# The influence of drying and storage conditions on the volatilome and cannabinoid content of *Cannabis sativa* L inflorescences

**SUPPLEMENTARY MATERIAL**

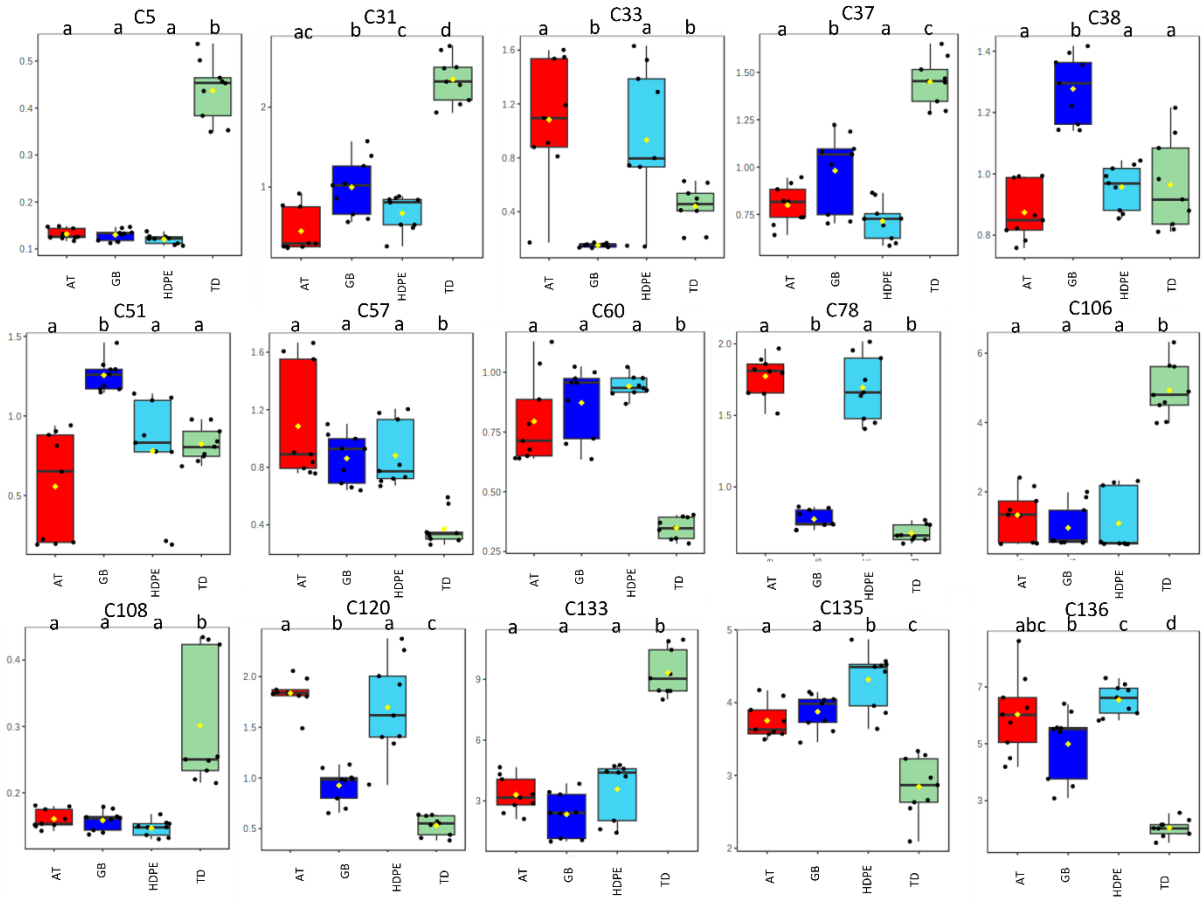


Figure S1: Boxplots of the selected VOCs based on Random Forest analysis in tray drying (TD, light green) condition, and after 6 months storage in airtight box made of high-density polyethylene (HDPE,light blue), lid tight brown glass bottle (GB, dark blue), open to air dry tray (AT,red). The same letter indicates that mean values are not significantly different from each other ($p > 0.05$). Different letters indicate significant differences ($p<0.05$, see Tables S1 and S5 for details). The black dots represent the relative intensity of the selected compounds from all samples. The mean relative intensity of each group is indicated with a yellow diamond.

38 Table S1: Complete list of VOCs detected in all cannabis samples.

| Code | VOC | RI | CAS | Compound family | Compound Sub group |
|---|---|---|---|---|---|
| C1 | Acetone | 487 | 67-64-1 | ketones | |
| C2 | Dimethyl sulfide | 520 | 75-18-3 | sulfur compound | |
| C3 | Acetic acid | 610 | 64-19-7 | carboxylic acids | |
| C4 | 1,3-Pentadiene, 2-methyl- | 624 | 1118-58-7 | alkene | |
| *C5* | *Butanal, 3-methyl-* | *652* | *590-86-3* | *aldehydes* | |
| C6 | 1-Propene, 3-propoxy- | 684 | 1471-03-0 | alkenes | |
| C7 | Butanal, 2-methyl- | 662 | 96-17-3 | aldehydes | |
| C8 | Furan, 2-ethyl- | 703 | 3208-16-0 | furans | |
| C9 | Propanoic acid, ethyl ester | 712 | 105-37-3 | esters | carboxylic acid esters |
| C10 | Propanoic acid, 2-methyl-, ethyl ester | 756 | 97-62-1 | esters | fatty acid esters |
| C11 | Hexane, 2,3-dimethyl- | 760 | 584-94-1 | alkanes | |
| C12 | Methyl isovalerate | 776 | 556-24-1 | esters | fatty acid esters |
| C13 | Octane | 800 | 111-65-9 | alkanes | |
| C14 | Hexanal | 801 | 66-25-1 | aldehydes | |
| C15 | Butanoic acid, ethyl ester | 802 | 105-54-4 | esters | fatty acid esters |
| C16 | 2-Butenoic acid, 3-methyl-, methyl ester | 842 | 924-50-5 | esters | fatty acids esters |
| C17 | Butanoic acid, 2-methyl-, ethyl ester | 849 | 7452-79-1 | esters | fatty acid esters |
| C18 | Butanoic acid, 3-methyl-, ethyl ester | 853 | 108-64-5 | esters | fatty acid esters |
| C19 | 2-Hexenal, (E)- | 854 | 6728-26-3 | aldehydes | |
| C20 | 1-Hexanol | 868 | 111-27-3 | alcohols | |
| C21 | Heptanal | 901 | 111-71-7 | aldehydes | |

