**Supplemental Table 1.** The compounds qualified and quantified (%) in EOs from L. rotata [11-12].

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Compounds | CAS | Formula | LRIsb, d | RT (min) (calculated LRIs) [11] | RIs [12] | Content | | | | | | | | | | |
| Aboveground [11] | Underground [11] | Flower [12] | | | Leaf [12] | | | Root [12] | | |
| Tibet | Yunnan | Qinghai | Tibet | Yunnan | Qinghai | Tibet | Yunnan | Qinghai |
| 1 | *n*-Octane | 111-65-9 | C8H18 | 800, 800 |  | 818 |  |  | nd | 0.13 | tr | 0.47 | 0.11 | 0.16 | nd | 0.22 | 0.12 |
| 2 | Dimethyl heptane | - | C9H20 | -, - |  | 837 |  |  | nd | tr | nd | nd | tr | tr | nd | 0.18 | tr |
| 3 | Dimethyl heptene | - | C9H18 | -, - |  | 857 |  |  | nd | 0.12 | tr | nd | 0.1 | 0.13 | nd | 0.37 | 0.19 |
| 4 | α-Pinene | 80-56-8 | C10H16 | 937, 1028 |  | 940 |  |  | 0.22 | nd | nd | 0.23 | nd | nd | nd | nd | nd |
| 5 | Hexanoic acid (6:0) | 142-62-1 | C6H12O2 | 990, 1846 | 4.21 |  | 0.36 | - |  |  |  |  |  |  |  |  |  |
| 6 | Dimethyl nonane | - | C11H24 | -, - |  | 1029 |  |  | nd | tr | nd | nd | tr | tr | nd | 0.12 | 0.12 |
| 7 | Methyl decane | - | C11H24 | -, - |  | 1038 |  |  | nd | tr | nd | nd | tr | tr | nd | 0.1 | tr |
| 8 | 2-hydroxy-benzaldehyde | 90-02-8 | C7H6O2 | 1047, 1672 | 3.71 |  | - | 0.76 |  |  |  |  |  |  |  |  |  |
| 9 | Dimethyldecane | - | C12H26 | -, - |  | 1062 |  |  | nd | 0.34 | tr | 0.12 | 0.3 | 0.36 | nd | 0.5 | 0.44 |
| 10 | Butyloctanol |  | C12H26O |  |  | 1083 |  |  | nd | 0.24 | tr | tr | 0.2 | 0.23 | nd | 0.28 | 0.26 |
| 11 | n-Undecane | 1120-21-4 | C11H24 |  |  | 1103 |  |  | nd | 0.52 | tr | nd | 0.25 | 0.61 | nd | 0.43 | 0.48 |
| 12 | Linalool | 78-70-6 | C10H18O | 1099, 1547 |  | 1103 |  |  | nd | nd | nd | 0.18 | nd | nd | nd | nd | nd |
| 13 | Dimethyl decene |  | C12H24 |  |  | 1105 |  |  | nd | 0.23 | tr | nd | 0.18 | 0.23 | nd | 0.39 | 0.34 |
| 14 | Benzeneethanol | 60-12-8 | C8H10O | 1116, 1906 |  | 1120 |  |  | nd | nd | nd | 0.15 | nd | nd | nd | nd | nd |
| 15 | Tetramethyl-4-piperidone |  | C9H17NO |  |  | 1124 |  |  | nd | nd | nd | 0.14 | nd | nd | nd | nd | nd |
| 16 | Caprylic acid (8:0) | 124-07-2 | C8H16O2 | 1180, 2060 | 5.4 |  | 0.8 | - |  |  |  |  |  |  |  |  |  |
| 17 | Naphthalene | 91-20-3 | C10H8 | 1182, 1745 |  | 1195 |  |  | tr | nd | nd | tr | nd | nd | nd | nd | nd |
| 18 | Dodecane | 112-40-3 | C12H26 | 1200, 1200 |  | 1202 |  |  | nd | 0.1 | tr | nd | tr | tr | nd | 0.11 | 0.12 |
