Table 1. Bioactive secondary metabolites obtained from *Bacillus velezensis* 33RBusing LC-MS/MS analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Compound** | **Formula** | **Molecular weight** | **RT [min]** | **References** |
| Phloroglucinol | C6H6O3 | 126.032 | 1.186 | (Decosterd et al. 1991) |
| Citric acid | C6H8O7 | 192.027 | 1.204 | (Hassan et al. 2015) |
| Uridine | C9H12N2O6 | 244.07 | 1.229 | (Shamsuddin et al. 2021) |
| DL-Malic acid | C4H6O5 | 134.022 | 1.245 | (Hassan et al. 2015) |
| Fumaric acid | C4H4O4 | 116.011 | 1.25 | (He et al. 2011) |
| Malonic acid | C3H4O4 | 104.011 | 1.25 | (Kuwaki et al. 2002) |
| L-(+)-Aspartic acid | C4H7NO4 | 133.037 | 1.251 | (Aiyelabola et al. 2016) |
| Phosphoric acid | H3PO4  | 97.9769 | 1.255 | (Thao and Yamakawa 2009) |
| Succinic acid | C4H6O4 | 118.027 | 1.379 | (Kumar et al. 2018) |
| L-Glutamic acid | C5H9NO4 | 147.053 | 1.392 | (Jastrzębowska and Gabriel 2015) |
| L-(+)-glutamine | C5H10N2O3 | 146.069 | 1.397 | (Jastrzębowska and Gabriel 2015) |
| Pantothenic acid | C9H17NO5 | 219.111 | 1.405 | (Dietl et al. 2018) |
| Mevalonic acid | C6H12O4 | 148.074 | 1.445 | (CP et al. 1957) |
| Isobutyric acid | C4H8O2 | 88.0524 | 1.611 | (Ezoubeiri et al. 2005) |
| L-(+)-Lysine | C6H1N2O2 | 146.106 | 1.85 | (Zhao et al. 2016) |
| Levulinic acid | C5H8O3 | 116.047 | 1.913 |  (Zhao et al. 2014) |
| Valeric acid | C5H10O2 | 102.068 | 2.084 | (Park et al. 1986) |
| 3,4-Dimethylbenzoic acid | C9H10O2 | 150.068 | 8.637 | (Peixoto et al. 2017) |
| Heptanoic acid | C7H14O2 | 130.1 | 9.459 | (Gershon and Shanks 1978) |
| Caprylic acid | C8H16O2 | 144.115 | 10.558 |  (Akula et al. 2021) |
| Nonanoic acid | C9H18O2 | 158.131 | 11.723 | (Jang et al. 2012) |
| Decanoic acid | C10H20O2 | 172.146 | 12.354 | (Kumar et al. 2011) |
| Prostaglandin G2 | C20H32O6 | 368.22 | 13.318 | (Liu et al. 2016) |
| Zinniol | C15H22O4 | 266.155 | 13.547 | (Moreno-Escobar et al. 2005) |
| Lauric acid | C12H24O2 | 200.178 | 13.627 | (Akula et al. 2021) |
| Pentadecanoic acid | C15H30O2 | 242.225 | 14.216 | (Agoramoorthy et al. 2007) |
| myristic acid | C14H28O2 | 228.209 | 14.274 | (Prasath et al. 2021) |
| Linoleic acid | C18H32O2 | 280.241 | 14.584 | (Walters et al. 2004) |
| Stearic acid | C18H36O2 | 284.271 | 14.859 | (Karimi et al. 2015) |
| Oleic acid | C18H34O2 | 282.256 | 14.913 | Walters et al., 2004 |
| L-(+)-Tartaric acid | C4H6O6 | 150.017 | 15.364 | (el Baaboua et al. 2018) |
| Arachidic acid | C20H40O2 | 312.303 | 15.711 | (Ells et al. 2008) |
| Erucic acid | C22H42O2 | 338.319 | 15.81 | (Sama et al. 2021) |