| | | | | | |
|---|---|---|---|---|---|
| C22 | 5,5-Dimethyl-1-vinylbicyclo[2.1.1]hexane | 921 | 16626-39-4 | alkanes | |
| C23 | 2-Butenoic acid, 3-methyl-, ethyl ester | 924 | 638-10-8 | esters | fatty acid esters |
| C24 | α-Thujene | 929 | 2867-05-02 | terpenes | monoterpenes |
| C25 | α-Pinene | 937 | 80-56-8 | terpenes | monoterpenes |
| C26 | Camphene | 952 | 79-92-5 | terpenes | monoterpenes |
| C27 | 2,4(10)-Thujadiene | 956 | 36262-09-6 | terpenes | monoterpenes |
| C28 | Benzaldehyde | 962 | 100-52-7 | aldehydes | |
| C29 | β-Pinene | 943 | 18172-67-3 | terpenes | monoterpenes |
| C30 | Sulcatone | 986 | 110-93-0 | ketones | |
| *C31* | *2,2,4,6,6-Pentamethylheptane* | *990* | *13475-82-6* | *alkanes* | |
| C32 | β-Myrcene | 991 | 123-35-3 | terpenes | monoterpenes |
| *C33* | *Decane* | *1000* | *124-18-5* | *alkanes* | |
| C34 | α-Phellandrene | 1005 | 99-83-2 | terpenes | monoterpenes |
| C35 | 3-Carene | 1011 | 13466-78-9 | terpenes | monoterpenes |
| C36 | Acetic acid, hexyl ester | 1011 | 142-92-7 | esters | carboxylic esters |
| *C37* | *Terpinolene* | *1088* | | *terpenes* | *monoterpenes* |
| *C38* | *p-Cymene* | *1025* | *99-87-6* | *terpenes* | *monoterpenes* |
| C39 | D-Limonene | 1031 | 5989-27-5 | terpenes | monoterpenes |
| C40 | β-Phellandrene | 1031 | 555-10-2 | terpenes | monoterpenes |
| C41 | Eucalyptol | 1032 | 470-82-6 | terpenes | monoterpenoids |
| C42 | Benzyl alcohol | 1036 | 100-51-6 | alcohols | |
| C43 | β-Ocimene | 1049 | 3779-61-1 | terpenes | monoterpenes |
| C44 | Unknown 2 | 1049 | | | |
| C45 | γ-Terpinene | 1060 | 99-85-4 | terpenes | monoterpenes |
| C46 | 4-Thujanol | 1070 | 17699-16-0 | terpenes | monoterpenoids |
| C47 | 1-Octanol | 1070 | 111-87-5 | alcohols | fatty alcohols |
| C48 | Linalool oxide | 1074 | 5989-33-3 | furans | |
| C49 | α-Terpinolene | 1088 | 586-62-9 | terpenes | monoterpenes |

| | | | | | |
|---|---|---|---|---|---|
| C50 | Fenchone | 1096 | 1195-79-5 | terpenes | monoterpenoids |
| *C51* | *p-Ocimene* | *1090* | *1195-32-0* | *terpenes* | *monoterpenes* |
| C52 | Undecane | 1100 | 1120-21-4 | alkanes | |
| C53 | Linalool | 1099 | 78-70-6 | terpenes | monoterpenoids |
| C54 | Nonanal | 1104 | 124-19-6 | aldehydes | |
| C55 | Propanoic acid, hexyl ester | 1108 | 2445-76-3 | esters | fatty acid esters |
| C56 | Acetic acid, heptyl ester | 1112 | 112-06-1 | esters | fatty acid esters |
| *C57* | *Phenylethyl Alcohol* | *1116* | *60-12-8* | *alcohols* | |
| C58 | Fenchol | 1114 | 1632-73-1 | terpenes | monoterpenoids |
| C59 | trans-2-Pinanol | 1132 | 4948-29-2 | terpenes | monoterpenoids |
| *C60* | *4-Acetyl-1-methylcyclohexene* | *1137* | *6090-09-1* | *ketones* | |
| C61 | L-Pinocarveol | 1139 | 547-61-5 | alcohols | |
| C62 | Benzyl nitrile | 1144 | 140-29-4 | aromatics | |
| C63 | 2-Pinanol | 1132 | 4948-29-2 | terpenes | monoterpenoids |
| C64 | Ipsdienol | 1147 | 35628-00-3 | alcohols | |
| C65 | Camphor | 1145 | 76-22-2 | terpenes | monoterpenoids |
| C66 | Myrcenone | 1145 | 539-70-8 | ketones | |
| C67 | Camphene hydrate | 1148 | 465-31-6 | terpenes | monoterpenoids |
| C68 | 1,5,7-Octatrien-3-ol, 2,6-dimethyl- | 1167 | 29414-56-0 | terpenes | monoterpenoids |
| C69 | 2-Methyl-6-methylene-1,7-octadien-3-one | 1145 | 22459-10-5 | terpenes | monoterpenoids |
| C70 | endo-Borneol | 1167 | 507-70-0 | terpenes | monoterpenoids |
| C71 | Pinocamphone | 1160 | 547-60-4 | terpenes | monoterpenoids |
| C72 | Terpinen-4-ol | 1182 | 20126-76-5 | terpenes | monoterpenoids |
| C73 | p-Cymen-8-ol | 1183 | 1197-01-9 | alcohols | phenylpropanes |
| C74 | 4-Methylacetophenone | 1183 | 122-00-9 | ketones | |
| C75 | n-Hexyl butanoate | 1192 | 2639-63-6 | esters | fatty acid esters |
| C76 | α±-Terpineol | 1189 | 98-55-5 | terpenes | monoterpenoids |

