**Supporting Information for**

**Effect of acetate and propionate on the production and characterization of soluble microbial products (SMP) in aerobic granular sludge system**

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Running title:Acetate and propionate affect aerobic granules producing SMP

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**Fig. S1 Abundance of main genera in the granules from R1 and R2 on day 120.**

**Table S1 Compounds detected by GC-MS in SMPs of the effluent in R1 (% match > 80%).**

| **Retention time (min)** | **Compound name** | **Molecular weight (Da)** | **Chemical formula** | **Percentage (%)** | **Match ratio(%)** |
| --- | --- | --- | --- | --- | --- |
| 2.973 | 2-Butanone, 3-methyl- (\*) | 86.1 | C5H10O | 5.43 | 84.23 |
| 2.997 | Butane, 2-chloro-2-methyl- (\*) | 106.1 | C5H11Cl | 2.6 | 95.98 |
| 3.092 | Formic acid, 2-ethylbutyl ester | 130.1 | C7H14O2 | 0.24 | 82.7 |
| 3.133 | Butane, 2-methoxy-2-methyl- (\*) | 102.1 | C6H14O | 0.37 | 86.45 |
| 3.222 | 3-Penten-2-ol (\*) | 86.1 | C5H10O | 2.93 | 95.17 |
| 3.299 | Heptane (\*) | 100.1 | C7H16 | 5.6 | 86.71 |
| 4.035 | 2-Hexanone (\*) | 100.1 | C6H12O | 0.33 | 89.43 |
| 4.065 | Methane, dichloronitro- | 128.9 | CHCl2NO2 | 0.5 | 93.85 |
| 4.326 | Toluene (\*) | 92.1 | C7H8 | 0.46 | 97.78 |
| 4.486 | 2-Buten-1-ol, 2-methyl- (\*) | 86.1 | C5H10O | 0.46 | 96.15 |
| 4.552 | 2,2-Diethylacetamide (\*) | 115.1 | C6H13NO | 1.21 | 82.32 |
| 4.587 | Formamide, N,N-dimethyl- (\*) | 73.1 | C3H7NO | 0.53 | 97.48 |
| 4.73 | 2-Propenoic acid, 4-methylpentyl ester | 156.1 | C9H16O2 | 0.31 | 81.67 |
| 4.914 | 3-Hexen-1-ol, (E)- (\*) | 100.1 | C6H12O | 1.06 | 93.45 |
| 5.032 | Ether, 2-chloro-1-methylethyl isopropyl | 136.1 | C6H13ClO | 0.75 | 81.48 |
| 6.095 | Ethylbenzene (\*) | 106.1 | C8H10 | 0.23 | 84.72 |
| 6.255 | o-Xylene (\*) | 106.1 | C8H10 | 0.37 | 91.79 |
| 6.528 | 2-sec-Butyl-3-methyl-1-pentene (\*) | 140.2 | C10H20 | 1.49 | 89.33 |
| 6.849 | Cyclopentene, 1,2,3,4,5-pentamethyl- (\*) | 138.1 | C10H18 | 7.21 | 95.11 |
| 6.938 | 3-Ethyl-4-methylpentan-1-ol (\*) | 130.1 | C8H18O | 0.38 | 81.55 |
| 7.276 | Cyclopentane, 1,2,3,4,5-pentamethyl- (\*) | 140.2 | C10H20 | 3.2 | 87.96 |
| 7.543 | 2,3,3-Trimethyl-1-hexene (\*) | 126.1 | C9H18 | 0.7 | 87.76 |
| 7.727 | Cyclohexane, 1-ethyl-1-methyl- (\*) | 126.1 | C9H18 | 0.43 | 89.3 |
| 7.775 | 1,2,3-Trimethyl-cyclopent-2-enecarboxaldehyde (\*) | 138.1 | C9H14O | 0.28 | 86.95 |
| 7.864 | 2,4,4-Trimethyl-1-hexene (\*) | 126.1 | C9H18 | 1.42 | 80.6 |
| 7.923 | Cyclohexane, 1-methyl-3-propyl- (\*) | 140.2 | C10H20 | 2.52 | 90.6 |
| 8.445 | 2,7-Dimethyl-2,7-octanediol (\*) | 174.2 | C10H22O2 | 0.17 | 80.3 |
| 8.938 | 1,3-Hexadiene, 3-ethyl-2,5-dimethyl- | 138.1 | C10H18 | 0.45 | 82.95 |
| 9.81 | 1,3-Cyclopentadiene, 5,5-dimethyl-1-propyl- (\*) | 136.1 | C10H16 | 0.17 | 80.34 |
| 13.437 | Cyclohexene, 2-butyl-1,3,3-trimethyl- | 180.2 | C13H24 | 0.23 | 83.76 |
| 14.28 | 2,2,6,7-Tetramethyl-10-oxatricyclo[4.3.0.1(1,7)]decan-5-one (\*) | 208.1 | C13H20O2 | 0.46 | 82.38 |
| 14.44 | Cyclohexene, 1,5,5-trimethyl-6-acetylmethyl- (\*) | 180.2 | C12H20O | 0.33 | 80.01 |
| 16.042 | 2,4a,8,8-Tetramethyldecahydrocyclopropa[d]naphthalene (\*) | 206.2 | C15H26 | 1.14 | 82.37 |
| 16.666 | 2,5,5,8a-Tetramethyl-4-methylene-4a,5,6,7,8,8a-hexahydro-4H-chromene (\*) | 206.2 | C14H22O | 0.47 | 84.69 |
| 22.916 | 7-Methyl-Z-tetradecen-1-ol acetate (\*) | 268.2 | C17H32O2 | 0.37 | 80.96 |
| 23.046 | 7-Hydroxy-6,9a-dimethyl-3-methylene-decahydro-azuleno[4,5-b]furan-2,9-dione | 264.1 | C15H20O4 | 0.19 | 82.24 |
| 25.147 | Phthalic acid, 2-cyclohexylethyl butyl ester | 332.2 | C20H28O4 | 0.97 | 89.56 |
| 26.483 | 1-Heptatriacotanol (\*) | 536.6 | C37H76O | 0.95 | 85.86 |
| 29.088 | Octadecanal, 2-bromo- (\*) | 346.2 | C18H35BrO | 3.76 | 80.47 |
| 31.219 | E,E,Z-1,3,12-Nonadecatriene-5,14-diol (\*) | 294.3 | C19H34O2 | 1.7 | 80.74 |
| 31.7 | Di-n-octyl phthalate | 390.3 | C24H38O4 | 4.62 | 84.14 |
| 31.824 | Bis(2-ethylhexyl) phthalate | 390.3 | C24H38O4 | 32.03 | 95.62 |
| 32.649 | Ethyl iso-allocholate | 436.3 | C26H44O5 | 0.68 | 83.5 |
| 33.813 | Tricyclo[20.8.0.0(7,16)]triacontane, 1(22),7(16)-diepoxy- (\*) | 444.4 | C30H52O2 | 2.27 | 81.48 |
| 42.781 | 2-Dodecen-1-yl(-)succinic anhydride (\*) | 266.2 | C16H26O3 | 7.02 | 81.31 |
| 46.734 | 2,5-Furandione, 3-dodecyl-  | 266.2 | C16H26O3 | 1.01 | 82.31 |