| 19 | Dimethylundecane | - | C13H28 | -, - |  | 1231 |  |  | nd | 0.24 | tr | nd | 0.17 | 0.24 | nd | 0.3 | 0.27 |
| 20 | Methyldodecane | - | C13H28 | -, - |  | 1283 |  |  | nd | 0.36 | 0.12 | nd | 0.32 | 0.33 | nd | 0.46 | 0.42 |
| 21 | Dimethyldodecane | - | C14H30 | -, - |  | 1284 |  |  | 0.19 | 0.78 | 0.2 | 0.47 | 0.85 | 0.73 | nd | 0.97 | 0.91 |
| 22 | 2-Butyl-1-octanol | 3913-02-8 | C12H26O | 1277, 1851 |  | 1325 |  |  | nd | 0.3 | 0.1 | nd | 0.31 | 0.27 | nd | 0.33 | 0.36 |
| 23 | 2-Hexyl-1-octanol | 19780-79-1 | C14H30O | , 2116 |  | 1334 |  |  | nd | 0.23 | tr | nd | 0.25 | 0.20 | nd | 0.26 | 0.28 |
| 24 | Trimethyldodecane |  | C15H32 |  |  | 1348 |  |  | nd | 0.57 | 0.11 | 0.34 | 0.51 | 0.53 | nd | 0.66 | 0.20 |
| 25 | *n*-Tetradecane | 629-59-4 | C14H30 | 1400, 1400 |  | 1401 |  |  | 1.16 | 0.14 | 0.15 | nd | 0.41 | 0.19 | 2 | 0.8 | 0.25 |
| 26 | Isocaryophyllene | 118-65-0 | C15H24 | 1406, 1587 |  | 1442 |  |  | 0.2 | 0.2 | tr | 0.18 | tr | nd | nd | nd | nd |
| 27 | Hydroxyproline | 51-35-4 | C5H9NO3 | -, - | 11.07 (2667) |  | 4.63 | - |  |  |  |  |  |  |  |  |  |
| 28 | *n*-Pentadecane | 629-62-9 | C15H32 | 1500, 1500 |  | 1502 |  |  | 3.48 | 1.18 | 0.59 | nd | 2.07 | 1.06 | 5.71 | 2.07 | 1.15 |
| 29 | 2,4-Di-tert-butylphenol | 96-76-4 | C14H22O | 1519, 2318 |  | 1539 |  |  | nd | 2.09 | 1.96 | 1.85 | 2.86 | 1.67 | 2.32 | 1.48 | 2.2 |
| 30 | 2-Hexyl-1-octanol | 19780-79-1 | C14H30O | , 2116 |  | 1544 |  |  | nd | 0.18 | tr | nd | 0.2 | 0.17 | 0.28 | 0.21 | 0.21 |
| 31 | Trimethyltetradecane | - | C17H36 | -, - |  | 1548 |  |  | nd | 0.58 | 0.27 | 0.51 | 0.43 | 0.55 | nd | 0.81 | 0.67 |
| 32 | Dodecanoic acid (12:0) | 143-07-7 | C12H24O2 | 1568, 2497 | 8.89 |  | 0.37 | 0.78 |  |  |  |  |  |  |  |  |  |
| 33 | 1-Tridecanol | 112-70-9 | C13H28O | 1577, 2074 |  | 1582 |  |  | nd | nd | nd | 0.51 | nd | nd | nd | nd | nd |
| 34 | Cedrol | 77-53-2 | C15H26O | 1598, 2116 | 7.25 |  | 0.16 | - |  |  |  |  |  |  |  |  |  |
| 35 | *n*-Cetane | 544-76-3 | C16H34 | 1600, 1600 |  | 1604 |  |  | 4.13 | 0.17 | 0.12 | 2.23 | 0.79 | 0.21 | 7.17 | 0.77 | 0.24 |
| 36 | 7-Methyl-cyclopentapyran-4-carboxylic acid methylester | - | C11H10O3 | -, - |  | 1611 |  |  | nd | nd | nd | 0.53 | nd | nd | nd | nd | nd |
| 37 | Hexahydrofarnesol | 6750-34-1 | C15H32O | 1571, - |  | 1683 |  |  | nd | nd | nd | 0.41 | nd | nd | nd | nd | nd |