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|---|---|---|---|---|---|
| C77 | Dodecane | 1200 | 112-40-3 | alkanes | |
| *C78* | *(-)-Myrtenol* | *1213* | *19894-97-4* | *terpenes* | *monoterpenoids* |
| C79 | Acetic acid, octyl ester | 1210 | 112-14-1 | esters | carboxylic acid esters |
| C80 | Fenchyl acetate | 1224 | 13851-11-1 | terpenes | monoterpenoids |
| C81 | Carveol | 1219 | 99-48-9 | terpenes | monoterpenoids |
| C82 | α-Citronellol | 1213 | 6812-78-8 | alcohols | |
| C83 | Hexyl 2-methylbutyrate | 1236 | 10032-15-2 | esters | fatty acid esters |
| C84 | (-)-Carvone | 1245 | 6485-40-1 | terpenes | monoterpenoids |
| C85 | 5-Decen-1-ol, (E)- | 1247 | 56578-18-8 | alcohols | |
| C86 | (Z)-4-Decen-1-ol | 1257 | 57074-37-0 | alcohols | |
| C87 | Myrtanol | 1261 | 51152-12-6 | terpenes | monoterpenoids |
| C88 | Bornyl acetate | 1285 | 76-49-3 | terpenes | monoterpenoids |
| C89 | Indole | 1295 | 120-72-9 | Indoles | |
| C90 | Benzene, (2-nitroethyl)- | 1304 | 6125-24-2 | aromatics | |
| C91 | Myrtenyl acetate | 1327 | 1079-01-2 | terpenes | monoterpenoids |
| C92 | 2,4-Decadien-1-ol | 1307 | 14507-02-9 | alcohols | |
| C93 | Tridecane | 1300 | 629-50-5 | alkanes | |
| C94 | Methyl anthranilate | 1343 | 134-20-3 | esters | carboxylic acid ester |
| C95 | Citronellyl acetate | 1353 | 150-84-5 | terpenes | monoterpenoids |
| C96 | 8-Hydroxylinalool | 1361 | 64142-78-5 | alcohols | |
| C97 | Copaene | 1376 | 3856-25-5 | terpenes | sesquiterpenes |
| C98 | Ylangene | 1372 | 14912-44-8 | terpenes | sesquiterpenes |
| C99 | Myrtanyl acatate | 1387 | 29021-36-1 | terpenes | monoterpenoids |
| C100 | Hexyl caproate | 1384 | 6378-65-0 | esters | fatty acid esters |
| C101 | Alloisolongifolene | 1409 | 87064-18-4 | terpenes | sesquiterpenes |
| C102 | Selina-5,11-diene | 1447 | 52026-55-8 | terpenes | sesquiterpenes |
| C103 | α-Gurjunene | 1409 | 489-40-7 | terpenes | sesquiterpenes |
| C104 | Caryophyllene | 1419 | 87-44-5 | terpenes | sesquiterpenes |

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|---|---|---|---|---|---|
| C105 | α-Bergamotene | 1435 | 17699-05-7 | terpenes | sesquiterpenes |
| *C106* | *Unknown 3* | *1454* | | | |
| C107 | Germacrene D | 1481 | 23986-74-5 | terpenes | sesquiterpenes |
| *C108* | *Perillyl acetate* | *1436* | *15111-96-3* | *terpenes* | *monoterpenoids* |
| C109 | 8,10-Dodecadien-1-ol | 1473 | 33956-49-9 | alcohols | |
| C110 | Aromandendrene | 1440 | 489-39-4 | terpenes | sesquiterpenes |
| C111 | Bicyclo[3.1.1]heptane, 6-methyl-2-methylene-6-(4-methyl-3-pentenyl)-, [1R-(1α,5α,6β)]- | 1446 | 55123-21-2 | terpenes | monoterpenoids |
| C112 | γ-Gurjunene | 1473 | 22567-17-5 | terpenes | sesquiterpenes |
| C113 | (-)-Aristolene | 1447 | 6831-16-9 | terpenes | sesquiterpenes |
| C114 | Humulene | 1454 | 6753-98-6 | terpenes | sesquiterpenes |
| C115 | α-Farnesene | 1508 | 502-61-4 | terpenes | sesquiterpenes |
| C116 | Alloaromadendrene | 1461 | 25246-27-9 | terpenes | sesquiterpenes |
| C117 | α-Elemene | 1454 | 5951-67-7 | terpenes | sesquiterpenes |
| C118 | 4,5-Di-epi-aristolochene | 1470 | 54868-40-5 | terpenes | sesquiterpenes |
| C119 | β-Guaiene | 1490 | 88-84-6 | terpenes | sesquiterpenes |
| *C120* | *Unknown* | *1500* | | | |
| C121 | Naphthalene, 1,2,3,4,4a,5,6,7-octahydro-4a,8-dimethyl-2-(1-methylethenyl)- | 1492 | 103827-22-1 | aromatics | |
| C122 | Valencene | 1492 | 4630-07-3 | terpenes | sesquiterpenes |
| C123 | α±-Farnesene | 1508 | 502-61-4 | terpenes | sesquiterpenes |
| C124 | Dihydroagarofuran | 1550 | 5956-12-7 | furans | |
| C125 | β-Curcumene | 1514 | 28976-67-2 | terpenes | sesquiterpenes |