Note:
1. (\*) represents the compound that was also detected in the effluent of R2.
2. Samples were collected at the end of the experiment.

**Table S2 Compounds detected by GC-MS in SMPs of the effluent in R2 (% match > 80%).**

| **Retention time (min)** | **Compound name** | **Molecular** **weight (Da)** | **Chemical formula** | **Percentage (%)** | **Match** **ratio (%)** |
| --- | --- | --- | --- | --- | --- |
| 2.908 | 2-Butanone, 3-methyl- (\*) | 86.1 | C5H10O | 5.95 | 84.56 |
| 2.937 | Butane, 2-chloro-2-methyl- (\*) | 106.1 | C5H11Cl | 2.5 | 97.25 |
| 3.074 | Butane, 2-methoxy-2-methyl- (\*) | 102.1 | C6H14O | 0.21 | 88.59 |
| 3.169 | 3-Penten-2-ol (\*) | 86.1 | C5H10O | 2.94 | 95.04 |
| 3.222 | Heptane (\*) | 100.1 | C7H16 | 6.02 | 94.06 |
| 4.0 | 2-Hexanone (\*) | 100.1 | C6H12O | 0.33 | 89.57 |
| 4.296 | Toluene (\*) | 92.1 | C7H8 | 0.38 | 97.09 |
| 4.344 | 2-Butene, 1-chloro-2-methyl- | 104 | C5H9Cl | 0.11 | 88.42 |
| 4.457 | 2-Buten-1-ol, 2-methyl-(\*) | 86.1 | C5H10O | 0.46 | 95.56 |
| 4.522 | 2,2-Diethylacetamide (\*) | 115.1 | C6H13NO | 1.28 | 83.26 |
| 4.57 | Formamide, N,N-dimethyl- (\*) | 73.1 | C3H7NO | 0.29 | 94.72 |
| 4.89 | 3-Hexen-1-ol, (E)- (\*) | 100.1 | C6H12O | 1.14 | 93.05 |
| 4.943 | 4-Chloro-2-methylbutan-2-ol | 122 | C5H11ClO | 0.11 | 84.19 |
| 5.009 | 2-Pentanol, 4-methyl- | 102.1 | C6H14O | 0.78 | 83.51 |
| 6.083 | Ethylbenzene (\*) | 106.1 | C8H10 | 0.2 | 85.66 |
| 6.249 | o-Xylene (\*) | 106.1 | C8H10 | 0.43 | 80.32 |
| 6.522 | 2-sec-Butyl-3-methyl-1-pentene (\*) | 140.2 | C10H20 | 1.58 | 89.63 |
| 6.843 | Cyclopentene, 1,2,3,4,5-pentamethyl- (\*) | 138.1 | C10H18 | 7.55 | 95.69 |
| 6.932 | 3-Ethyl-4-methylpentan-1-ol (\*) | 130.1 | C8H18O | 0.33 | 84.65 |
| 7.27 | Cyclopentane, 1,2,3,4,5-pentamethyl- (\*) | 140.2 | C10H20 | 3.4 | 89.32 |
| 7.496 | Octane, 3-methyl-6-methylene- | 140.2 | C10H20 | 1.42 | 83.86 |
| 7.543 | 2,3,3-Trimethyl-1-hexene (\*) | 126.1 | C9H18 | 0.73 | 90.2 |
| 7.727 | Cyclohexane, 1-ethyl-1-methyl- (\*) | 126.1 | C9H18 | 0.47 | 89.01 |
| 7.775 | 1,2,3-Trimethyl-cyclopent-2-enecarboxaldehyde (\*) | 138.1 | C9H14O | 0.28 | 86.68 |
| 7.864 | 2-Octene, 3,7-dimethyl-, (Z)- | 140.2 | C10H20 | 1.22 | 80.77 |
| 7.923 | Cyclohexane, 1-methyl-3-propyl- (\*) | 140.2 | C10H20 | 2.88 | 90.83 |
| 8.012 | 2,4,4-Trimethyl-1-hexene (\*) | 126.1 | C9H18 | 0.4 | 82.97 |
| 8.356 | 5-Isopropyl-3,3-dimethyl-2-methylene-2,3-dihydrofuran | 152.1 | C10H16O | 0.14 | 81.13 |
| 8.445 | 2,7-Dimethyl-2,7-octanediol (\*) | 174.2 | C10H22O2 | 0.16 | 82.8 |