| 38 | Diisobutyl adipate | 141-04-8 | C14H26O4 | 1695, 2126 |  | 1690 |  |  | 0.45 | nd | nd | 0.66 | nd | nd | nd | nd | nd |
| 39 | *n*-Heptadecane | 629-78-7 | C17H36 | 1700, 1700 |  | 1704 |  |  | 3.68 | 0.37 | tr | 2.73 | 0.68 | 0.38 | 7.69 | 0.6 | 0.26 |
| 40 | Trimethylpentadecane | - | C18H38 | -, - |  | 1719 |  |  | nd | 0.55 | 0.35 | 0.61 | 0.67 | 0.56 | nd | 0.68 | 0.63 |
| 41 | Tetramethylhexadecane | - | C20H42 | -, - |  | 1758 |  |  | tr | 0.62 | 0.44 | 0.45 | 0.41 | 0.9 | nd | 0.47 | 0.41 |
| 42 | Tetradecanoic acid (14:0) | 544-63-8 | C14H28O2 | 1768, 2694 | 11.41 | 1765 | 1.45 | 1.02 | 0.94 | 2.77 | 4.09 | 1.81 | 2.26 | 2.8 | nd | 1.4 | 1.96 |
| 43 | *n*-Octadecane | 593-45-3 | C18H38 | 1800, 1800 |  | 1804 |  |  | 2.24 | nd | nd | 1.57 | nd | nd | 4.93 | tr | tr |
| 44 | Trimethylpentadecan-2-ol | - | C18H38O | -, - |  | 1847 |  |  | 1.79 | 2.85 | 1.86 | 7.5 | 6.35 | 5.06 | nd | tr | nd |
| 45 | Hexahydrofarnesyl acetone | 502-69-2 | C18H36O | 1844, 2131 |  | 1853 |  |  | 0.49 | 0.54 | 0.55 | 0.91 | 0.73 | 0.81 | nd | nd | nd |
| 53 | 12-methyl-tetradecanoic acid (14:0) | - | C15H30O2 | -, - | 12.38 (2783) |  | 0.46 | 0.19 |  |  |  |  |  |  |  |  |  |
| 46 | Pentadecanoic acid (15:0) | 1002-84-2 | C15H30O2 | 1867, 2822 | 12.81 |  | 1.26 | 0.83 |  |  |  |  |  |  |  |  |  |
| 47 | Trimethylpentadecan-1-ol | - | C18H38O | -, - |  | 1890 |  |  | nd | 1.32 | 0.93 | 3.34 | 2.89 | 2.33 | 3.78 | tr | nd |
| 48 | *n*-Nonadecane | 629-92-5 | C19H40 | 1900, 1900 |  |  |  |  | 1.87 | 0.18 | 0.13 | 1.6 | 0.13 | 0.1 | 1.58 | nd | nd |
| 49 | Trimethyloctadecane |  | C21H44 |  |  | 1934 |  |  | 0.65 | 1.15 | 1.03 | 0.95 | 1.41 | 1.01 | 0.55 | 1.28 | 1.19 |
| 50 | 9-hexadecenoic acid (16:1, n-7) | - | C16H30O2 | -, - | 14.6 (2949) |  | 6.2 | 4.35 |  |  |  |  |  |  |  |  |  |
| 51 | Dibutyl phthalate | 84-74-2 | C16H22O4 | 1965, 2680 | 12.02 (2750) |  | 0.78 | 0.48 |  |  |  |  |  |  |  |  |  |
| 52 | 9,17-octadecadienol | - | C18H34O | -, - | 12.2 (2766) |  | 0.43 | 0.62 |  |  |  |  |  |  |  |  |  |
| 54 | 14-pentadecenoic acid (15:1, n-1) | 17351-34-7 | C15H28O2 | -, - | 12.98 (2834) |  | 3.21 | 2.60 |  |  |  |  |  |  |  |  |  |
| 55 | *n*-Hexadecanoic acid (palmitic acid, PA) (16:0) | 57-10-3 | C16H32O2 | 1968, 2931 | 14.38 | 1967 | 50.9 | 34.51 | 9.97 | 11.25 | 14.98 | 7.08 | 12.42 | 12.22 | 9.65 | 16.95 | 18.54 |