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|---|---|---|---|---|---|
| C126 | α-Selinene | 1494 | 473-13-2 | terpenes | sesquiterpenes |
| C127 | β-Bisabolene | 1509 | 495-61-4 | terpenes | sesquiterpenes |
| C128 | β-Sesquiphellandrene | 1524 | 20307-83-9 | terpenes | sesquiterpenes |
| C129 | γ-Bisabolene | 1514 | 13062-00-5 | terpenes | sesquiterpenes |
| C130 | Naphthalene, decahydro-4a-methyl-1-methylene-7-(1-methylethylidene)- | 1544 | 58893-88-2 | aromatics | |
| C131 | α-Bisabolene | 1512 | 25532-79-0 | terpenes | sesquiterpenes |
| C132 | Selina-3,7(11)-diene | 1542 | 6813-21-4 | terpenes | sesquiterpenes |
| *C133* | *(-)-helminthogermacrene* | *1570* | *75023-40-4* | *terpenes* | *sesquiterpenes* |
| C134 | Unknown 1 | 1577 | | | |
| *C135* | *Nerolidol* | *1563* | *7212-44-4* | *terpenes* | *sesquiterpenoids* |
| *C136* | *Caryophyllene oxide* | *1581* | *1139-30-6* | *terpenes* | *sesquiterpenoids* |
| C137 | Guaiol | 1596 | 489-86-1 | terpenes | sesquiterpenoids |
| C138 | α-epi-7-epi-5-Eudesmol | 1616 | 446050-56-2 | terpenes | sesquiterpenoids |
| C139 | Humulene oxide II | 1606 | 19888-34-7 | terpenes | sesquiterpenoids |
| C140 | Unknown 4 | 1662 | | | |
| C141 | Agarospirol | 1644 | 19431-80-2 | terpenes | sesquiterpenoids |
| C142 | Hinesol | 1635 | 23811-08-7 | terpenes | sesquiterpenoids |
| C143 | β-Selinenol | 1649 | 473-15-4 | terpenes | sesquiterpenoids |
| C144 | Unknown 5 | 1653 | | | |
| C145 | 7-epi-a-Eudesmol | 1658 | 123123-38-6 | terpenes | sesquiterpenoids |
| C146 | 8-Heptadecene | 1675 | 2579-04-6 | alkenes | |
| C147 | Bulnesol | 1667 | 22451-73-6 | terpenes | sesquiterpenoids |
| C148 | Levomenol | 1695 | 23089-26-1 | terpenes | sesquiterpenoids |
| C149 | Eudesm-7(11)-en-4-ol | 1692 | 473-04-1 | terpenes | sesquiterpenoids |

In italics the top discriminatory VOCs obtained with RF.

Table S2: Significant metabolites based on Volcano plot analysis. FC=fold change, raw.pval= p-value based on t-test, FD=freeze drying.

