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***NOTE***

# Chemical Composition of Essential Oil of *Striga asiatica* (L.) O. Kuntze

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Essential oils from the whole plant of *Striga asiatica* was isolated by hydrodistillation and characterized by GC-MS. Fifty-eight components have been identified in the essential oil. The main compounds of the essential oil were identified as (-)-caryophyllene (10.49 %) followed by β-caryophyllene oxide (8.56 %) and hexadecanoic acid (7.59 %).

**Keywords: *Striga asiatica*, Scrophulariaceae, Essential oil, GC-MS, Caryophyllene, Caryophyllene oxide, Hexadecanoic acid.**

*Strga asiatica* (L.) O. kuntze is a small, annual, erect herb in the genus of Striga which is in Scrophulariaceae family [1,2]. The extremely devastating parasitic weeds cause severe reductions in food crop yield of several graminaceous and leguminous crops such as sorghum, maize and millet in tropical and subtropical regions of the eastern hemisphere [1-4]. This species is mainly distributed in south part of China [1], as well as Hainan, Fujian, Guangdong, Guangxi, Yunnan, Guizhou, *etc*. It also exists in the tropical and semitropical areas of Asia and Africa [1]. It grows up to 10-20 cm with square stem; bristles may be present on stem. The leaves are 1 cm long. The plant has yellow or red or white flowers in axillary or terminal spikes. Small ovate or rounded fruit wrap the shrinkage of calyx. The whole plant have been used traditionally in the treatment of intestinal parasites, icterohepatitis, infantile malnutrition and peevishness in unweaned infants, and against some unwanted gastrointestinal adverse reactions during cancer chemotherapy [2].

In this study, we reported the results of GC-MS analysis of the essential oil of *S. asiatica* for the first time from China.

**Extraction and isolation:** The air-dried whole plant of *S. asiatica* was obtained from southeast regions of China. About 500 g of air-dried plant was ground into fine powder and oil extraction was carried out by hydro distillation in Clevenger type apparatus in three batches for 5 h, in which each batch contains approximately 170 g plant and 1000 mL water. The obtained light greenish yellow coloured essential oil was dried over anhydrous sodium sulfate and kept at 4°C until the GCMS analyses [5,6].

**GC-MS analysis:** GC-MS analysis of the oil was carried out by splitless injection of 0.2 µL on a Agilent 7890 gas chromatograph fitted with an DB-35MS fused silica column (5 % phenyl 95 % polydimethylsiloxane 30 m × 0.25 mm, film thickness 0.25 µm), interfaced with a Hewlett Packard mass selective detector 5975 (Agilent Technologies, Palo Alto, CA, USA). GC oven temperature was kept at 60 °C for 1 min and programmed to 200 °C at a rate of 15 °C/min and kept constant at 200 °C for 5 min and then programmed to 280 °C at a rate of 5 °C/min. The injector temperature was set at 250 °C. The carrier gas was helium at a flow rate of 1.2 mL/min. Mass spectra were recorded at 70 eV. Mass range was from *m/z* 50 to 550.

**Identification:** The identification of the compounds was performed by matching their GC kovats index obtained with reference to *n*-alkanes series on DB-35MS column and by computer matching with Nist 08 Mass Spectral Database for GC-MS [7].

The essential oil compositions of *S. asiatica* were analyzed by GC-MS. The hydrodistillation of the dried plant gave light yellowish oil with yield of 0.3 % (w/w). The general profile of the essential oil, the percentage content and the calculated kovats index of the constituents was summarized in Table-1. As shown in Table-1, 58 components were identified in this oil, which presented about 92.62 % of the total composition of the oil.

The oil of *S. asiatica* comprised 12 monoterpenoids (9.25 %), 27 sesquiterpenoids (56.65 %), 11 diterpenoids (2.40 %), 3 fatty acids (11.78 %) and 5 non-terpenoids (12.54 %). The essential oil of *S. asiatica* was rich in sesquiterpenoids. The common main constituents of the essential oil from the *S. asiatica* were characterized by a high percentage of (-)-caryophyllene (10.49 %), β-caryophyllene oxide (8.56 %), hexadecanoic acid (7.59 %), methyleugenol (5.15 %), τ-muurolol (4.83 %), (-)-β-cadinene (4.28 %), α-cadinol (4.22 %), myristicine (3.99 %).