| 56 | *n*-Eicosane | 112-95-8 | C20H42 | 2000, 2000 |  | 2000 |  |  | 0.75 | nd | nd | 0.57 | nd | nd | 1.5 | nd | nd |
| 57 | *n*-Heneicosane | 629-94-7 | C21H44 | 2100, 2100 |  |  |  |  | nd | nd | nd | nd | nd | nd | 0.74 | nd | nd |
| 58 | Phytol | 150-86-7 | C20H40O | 2114, 2622 |  |  |  |  | nd | 0.64 | 0.22 | 2.1 | 1.56 | 1.43 | nd | nd | nd |
| 59 | Oleic acid (18:1, n-9) | 112-80-1 | C18H34O2 | 2141, 3173 | 17.4 |  | 13.44 | 11.05 |  |  |  |  |  |  |  |  |  |
| 60 | Linoleic acid (18:2, n-6) | 60-33-3 | C18H32O2 | 2133, 3164 | 17.79 |  | 7.56 | 23.92 | 6.9 | 11.38 | 15.78 | 2.75 | 3.54 | 9.36 | 8.06 | 18.63 | 19.11 |
| 61 | Linolenic acid methyl ester (Methyl linolenate) | 301-00-8 | C19H32O2 | 2098, 2571 |  |  |  |  | 11.9 | 10.63 | 8.77 | 11.19 | 11.55 | 18.23 | 18.38 | 20.8 | 17.31 |
| 62 | Stearic acid (18:0) | 57-11-4 | C18H36O2 | 2172, 3136 |  |  |  |  | 2.41 | 4.07 | 3.81 | 2.02 | 4.52 | 2.92 | tr | 7.83 | 6.66 |
| 63 | **Linoleic acid ethyl ester** | 544-35-4 | C20H36O2 | 2162, 2521 | 18.48 (> 3173) |  | 1.7 | 14.36 |  |  |  |  |  |  |  |  |  |
| 64 | **Cyclohexenylacetic acid** | - | C8H12O2 | -, - |  |  |  |  | 2.41 | 4.07 | 3.36 | nd | tr | tr | nd | nd | nd |
| 65 | *n*-Docosane | 629-97-0 | C22H46 | 2200, 2200 |  |  |  |  | 0.42 | nd | nd | nd | nd | nd | nd | nd | nd |
| 66 | *n*-Tricosane | 638-67-5 | C23H48 | 2300, 2300 |  |  |  |  | 1.03 | 0.54 | nd | nd | 0.45 | nd | nd | 0.2 | nd |
| 67 | 9-Octadecenamide | 3322-62-1 | C18H35NO | 2334, - |  |  |  |  | nd | 1.12 | 1.14 | 0.28 | 0.14 | 1.67 | nd | 0.39 | 0.17 |
| 68 | *n*-Tetracosane | 646-31-1 | C24H50 | 2400, 2400 |  |  |  |  | 0.78 | 0.44 | 0.3 | 0.6 | 0.37 | 0.19 | nd | nd | 0.11 |
| 69 | *n*-Pentacosane | 629-99-2 | C25H52 | 2500, 2500 |  |  |  |  | 1.72 | 1.07 | 0.76 | 0.86 | 0.29 | nd | nd | nd | 0.13 |
| 70 | *n*-Hexacosane | 630-01-3 | C26H54 | 2600, 2600 |  |  |  |  | 0.63 | 0.59 | 0.5 | 0.67 | 0.44 | nd | nd | nd | 0.16 |
| 71 | n-Heptacosane | 593-49-7 | C27H56 | 2700, 2700 |  |  |  |  | 2.82 | 2.50 | 2 | 0.98 | 0.53 | 0.49 | nd | nd | tr |
| 72 | Glyceryl monostearate | - | C21H42O4 | -, - |  |  |  |  | 0.33 | nd | nd | nd | nd | nd | nd | nd | nd |
| 73 | n-Octacosane | 630-02-4 | C28H58 | 2800, 2800 |  |  |  |  | 0.84 | 0.53 | 0.5 | 0.48 | 0.39 | nd | nd | nd | nd |
| 74 | Squalene | 111-02-4 | C30H50 | 2832, 2865 |  |  |  |  | nd | 0.77 | 0.29 | 0.56 | 1.16 | nd | nd | nd | nd |