| Feature Name | Chemical Group | Chemical subgroup | Code | FC | log2(FC) | raw.pval | LOG10(p) |
|---|---|---|---|---|---|---|---|
| **Compounds negatively affected by FD** | | | | | | | |
| 2-Hexenal, (E)- | aldehydes | | C19 | 0.16 | -2.60 | 0.00 | 3.78 |
| Butanal, 3-methyl- | aldehydes | | C5 | 0.10 | -3.37 | 0.00 | 8.48 |
| Butanal, 2-methyl- | aldehydes | | C7 | 0.04 | -4.59 | 0.00 | 7.52 |
| 5,5-Dimethyl-1-vinylbicyclo[2.1.1]hexane | alkanes | | C22 | 0.18 | -2.50 | 0.04 | 1.36 |
| 2,2,4,6,6-Pentamethylheptane | alkanes | | C31 | 0.09 | -3.40 | 0.00 | 8.80 |
| Undecane | alkanes | | C52 | 0.08 | -3.61 | 0.00 | 8.92 |
| Dodecane | alkanes | | C77 | 0.40 | -1.31 | 0.04 | 1.43 |
| CBD | Cannabinoids | | CBD | 0.10 | -3.26 | 0.03 | 1.49 |
| CBG | Cannabinoids | | CBG | 0.04 | -4.53 | 0.00 | 4.60 |
| THC | Cannabinoids | | THC | 0.16 | -2.61 | 0.00 | 3.86 |
| Propanoic acid, 2-methyl-, ethyl ester | esters | carboxylic acid esters | C10 | 0.23 | -2.14 | 0.00 | 2.31 |
| Propanoic acid, ethyl ester | esters | carboxylic acid esters | C9 | 0.22 | -2.19 | 0.01 | 2.29 |
| Butanoic acid, ethyl ester | esters | fatty acid esters | C15 | 0.22 | -2.16 | 0.00 | 2.30 |
| Butanoic acid, 2-methyl-, ethyl ester | esters | fatty acid esters | C17 | 0.11 | -3.15 | 0.00 | 3.26 |
| Propanoic acid, hexyl ester | esters | fatty acid esters | C55 | 0.20 | -2.30 | 0.01 | 2.14 |
| Methyl isovalerate | esters | fatty acid esters | C12 | 0.22 | -2.19 | 0.01 | 2.29 |
| Furan, 2-ethyl- | furans | | C8 | 0.14 | -2.86 | 0.00 | 4.73 |
| Myrcenone | ketones | | C66 | 0.20 | -2.33 | 0.01 | 2.23 |
| α-Phellandrene | terpenes | monoterpenes | C34 | 0.22 | -2.18 | 0.00 | 3.58 |
| 3-Carene | terpenes | monoterpenes | C35 | 0.08 | -3.61 | 0.00 | 5.25 |
| Terpinolene | terpenes | monoterpenes | C37 | 0.35 | -1.51 | 0.00 | 6.93 |
| D-Limonene | terpenes | monoterpenes | C39 | 0.33 | -1.60 | 0.00 | 4.69 |
| β-Phellandrene | terpenes | monoterpenes | C40 | 0.09 | -3.52 | 0.00 | 3.13 |
| α-Terpinolene | terpenes | monoterpenes | C49 | 0.08 | -3.59 | 0.00 | 11.32 |
| α-Thujene | terpenes | monoterpenes | C24 | 0.32 | -1.63 | 0.01 | 1.94 |
| α-Pinene | terpenes | monoterpenes | C25 | 0.23 | -2.13 | 0.00 | 5.73 |
| Camphene | terpenes | monoterpenes | C26 | 0.18 | -2.46 | 0.00 | 5.50 |
| 2,4(10)-Thujadiene | terpenes | monoterpenes | C27 | 0.28 | -1.84 | 0.00 | 3.40 |
| β-Pinene | terpenes | monoterpenes | C29 | 0.46 | -1.11 | 0.01 | 1.94 |
| β-Myrcene | terpenes | monoterpenes | C32 | 0.04 | -4.56 | 0.00 | 4.73 |
| Perillyl acetate | terpenes | monoterpenoids | C108 | 0.29 | -1.80 | 0.00 | 3.44 |
| Camphor | terpenes | monoterpenoids | C65 | 0.28 | -1.82 | 0.00 | 3.43 |
| Myrtenyl acetate | terpenes | monoterpenoids | C91 | 0.27 | -1.87 | 0.00 | 3.35 |
| Bicyclo[3.1.1]heptane, 6-methyl-2-methylene-6-(4-methyl-3-pentenyl)-, [1R-(1α,5α,6β)]- | terpenes | monoterpenoids | C111 | 0.13 | -2.95 | 0.00 | 2.88 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2-Methyl-6-methylene-1,7-octadien-3-one | terpenes | monoterpenoids | C69 | 0.21 | -2.27 | 0.01 | 2.27 |
| Fenchyl acetate | terpenes | monoterpenoids | C80 | 0.27 | -1.88 | 0.00 | 3.36 |
| Alloisolongifolene | terpenes | sesquiterpenes | C101 | 0.25 | -1.98 | 0.00 | 3.26 |
| γ-Gurjunene | terpenes | sesquiterpenes | C112 | 0.24 | -2.04 | 0.00 | 2.67 |
| (-)-Aristolene | terpenes | sesquiterpenes | C113 | 0.18 | -2.44 | 0.01 | 1.90 |
| α-Elemene | terpenes | sesquiterpenes | C117 | 0.26 | -1.96 | 0.00 | 2.40 |
| β-Bisabolene | terpenes | sesquiterpenes | C127 | 0.22 | -2.19 | 0.01 | 2.29 |
| γ-Bisabolene | terpenes | sesquiterpenes | C129 | 0.10 | -3.35 | 0.00 | 4.30 |
| (-)-helminthogermacrene | terpenes | sesquiterpenes | C133 | 0.02 | -5.64 | 0.00 | 7.96 |
| Unknown 3 | | | C106 | 0.08 | -3.57 | 0.00 | 9.00 |
| Unknown 2 | | | C44 | 0.20 | -2.35 | 0.00 | 3.24 |
| **Compounds positively affected by FD** | | | | | | | |
| Phenylethyl Alcohol | alcohols | | C57 | 3.17 | 1.66 | 0.00 | 4.00 |
| Heptanal | aldehydes | | C21 | 5.92 | 2.57 | 0.00 | 2.97 |
| Benzaldehyde | aldehydes | | C28 | 2.35 | 1.23 | 0.02 | 1.72 |
| Nonanal | aldehydes | | C54 | 9.17 | 3.20 | 0.00 | 7.39 |
| Hexane, 2,3-dimethyl- | alkanes | | C11 | 4.78 | 2.26 | 0.01 | 2.25 |
| Unknown | | | C120 | 16.96 | 4.08 | 0.00 | 11.18 |
| Decane | alkanes | | C33 | 11.58 | 3.53 | 0.00 | 2.68 |
| Benzyl nitrile | aromatics | | C62 | 2.03 | 1.02 | 0.02 | 1.81 |
| Acetic acid, heptyl ester | esters | fatty acid esters | C56 | 13.64 | 3.77 | 0.04 | 1.41 |
| Acetic acid, octyl ester | esters | fatty alcohols esters | C79 | 4.11 | 2.04 | 0.00 | 2.39 |
| Indole | Indoles | | C89 | 2.91 | 1.54 | 0.02 | 1.77 |
| Sulcatone | ketones | | C30 | 16.62 | 4.05 | 0.00 | 6.87 |
| 4-Acetyl-1-methylcyclohexene | ketones | | C60 | 9.71 | 3.28 | 0.00 | 8.53 |
| 1,5,7-Octatrien-3-ol, 2,6-dimethyl- | terpenes | monoterpenoids | C68 | 12.76 | 3.67 | 0.02 | 1.76 |
| α±-Terpineol | terpenes | monoterpenoids | C76 | 2.17 | 1.12 | 0.02 | 1.63 |
| (-)-Myrtenol | terpenes | monoterpenoids | C78 | 16.06 | 4.01 | 0.00 | 10.89 |
| Caryophyllene oxide | terpenes | sesquiterpenoids | C136 | 8.80 | 3.14 | 0.00 | 7.51 |
| Guaiol | terpenes | sesquiterpenoids | C137 | 2.18 | 1.12 | 0.02 | 1.61 |
| α-epi-7-epi-5-Eudesmol | terpenes | sesquiterpenoids | C138 | 2.68 | 1.42 | 0.04 | 1.38 |
| β-Selinenol | terpenes | sesquiterpenoids | C143 | 3.81 | 1.93 | 0.04 | 1.40 |
| 7-epi-a-Eudesmol | terpenes | sesquiterpenoids | C145 | 2.16 | 1.11 | 0.05 | 1.32 |
| Unknown 1 | | | C134 | 2.91 | 1.54 | 0.00 | 3.01 |
| Unknown 4 | | | C140 | 2.28 | 1.19 | 0.01 | 1.85 |
| Unknown 5 | | | C144 | 3.08 | 1.62 | 0.03 | 1.60 |