Table 2. Bioactive secondary metabolites extracted from *A. niger* 46SF using LC-MS/MS analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Compound** | **Formula** | **Molecular Weight** | **RT [min]** | **References** |
| Fumaric acid | C4H4O4 | 116.011 | 1.147 | (He et al. 2011) |
| Malic acid | C4H6O5 | 134.0217 | 1.152 | (Hassan et al. 2012) |
| Oxalic acid | C2H2O4 | 89.99537 | 1.216 | (Hassan et al. 2012) |
| Gluconic acid | C6H12O7 | 136.0373 | 1.295 | (Kaur et al. 2006) |
| Galacturonic acid | C6H10O7 | 194.0427 | 1.309 | (Ansari et al. 2019) |
| Quinic acid | C7H12O6 | 132.0424 | 1.31 | (Lu et al. 2021) |
| Itaconic acid | C5H6O4 | 130.0268 | 1.319 | (Cordes et al. 2015) |
| Pseudouridine | C9H12N2O6 | 244.0697 | 1.332 | (Pickerill et al. 2019) |
| DL-Malic acid | C4H6O5 | 134.0216 | 1.368 |  (Hassan et al. 2015) |
| Phosphoric acid | H3PO4 | 97.97696 | 1.42 |  (Thao and Yamakawa 2009) |
| Ascorbic acid | C6H8O6 | 116.0111 | 1.423 | (Wang et al. 2009) |
| Citric acid | C6H8O7 | 192.0271 | 1.472 |  (Hassan et al. 2015) |
| Succinic acid | C4H6O4 | 118.0267 | 1.515 | (Kumar et al. 2018) |
| Phloroglucinol | C6H6O3 | 126.0318 | 1.528 |  (Decosterd et al. 1991) |
| Chorismic acid | C10H10O6 | 226.0483 | 1.54 | (Perez et al. 2015) |
| Propionic acid | C3H6O2 | 74.03686 | 1.595 | (Yun and Lee 2016) |
| Levulinic acid | C5H8O3 | 116.0474 | 1.949 |  (Zhao et al. 2014) |
| Mevalonic acid | C6H12O4 | 148.0737 | 2.085 |  (CP et al. 1957) |
| Pantothenic acid | C9H17NO5 | 219.1109 | 2.328 |  (Dietl et al. 2018) |
| 2-Anisic acid | C8H8O3 | 152.0475 | 2.44 | (Wang et al. 2018) |
| Caffeic acid | C9H8O4 | 180.0425 | 3.993 | (Sardi et al. 2016) |
| Azelaic acid | C9H16O4 | 188.105 | 4.263 | (Brasch and Christophers 1993) |
| Valeric acid | C5H10O2 | 102.0682 | 4.664 |  (Park et al. 1986) |
| Riboflavin | C17H20N4O6 | 376.1385 | 8.26 | (Bilgihan et al. 2016) |
| Prostaglandin G2 | C20H32O6 | 368.2202 | 9.182 |  (Liu et al. 2016) |
| Caprylic acid | C8H16O2 | 144.1152 | 11.128 |  (Akula et al. 2021) |
| Nonanoic acid | C9H18O2 | 158.1307 | 11.989 |  (Jang et al. 2012) |
| Decanoic acid | C10H20O2 | 172.1465 | 12.291 |  (Kumar et al. 2011) |
| Tartaric acid | C4H6O6 | 150.017 | 13.816 |  (el Baaboua et al. 2018) |
| myristic acid | C14H28O2 | 228.2091 | 14.223 |  Prasath et al ., 2021 |
| 7-Methylxanthine | C6H6N4O2 | 166.0483 | 14.28 | (Tsirilakis et al. 2012) |
| Pentadecanoic acid | C15H30O2 | 242.2249 | 14.486 |  (Agoramoorthy et al. 2007) |
| Linoleic acid | C18H32O2 | 280.2405 | 14.543 | (Walters et al. 2004) |
| Ethyl myristate | C16H32O2 | 256.2403 | 14.733 | (Nurmala et al. 2018) |
| Stearic acid | C18H36O2 | 284.2717 | 14.784 | (Karimi et al. 2015) |
| Oleic acid | C18H34O2 | 282.2562 | 14.85 | (Walters et al. 2004) |



Fig.1. KEGG Pathway of different metabolites produced by *B. velenzensis and A. niger.* (A&B) KEGG Meta negative and positive Annotation of *B. velenzensis*. (C&D) KEGG Meta negative and positive Annotation of *A. niger.*



Fig. 2. Lipid maps analysis of bioactive metabolites of *B. velenzensis* and *A. niger* by negative and positive annotation. (A&B) Lipid maps of Meta negative and positive Annotation of *B. velenzensis*. (C&D) Lipid maps of Meta negative and positive Annotation of *A. niger*.

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