| 75 | n-Nonacosane | 630-03-5 | C29H60 | 2900, 2900 |  |  |  |  | 4.33 | 4.77 | 4.8 | 3.29 | 2.86 | 2.33 | nd | nd | nd |
| 76 | n-Triacontane | 638-68-6 | C30H62 | 3000, 3000 |  |  |  |  | 0.8 | nd | nd | 0.83 | nd | nd | nd | nd | nd |
| 77 | n-Hentriacontane | 630-04-6 | C31H64 | 3100, 3100 |  |  |  |  | 4.08 | 6.73 | 7.76 | 7.18 | 8.58 | 8.45 | nd | nd | 0.45 |
| 78 | n-Dotriacontane | 544-85-4 | C32H66 | 3200, 3200 |  |  |  |  | nd | nd | nd | 0.74 | nd | nd | nd | nd | nd |
| 79 | Campesterol | 474-62-4 | C28H48O | 3131, - |  |  |  |  | 2.82 | 1.73 | 1.89 | 2.69 | 2.92 | 1.28 | 8.83 | 3.92 | 4.56 |
| 80 | n-Tritriacontane | 630-05-7 | C33H68 | 3300, 3300 |  |  |  |  | 3.04 | 1.37 | 2.18 | 5.08 | 0.93 | 2.34 | nd | nd | 1.25 |
| 81 | *β*-Sitosterol | 83-46-5 | C29H50O | 3200, - |  |  |  |  | 16.63 | 13.72 | 16.46 | 15.04 | 18 | 15.15 | 14.84 | 13.05 | 16.57 |
|  | Total (81, 17, 67) |  |  |  |  |  | 93.71 | 95.47 | 96.1 | 96.97 | 98.5 | 95.44 | 96.49 | 97.88 | 98.01 | 98.02 | 98.7 |
|  | Common (3, 3, 3) |  |  |  |  |  | 59.91 | 59.45 | 17.81 | 25.4 | 34.85 | 11.64 | 18.22 | 24.38 | 17.71 | 36.98 | 39.61 |
|  | Hydrocarbon monoterpenes (HMs) (1, 0, 1) |  |  |  |  |  |  |  | 0.22 | 0 | 0 | 0.23 | 0 | 0 | 0 | 0 | 0 |
|  | Alcohol monoterpenes (AMs) (1, 0, 1) |  |  |  |  |  |  |  | 0 | 0 | 0 | 0.18 | 0 | 0 | 0 | 0 | 0 |
|  | Hydrocarbon sesquiterpenes (HSs) (1, 0, 1) |  |  |  |  |  |  |  | 0.2 | 0.2 | 0 | 0.18 | 0 | 0 | 0 | 0 | 0 |
|  | Alcohol sesquiterpenes (ASs) (2, 1, 1) |  |  |  |  |  | 0.16 | 0 | 0 | 0 | 0 | 0.41 | 0 | 0 | 0 | 0 | 0 |
|  | Alcohol diterpenes (ADs) (1, 0, 1) |  |  |  |  |  |  |  | 0 | 0.64 | 0.22 | 2.1 | 1.56 | 1.43 | 0 | 0 | 0 |
|  | Aldehydes (1, 1, 0) |  |  |  |  |  | 0 | 0.76 |  |  |  |  |  |  |  |  |  |
|  | Alcohols (1, 1, 0) |  |  |  |  |  | 0.43 | 0.62 |  |  |  |  |  |  |  |  |  |
|  | Ketones (1, 0, 1) |  |  |  |  |  |  |  | 0.49 | 0.54 | 0.55 | 0.91 | 0.73 | 0.81 | 0 | 0 | 0 |
|  | Piperidone (1, 0, 1) |  |  |  |  |  |  |  | 0 | 0 | 0 | 0.14 | 0 | 0 | 0 | 0 | 0 |
|  | Amide (1, 0, 1) |  |  |  |  |  |  |  | 0 | 1.12 | 1.14 | 0.28 | 0.14 | 1.67 | 0 | 0.39 | 0.17 |
|  | Fatty acids (FAs) (12, 11, 4) |  |  |  |  |  | 86.01 | 79.25 | 20.22 | 29.47 | 38.66 | 13.66 | 22.74 | 27.3 | 17.71 | 44.81 | 46.27 |
|  | Long-chain FAs (LCFAs) (10, 9, 4) |  |  |  |  |  | 84.85 | 79.25 | 20.22 | 29.47 | 38.66 | 13.66 | 22.74 | 27.3 | 17.71 | 44.81 | 46.27 |