Supplementary table S3. Top 25 most significant metabolites (blu= negatively affected by freeze drying, red=positively affected by freeze drying) with their aroma description. FC=fold change, raw.pval= p-value based on t-test

| Feature Name | Chemical Group | Chemical subgroup | Code | FC | log2(FC) | raw.pval | LOG10(p) | *Aroma descriptors |
|---|---|---|---|---|---|---|---|---|
| α-Terpinolene | terpenes | monoterpenes | C49 | 0.083328 | -3.5851 | 4.82E-12 | 11.317 | woody, woody earthy spicy |
| Unknown 3 | | | C106 | 0.084053 | -3.5726 | 9.95E-10 | 9.0023 | |
| Undecane | alkanes | | C52 | 0.082067 | -3.6071 | 1.20E-09 | 8.9225 | musty, green |
| 2,2,4,6,6-Pentamethylheptane | alkanes | branched alkanes | C31 | 0.094904 | -3.3974 | 1.58E-09 | 8.801 | cedar and musk fragrance |
| Butanal, 3-methyl- | aldehydes | aldehydes | C5 | 0.096598 | -3.3719 | 3.30E-09 | 8.4811 | gasoline-like to odorless |
| (-)-Helminthogermacrene | terpenes | sesquiterpenes | C133 | 0.02001 | -5.6432 | 1.10E-08 | 7.9585 | woody |
| Butanal, 2-methyl- | aldehydes | aldehydes | C7 | 0.041443 | -4.5927 | 2.99E-08 | 7.5246 | pine-like |
| Terpinolene | terpenes | monoterpenes | C37 | 0.35112 | -1.51 | 1.16E-07 | 6.934 | caramel, buttery, baked bread, and nutty |
| α-Pinene | terpenes | monoterpenes | C25 | 0.22768 | -2.1349 | 1.85E-06 | 5.7329 | fruity |
| Camphene | terpenes | monoterpenes | C26 | 0.18167 | -2.4606 | 3.17E-06 | 5.499 | malty |
| 3-Carene | terpenes | monoterpenes | C35 | 0.082083 | -3.6068 | 5.65E-06 | 5.2478 | balsamic, sweet, myrrh, orange flower |
| β-Myrcene | terpenes | monoterpenes | C32 | 0.042494 | -4.5566 | 1.87E-05 | 4.7287 | ethereal rum, cocoa note |
| Furan, 2-ethyl- | furans | furans | C8 | 0.13776 | -2.8598 | 1.88E-05 | 4.7268 | earthy, woody and herbaceous odor |
| D-Limonene | terpenes | monoterpenes | C39 | 0.33039 | -1.5978 | 2.03E-05 | 4.692 | green |
| CBG | Cannabinoids | Cannabinoids | CBG | 0.043373 | -4.5271 | 2.53E-05 | 4.5971 | camphor-like |
| γ-Bisabolene | terpenes | sesquiterpenes | C129 | 0.098041 | -3.3505 | 5.05E-05 | 4.2967 | dry woody, resinous-piney |
| THC | Cannabinoids | Cannabinoids | THC | 0.16412 | -2.6072 | 0.0001372 | 3.8626 | citrus-like |
| 2-Hexenal, (E)- | aldehydes | aldehydes | C19 | 0.16484 | -2.6009 | 0.0001671 | 3.777 | pine-like |
| Unknown | | | C120 | 16.963 | 4.0843 | 6.54E-12 | 11.184 | sweet, fresh, dry wood, spicy |
| (-)-Myrtenol | terpenes | monoterpenes | C78 | 16.055 | 4.005 | 1.28E-11 | 10.892 | sweet and fruity |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4-Acetyl-1-methylcyclohexene | ketones | ketones | C60 | 9.7075 | 3.2791 | 2.98E-09 | 8.5259 | spice |
| Caryophyllene oxide | terpenes | sesquiterpenes | C136 | 8.7982 | 3.1372 | 3.07E-08 | 7.5126 | herbal, minty |
| Nonanal | aldehydes | aldehydes | C54 | 9.1685 | 3.1967 | 4.05E-08 | 7.3921 | citrus-like lemongrass |
| Sulcatone | ketones | ketones | C30 | 16.617 | 4.0546 | 1.36E-07 | 6.8675 | |
| Phenylethyl Alcohol | alcohols | aromatic alcohols | C57 | 3.1691 | 1.6641 | 9.96E-05 | 4.0019 | floral, sweet, with rose note |

