the chloroquine-sensitive (D6) strain. Stigmasterol (**8**) showed low activity with IC_{50} values of 24.21 ± 3.8 and 4.31 ± 0.2 μg/ml against chloroquine-sensitive (W2) and chloroquine-resistant (D6) strains respectively.

Dried and ground seeds of *Derris trifoliata* were extracted with methanol by cold percolation for 24 hrs at room temperature. The methanol extract showed good larvicidal activity against the 2nd instar larvae of *Aedes aegypti* with LC_{50} value of 2.68 ± 1.1 μg/ml. Chromatographic separation of this extract led to the isolation and characterization of five compounds, namely: 13-spiro-13-homo-13-oxaelliptone (**9**), 7a-*O*-methyl-12a-hydroxydeguelol (**10**), 6,7-dimethoxy-4-chromanone (**11**), 6a,12a-dehydrodeguelin (**12**) and tephrosin (**13**). 13-Spiro-13-homo-13-oxaelliptone (**9**) and 7a-*O*-methyl-12a-hydroxydeguelol (**10**) are new compounds representing unique isoflavonoid skeleta. 6,7-Dimethoxy-4-chromanone (**11**) is a rare natural product being reported here only for the second time in nature. Compound **11** was tested against 2nd instar mosquito larvae of *A. aegypti* with LC_{50} value of 13.37 ± 2.2 μg/ml while rotenone (**14**) the main compound which crystallized from the crude showed the highiest activity of 0.68 ± 1.1 μg/ml.

The root bark of *Lonchocarpus eriocalyx* was successively extracted using CH_2Cl_2 and MeOH by cold percolation for 24 hrs. Chromatographic separation of CH_2Cl_2 extract led to the isolation and characterization of only one compound lupeol (**15**), a compound which is known to have good antiplasmodial activity.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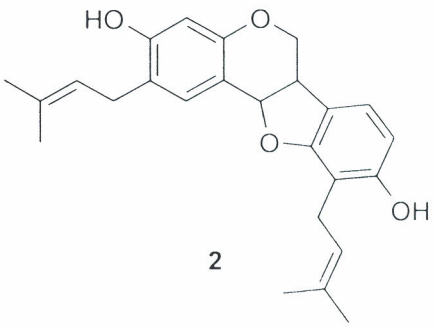
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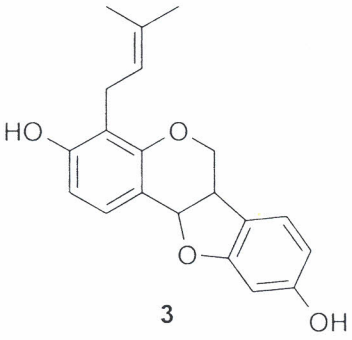
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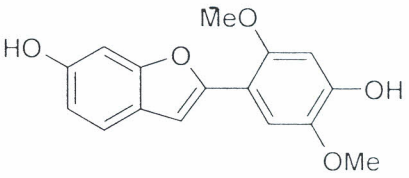
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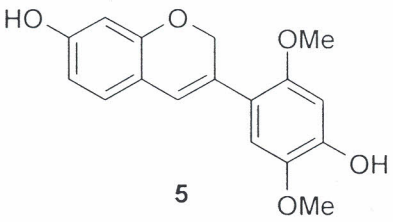
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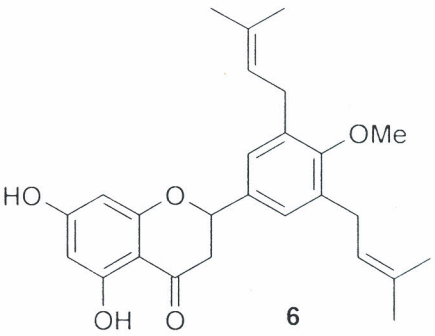
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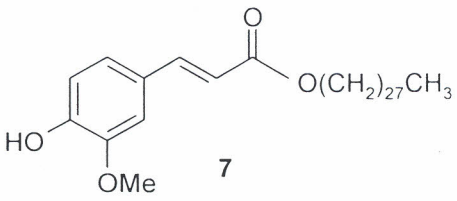
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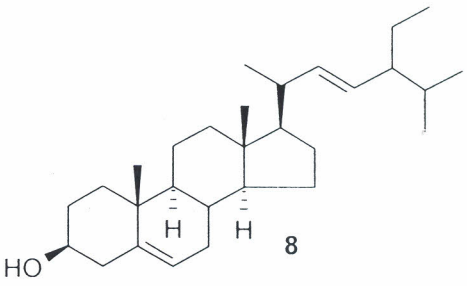
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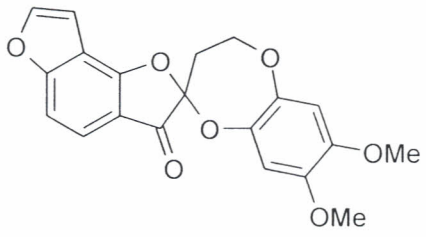

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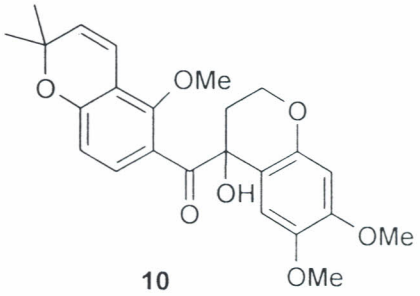

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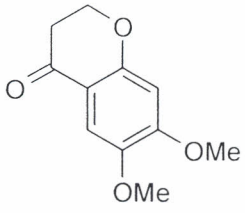

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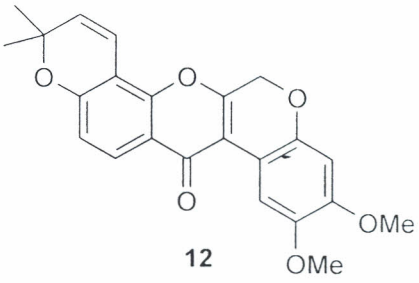

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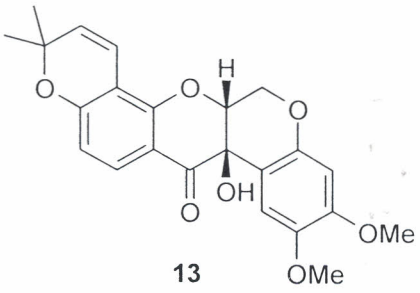

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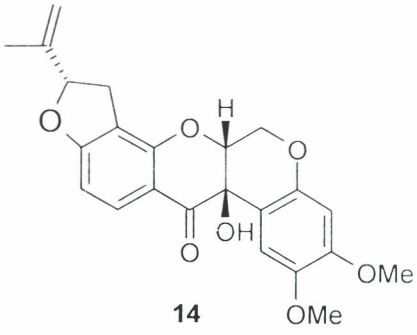

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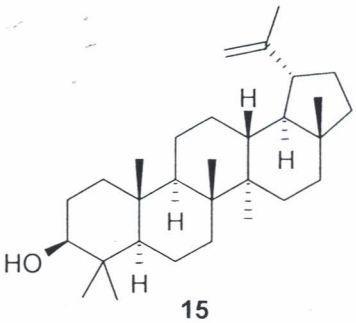

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