|  | Short-chain FAs (SCFAs) (2, 2, 0) |  |  |  |  |  | 1.16 | 0 |  |  |  |  |  |  |  |  |  |
|  | Saturated FAs (SFAs) (8, 7, 3) |  |  |  |  |  | 55.6 | 37.33 | 13.32 | 18.09 | 22.88 | 10.91 | 19.2 | 17.94 | 9.65 | 26.18 | 27.16 |
|  | Monounsaturated FAs (MUFAs) (3, 3, 0) |  |  |  |  |  | 22.85 | 18 |  |  |  |  |  |  |  |  |  |
|  | Polyunsaturated FAs (PUFAs) (1, 1, 1) |  |  |  |  |  | 7.56 | 23.92 | 6.9 | 11.38 | 15.78 | 2.75 | 3.54 | 9.36 | 8.06 | 18.63 | 19.11 |
|  | Proline (1, 1, 0) |  |  |  |  |  | 4.63 | 0 |  |  |  |  |  |  |  |  |  |
|  | Uncertain (3, 1, 2) |  |  |  |  |  | 1.7 | 14.36 | 2.41 | 4.37 | 3.46 | 0 | 0.31 | 0.27 | 0 | 0.33 | 0.36 |
|  | Esters (5, 1, 4) |  |  |  |  |  | 0.78 | 0.48 | 12.68 | 10.63 | 8.77 | 12.38 | 11.55 | 18.23 | 18.38 | 20.8 | 17.31 |
|  | Phthalate (1, 1, 0) |  |  |  |  |  | 0.78 | 0.48 |  |  |  |  |  |  |  |  |  |
|  | Esters of FAs (4, 0, 4) |  |  |  |  |  |  |  | 12.68 | 10.63 | 8.77 | 12.38 | 11.55 | 18.23 | 18.38 | 20.8 | 17.31 |
|  | Total oxygenated compounds (TOCs) (36, 16, 23) |  |  |  |  |  | 92.01 | 81.11 | 54.63 | 63.44 | 71.51 | 57.8 | 67.5 | 73.2 | 62.36 | 85.2 | 87.83 |
|  | Alkanes (35, 0, 35) |  |  |  |  |  |  |  | 38.64 | 26.52 | 22.31 | 33.33 | 24.35 | 21.72 | 31.87 | 11.73 | 9.98 |
|  | n-Alkanes (22, 0, 22) |  |  |  |  |  |  |  | 37.8 | 21.2 | 19.79 | 29.41 | 19.17 | 16.35 | 31.32 | 4.98 | 4.6 |
|  | Branched alkanes (13, 0, 13) |  |  |  |  |  |  |  | 0.84 | 5.32 | 2.52 | 3.92 | 5.18 | 5.37 | 0.55 | 6.75 | 5.38 |

Note: - or blank means no related information; RT (Retention time) gotten form AT-WAX (30 m × 0.25 mm × 0.25 µm); RIs (Retention indices) relative to C8-C20 *n*-alkanes on HP-5 column; tr (trace quantities) (<0.1% detected); nd (not detected); LRIs (Linear retention indices)b, d detected by semi-standard apolar column or polar column were gotten from NIST (National Institute of Standards and Technology) 17 library, respectively. SCFAs mean the chain is less than 10 carbons. The compounds denoted with red color mean they are identified and quantified both. FAs are represented by number of carbon atoms in fatty carboxyl chain:number of double bonds. The n- designates the location of the double bond nearest the methyl terminus. The three numbers in bracket mean the total number, the number in reference [11], and the number in reference [12], of each kind of compounds, respectively.