*Aroma descriptors were sourced from Good Scents company database (https://www.thegoodscentscompany.com/search3.php.1988)

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Table S4: Significant variables based on ANOVA and Tukey's post-hoc test. TD=tray drying, HDPE=airtight box made of high-density polyethylene, AT=air dry tray, GB=lid tight brown glass bottle; p.value <0.05

| Code | f.value | p.value | FDR | Tukey's HSD | | | | |
|---|---|---|---|---|---|---|---|---|
| C5 | 294.47 | 2.2581e-23 | 3.2968e-21 | TD-AT | GB-TD | HDPE-TD | | |
| C78 | 237.56 | 6.1146e-22 | 4.4636e-20 | TD-AT | GB-AT | GB-TD | HDPE-TD | HDPE-GB |
| C60 | 77.40 | 9.3275e-15 | 4.5394e-13 | TD-AT | GB-TD | HDPE-TD | | |
| C120 | 69.26 | 4.3694e-14 | 1.5948e-12 | TD-AT | GB-AT | GB-TD | HDPE-TD | HDPE-GB |
| C136 | 65.83 | 8.7963e-14 | 2.5685e-12 | TD-AT | GB-TD | HDPE-TD | HDPE-GB | |
| C8 | 46.51 | 9.0304e-12 | 2.1974e-10 | TD-AT | GB-TD | HDPE-TD | | |
| C37 | 37.36 | 1.4404e-10 | 3.0042e-09 | TD-AT | GB-TD | HDPE-TD | HDPE-GB | |
| C7 | 34.87 | 3.3483e-10 | 6.1107e-09 | TD-AT | GB-TD | HDPE-TD | | |
| C31 | 32.28 | 8.4684e-10 | 1.3738e-08 | TD-AT | GB-AT | GB-TD | HDPE-TD | |
| C108 | 30.72 | 1.526e-09 | 2.228e-08 | TD-AT | GB-TD | HDPE-TD | | |
| C52 | 29.46 | 2.4903e-09 | 3.1346e-08 | TD-AT | GB-AT | GB-TD | HDPE-TD | HDPE-GB |
| C135 | 29.37 | 2.5764e-09 | 3.1346e-08 | TD-AT | HDPE-AT | GB-TD | HDPE-TD | |
| C57 | 27.46 | 5.5842e-09 | 6.2715e-08 | TD-AT | GB-TD | HDPE-TD | | |
| C133 | 23.28 | 3.4966e-08 | 3.6464e-07 | TD-AT | GB-TD | HDPE-TD | | |
| C32 | 21.95 | 6.5932e-08 | 6.4173e-07 | TD-AT | GB-TD | HDPE-TD | | |
| C38 | 20.77 | 1.1746e-07 | 1.0613e-06 | GB-AT | GB-TD | HDPE-GB | | |
| C94 | 20.67 | 1.2358e-07 | 1.0613e-06 | TD-AT | GB-TD | HDPE-TD | | |
| C106 | 19.69 | 2.0368e-07 | 1.6521e-06 | TD-AT | GB-TD | HDPE-TD | | |
| C35 | 15.31 | 2.3645e-06 | 1.783e-05 | TD-AT | GB-TD | HDPE-TD | | |
| C49 | 15.26 | 2.4425e-06 | 1.783e-05 | TD-AT | GB-TD | HDPE-TD | | |
| C33 | 15.00 | 2.8576e-06 | 1.9867e-05 | TD-AT | GB-AT | GB-TD | HDPE-GB | |
| C92 | 14.38 | 4.1802e-06 | 2.7741e-05 | TD-AT | GB-TD | HDPE-TD | | |
| C15 | 14.19 | 4.7296e-06 | 3.0023e-05 | TD-AT | GB-TD | HDPE-TD | | |
| C12 | 14.06 | 5.119e-06 | 3.0906e-05 | TD-AT | GB-TD | HDPE-TD | | |
| C9 | 14.01 | 5.2921e-06 | 3.0906e-05 | TD-AT | GB-TD | HDPE-TD | | |
| C69 | 13.66 | 6.5932e-06 | 3.7023e-05 | TD-AT | GB-TD | HDPE-TD | | |
| C40 | 13.59 | 6.9348e-06 | 3.7499e-05 | TD-AT | GB-TD | HDPE-TD | | |
| C4 | 10.90 | 4.3369e-05 | 0.0002261 | HDPE-AT | GB-TD | HDPE-TD | | |
| C105 | 10.37 | 6.368e-05 | 0.0003206 | TD-AT | GB-TD | HDPE-TD | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| C122 | 10.04 | 8.1343e-05 | 0.0003959 | TD-AT | GB-TD | HDPE-TD | | |
| C26 | 9.51 | 0.0001222 | 0.0005755 | TD-AT | GB-TD | HDPE-TD | | |
| C93 | 8.12 | 0.0003681 | 0.0016795 | TD-AT | GB-AT | | | |
| C70 | 7.69 | 0.0005254 | 0.0023245 | TD-AT | GB-TD | HDPE-TD | | |
| C89 | 7.29 | 0.0007348 | 0.0031552 | GB-AT | HDPE-AT | GB-TD | HDPE-TD | |
| C59 | 6.94 | 0.0009946 | 0.0041487 | TD-AT | GB-TD | HDPE-TD | | |
| C25 | 6.43 | 0.0015653 | 0.006348 | TD-AT | HDPE-TD | | | |
| C51 | 6.30 | 0.001753 | 0.0068931 | GB-AT | | | | |
| C58 | 6.28 | 0.0017941 | 0.0068931 | TD-AT | GB-TD | HDPE-TD | | |
| C28 | 6.05 | 0.002212 | 0.0082807 | TD-AT | | | | |
| C111 | 5.91 | 0.0025 | 0.0091251 | HDPE-TD | | | | |
| C74 | 5.38 | 0.0040971 | 0.01459 | TD-AT | GB-TD | | | |
| C14 | 5.32 | 0.0043405 | 0.015088 | GB-TD | | | | |
| C30 | 5.26 | 0.0045839 | 0.015564 | TD-AT | | | | |
| C45 | 5.04 | 0.0056648 | 0.018797 | TD-AT | HDPE-TD | | | |
| C62 | 4.81 | 0.0071021 | 0.023043 | GB-AT | GB-TD | | | |
| C124 | 4.65 | 0.0083112 | 0.026379 | TD-AT | HDPE-TD | | | |
| C27 | 4.52 | 0.0094624 | 0.029394 | TD-AT | | | | |
| C140 | 4.48 | 0.0098234 | 0.02988 | TD-AT | HDPE-TD | | | |
| C24 | 4.37 | 0.010923 | 0.032547 | TD-AT | | | | |
| C34 | 4.18 | 0.013202 | 0.038549 | TD-AT | | | | |