TABLE-1
CHEMICAL COMPOSITION OF THE ESSENTIOL OIL FROM *Striga asiatica*

| RT | KI[a] | Component[b] | Area (%)[c] |
|---|---|---|---|
| 5.776 | 1089 | (-)-Thujone | 0.20 |
| 6.220 | 1134 | Isopinocarveol | 0.16 |
| 6.364 | 1148 | Verbenol | 0.08 |
| 6.531 | 1165 | 4-Terpineol | 0.28 |
| 6.631 | 1175 | (S)-(-)-Terpineol | 0.58 |
| 7.042 | 1218 | 1-Isopropyl-4,8-dimethylspiro[4.5]dec-8-en-7-one | 0.19 |
| 7.264 | 1241 | (±)-Lavandulal | 0.15 |
| 7.342 | 1249 | α-Ionene | 0.23 |
| 7.520 | 1268 | Thymol | 2.12 |
| 7.598 | 1277 | 3-(1-Cyclohexen-1-yl)-1-methyl-2-propynyl acetate | 3.83 |
| 7.786 | 1296 | Longibornan-9-ol | 0.38 |
| 7.931 | 1313 | (4-Isopropyl-1-methyl-6,7-dimethylenebicyclo[3.2.1]oct-8-yl)methanol | 0.14 |
| 8.075 | 1329 | Guaiacol, 3-allyl- | 0.69 |
| 8.231 | 1346 | O-Acetylthymol | 0.88 |
| 8.297 | 1354 | (-)-α-Cubebene | 0.26 |
| 8.475 | 1374 | Methyleugenol | 5.14 |
| 8.564 | 1384 | (-)-α-Copaene | 1.87 |
| 8.653 | 1394 | (-)-β-Elemene | 2.22 |
| 8.964 | 1430 | (-)-Caryophyllene | 10.49 |
| 9.120 | 1449 | β-Farnesene | 2.05 |
| 9.231 | 1462 | α-Caryophyllene | 2.91 |
| 9.375 | 1479 | γ-Muurolene | 1.70 |
| 9.431 | 1486 | (-)-β-Cubebene | 1.50 |
| 9.486 | 1492 | Myristicine | 3.99 |
| 9.731 | 1522 | (-)-β-Cadinene | 4.28 |
| 9.808 | 1532 | Naphthalene,1,2,3,4,6,8a-hexahydro-1-isopropyl-4,7-dimethyl- | 0.33 |
| 9.853 | 1538 | Bicyclo[4.1.0]heptan-2-ol,1β-(3-methyl-1,3-butadienyl)-2α,6β-dimethyl-3β-acetoxy- | 0.76 |
| 9.975 | 1553 | Nerolidol | 2.60 |
| 10.097 | 1568 | Aromadendrene oxide | 0.82 |
| 10.242 | 1586 | β-Caryophyllene oxide | 8.56 |
| 10.319 | 1596 | Parsley camphor | 2.42 |
| 10.553 | 1624 | Cubenol | 1.54 |
| 10.653 | 1636 | τ-Muurolol | 4.83 |
| 10.753 | 1647 | α-Cadinol | 4.22 |
| 10.864 | 1661 | Bulnesol | 3.27 |
| 11.042 | 1682 | Ledene oxide-(II) | 0.94 |
| 11.130 | 1692 | Diepicedrene-1-oxide | 1.94 |
| 11.408 | 1720 | Isoaromadendrene epoxide | 0.27 |
| 11.475 | 1727 | 10-Peroxymurolan-3,9(11)-diene | 0.34 |
| 11.775 | 1756 | Deoxysericealactone | 0.32 |
| 12.375 | 1811 | β-D-Mannofuranoside, farnesyl- | 0.29 |
| 12.541 | 1823 | Hexahydrofarnesyl acetone | 0.95 |
| 12.997 | 1858 | Linoleoyl chloride | 0.36 |
| 13.419 | 1889 | Farnesylacetone | 1.17 |
| 13.786 | 1912 | Phen-1,4-diol, 2,3-dimethyl-5-trifluoromethyl | 0.30 |
| 14.397 | 1947 | Hexadecanoic acid | 7.59 |
| 15.063 | 1984 | Manoyl oxide | 0.39 |
| 15.519 | 2008 | Sclareol | 0.30 |
| 16.907 | 2075 | Nerolidol formate | 0.08 |
| 18.618 | 2160 | 3-Oxomanoyl oxide | 0.41 |
| 18.774 | 2168 | Methyl kaur-16-en-18-oate | 0.10 |
| 19.885 | 2225 | Methyl sandaracopimarate | 0.49 |
| 20.574 | 2261 | Methyl isopimarate | 0.04 |
| 20.729 | 2270 | Methyl abietate | 0.23 |
| 21.162 | 2292 | Methyl dehydroabietate | 0.16 |
| 21.518 | 2312 | 5-Methyl-5-(4,8,12-trimethyltridecyl)-dihydro-2(3H)-furanone | 0.07 |
| 22.807 | 2384 | Methyl 6-dehydrodehydroabietate | 0.04 |
| 23.007 | 2395 | Methyl neoabietate | 0.17 |
| Total | | | 92.62 |

[a]Compounds are listed in order of their elution from a DB-35 column; [b]KI = Kovats index as determined on DB-35MS column using homologous series of *n*-alkanes; [c]Areas obtained by FID peak-area normalization; values represent an average of three determinations.

Bulnesol (3.27 %), α-caryophyllene (2.91 %), nerolidol (2.60 %), parsley camphor (2.42 %), (-)-β-elemene (2.22 %), thymol (2.13 %), β-farnesene (2.05 %) and diepicedrene-1-oxide (1.94 %).

β-Caryophyllene (10.49 %) was determined as major constituent in the essential oil of *S. asiatica.* This sesquiterpene presents a cyclobutane ring, rare in nature, being commonly found in a mixture with α-caryophyllene (α-humulene) and iso-caryophyllene [8]. β-Caryophyllene usually finds applications in spice blends, citrus flavors, soaps, detergents, creams, perfumes, cosmetics and lotions and also in a variety of food products and beverages [9]. It is also known for its insecticidal [10], antifungal [11], local anesthetic [12], antiinflammatory [13] and anticarcinogenic activities [5,8,13].

The earlier investigation of the EtOAc fraction from *S. asiatica* showed antiplasmodial activity against Plasmodium falciparum strain K1 and cytotoxicity against MRC-5 cells [2]. But a literature survey has shown that there is no report on the volatile constituents of this species; therefore, we were unable to investigate variations of oil components due to differences in climate and geographic areas.

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