| 8.79 | Cyclohexanol, 2-(1-methylpropyl)- | 156.2 | C10H20O | 0.19 | 81.19 |
| 8.944 | 1,3-Hexadiene, 3-ethyl-2,5-dimethyl- | 138.1 | C10H18 | 0.5 | 85.82 |
| 9.039 | Cyclohexene, 1,4,6,6-tetramethyl- | 138.1 | C10H18 | 0.73 | 80.83 |
| 9.662 | Cyclohexanol, 2-methyl-5-(1-methylethenyl)- | 154.1 | C10H18O | 0.15 | 82.54 |
| 9.816 | 1,3-Cyclopentadiene, 5,5-dimethyl-1-propyl- (\*) | 136.1 | C10H16 | 0.13 | 83.22 |
| 12.107 | 3,4-Hexadienal, 2-butyl-2-ethyl-5-methyl- | 194.2 | C13H22O | 0.13 | 84.35 |
| 14.28 | 2,2,6,7-Tetramethyl-10-oxatricyclo[4.3.0.1(1,7)]ecan-5-one (\*) | 208.1 | C13H20O2 | 0.46 | 82.14 |
| 14.446 | Cyclohexene, 1,5,5-trimethyl-6-acetylmethyl- (\*) | 180.2 | C12H20O | 0.32 | 81.45 |
| 14.57 | 1,1'-Bicyclohexyl, 2-(1-methylethyl)-, trans- | 208.2 | C15H28 | 0.36 | 80.84 |
| 16.042 | 2,4a,8,8-Tetramethyldecahydrocyclopropa[d]naphthalene (\*) | 206.2 | C15H26 | 1.27 | 81.24 |
| 16.672 | 2,5,5,8a-Tetramethyl-4-methylene-4a,5,6,7,8,8a-hexahydro-4H-chromene (\*) | 206.2 | C14H22O | 0.57 | 83.98 |
| 21.497 | Tetradecane, 2,6,10-trimethyl- | 240.3 | C17H36 | 1.32 | 80.16 |
| 22.862 | tert-Hexadecanethiol | 258.2 | C16H34S | 0.23 | 82.78 |
| 22.916 | Octadecane | 254.3 | C18H38 | 0.87 | 93.93 |
| 24.263 | Nonadecane | 268.3 | C19H40 | 2.58 | 96.06 |
| 25.052 | Estra-1,3,5(10)-trien-17.beta.-ol | 256.2 | C18H24O | 0.91 | 80.13 |
| 25.147 | Phthalic acid, butyl dodecyl ester | 390.3 | C24H38O4 | 1.31 | 91.43 |
| 25.557 | Eicosane | 282.3 | C20H42 | 3.98 | 97.19 |
| 26.127 | 1-Heptatriacotanol (\*) | 536.6 | C37H76O | 1.65 | 85.18 |
| 26.328 | E,E,Z-1,3,12-Nonadecatriene-5,14-diol (\*) | 294.3 | C19H34O2 | 8.67 | 81.99 |
| 26.72 | Octadecane, 1-chloro- | 288.3 | C18H37Cl | 0.57 | 81.88 |
| 26.785 | Heneicosane | 296.3 | C21H44 | 5.9 | 95.82 |
|  |  |  |  |  |  |
| 27.895 | 7-Methyl-Z-tetradecen-1-ol acetate (\*) | 268.2 | C17H32O2 | 0.32 | 82.19 |
| 27.961 | Docosane | 310.4 | C22H46 | 3.04 | 92.17 |
| 29.023 | Octadecanal, 2-bromo- (\*) | 346.2 | C18H35BrO | 1.73 | 82.84 |
| 30.168 | Heptacosane | 380.4 | C27H56 | 1.35 | 83.84 |
| 31.207 | Octadecane, 1-bromo- | 332.2 | C18H37Br | 1.03 | 80.77 |
| 32.922 | Tricyclo[20.8.0.0(7,16)]triacontane, 1(22),7(16)-diepoxy- (\*) | 444.4 | C30H52O2 | 5.24 | 82.3 |
| 38.33 | 12-Methyl-E,E-2,13-octadecadien-1-ol | 280.3 | C19H36O | 5.51 | 81.19 |
| 42.751 | 1-Dodecanol, 2-octyl- | 298.3 | C20H42O | 3.68 | 81.96 |
| 44.544 | Z,E-2,13-Octadecadien-1-ol | 266.3 | C18H34O | 0.24 | 81.79 |
| 46.74 | 2-Dodecen-1-yl(-)succinic anhydride (\*) | 266.2 | C16H26O3 | 1.37 | 81.94 |