Table S5: RF 15 VOC relative abundance based on different storage conditions

| | VOC %Rel. abundance | C5 | C31 | C33 | C37 | C38 | C51 | C57 | C60 | C78 | C106 | C108 | C120 | C133 | C135 | C136 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HDPE | average | 0.12 | 0.67 | 0.93 | 0.71 | 0.96 | 0.78 | 0.88 | 0.94 | 1.69 | 1.09 | 0.15 | 1.70 | 3.58 | 4.32 | 6.54 |
| | SE | 0.00 | 0.07 | 0.19 | 0.03 | 0.02 | 0.12 | 0.07 | 0.02 | 0.08 | 0.29 | 0.00 | 0.16 | 0.48 | 0.13 | 0.18 |
| AT | average | 0.13 | 0.45 | 1.08 | 0.80 | 0.87 | 0.56 | 1.09 | 0.79 | 1.77 | 1.33 | 0.16 | 1.84 | 3.31 | 3.75 | 6.03 |
| | SE | 0.00 | 0.09 | 0.15 | 0.03 | 0.03 | 0.11 | 0.13 | 0.06 | 0.05 | 0.24 | 0.00 | 0.05 | 0.29 | 0.08 | 0.46 |
| GB | average | 0.13 | 1.00 | 0.15 | 0.98 | 1.28 | 1.26 | 0.86 | 0.87 | 0.77 | 0.96 | 0.16 | 0.93 | 2.34 | 3.87 | 4.99 |
| | SE | 0.00 | 0.12 | 0.00 | 0.07 | 0.04 | 0.03 | 0.06 | 0.05 | 0.02 | 0.21 | 0.01 | 0.06 | 0.36 | 0.08 | 0.40 |
| TD | average | 0.44 | 2.35 | 0.44 | 1.45 | 0.96 | 0.82 | 0.37 | 0.35 | 0.68 | 4.93 | 0.30 | 0.53 | 9.32 | 2.85 | 2.04 |
| | SE | 0.02 | 0.10 | 0.05 | 0.04 | 0.05 | 0.04 | 0.04 | 0.02 | 0.02 | 0.26 | 0.03 | 0.03 | 0.38 | 0.14 | 0.10 |

60 Table S6: Cannabinoids content based on different storage conditions.

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| | % w/w | CBGA* | CBDA** | THC | CBC | THCA | CBG* | CBD** |
|---|---|---|---|---|---|---|---|---|
| HDPE | average | 11.65 | 12.86 | 0.07 | 0.07 | 0.27 | 1.14 | 0.59 |
| | SE | 0.10 | 0.59 | 0.01 | 0 | 0.04 | 0 | 0.01 |
| AT | average | 11.76 | 12.57 | 0.05 | 0.07 | 0.32 | 1.13 | 0.51 |
| | SE | 0.07 | 0.36 | 0 | 0 | 0.04 | 0 | 0.01 |
| GB | average | 10.27 | 11.89 | 0.17 | 0.17 | 0.24 | 1.44 | 1.42 |
| | SE | 0.01 | 1.00 | 0.02 | 0 | 0.04 | 0.02 | 0.06 |
| TD | average | 11.65 | 12.34 | 0.07 | 0.05 | 0.36 | 1.43 | 1.14 |
| | SE | 0.11 | 0.74 | 0.01 | 0 | 0.05 | 0.02 | 0.08 |

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