Note:
1. (\*) represents the compound that was also detected in the effluent of R1.
2. Samples were collected at the end of the experiment.

**Table S3 Composition of the microbial community in the SBR biomass samples on day 120 obtained from 16S rDNA clone library.**

|  |  |  |  |
| --- | --- | --- | --- |
| Phylum | Class | R1-granules(% of total clones) | R2-granules(% of total clones) |
| Proteobacteria | Betaproteobacteria | 76.2 | 74.3 |
| Alphaproteobacteria | 2.8 | 3.9 |
| Gammaproteobacteria | 2.7 | 3.6 |
| Deltaproteobacteria | 0.3 | 0.5 |
| Bacteroidetes | Sphingobacteria | 5.0 | 3.4 |
| Cytophagia | 3.6 | 4.8 |
| Flavobacteria | 2.8 | 2.2 |
| Nitrospirae | Nitrospira | 1.1 | 1.4 |
| Planctomycetes | BD7-11 | 0.2 | 0.3 |
| Chlorobi | Chlorobia | 0.3 | 0.3 |
| Chloroflexi | Anaerolineae | 0.3 | 0.9 |
| Verrucomicrobia | Opitutae | 0.1 | 0.5 |
| Spirochaetes | unidentified\_Spirochaetes | 0.1 | 0.1 |
| Acidobacteria | Acidimicrobia | 0.1 | 0.1 |
| Firmicutes | Bacilli | 0.1 | 0.1 |
| Unclassified |  | 4.3 | 3.9 |