## Drought tolerant wheat varieties enrich seed microbiomes for beneficial microbes under drought conditions

Holly Hone\*1, Ross Mann1, Guodong Yang1,3, Jatinder Kaur1, Ian Tannenbaum1,2, Tongda Li1,2, German Spangenberg1,2 and Timothy Sawbridge1,2

1Agriculture Victoria, AgriBio, Centre for AgriBioscience, Bundoora, VIC, Australia.

2School of Applied Systems Biology, La Trobe University, Bundoora, VIC, Australia.

3College of Animal Science and Technology, Henan University of Science and Technology, Luoyang, Henan, People's Republic of China

Supplementary Figure 1 – Curtobacterium MALDI tree

A close up of text on a white background

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Supplementary Figure 2 – Arthrobacter MALDI tree

A close up of text on a white background

Description automatically generated

Supplementary Table 1. Microbial isolates from Line 3 and Line 4

|  |  |  |
| --- | --- | --- |
|  | Line 3 | Line 4 |
| Arthrobacter | 0 | 49 |
| Clavibacter | 0 | 0 |
| Curtobacterium | 49 | 0 |
| Erwinia | 0 | 0 |
| Rathayibacter | 0 | 0 |
| Paenibacillus | 0 | 0 |
| Pantoea | 0 | 0 |
| Pseudomonas | 0 | 0 |
| No identification | 2 | 7 |
| Total | 51 | 56 |

Supplementary Table 2. ANOVA analysis identified the 60 most significant OTUs when comparing microbiomes under drought conditions and microbiomes under rainfed conditions.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| OTU number. | OTU ID | Genera | P-value | BH Q-value |
| 1 | 9af3467db68cf6063627304cecd46a65 | Pseudomonas\* | 9.04E-18 | 2.30E-13 |
| 2 | 7ff346973a282aa55de296afdb5d74af | Unknown | 2.11E-15 | 2.69E-11 |
| 3 | 945f562bda86790338922e12f9854407 | Flavobacterium | 7.74E-13 | 6.57E-09 |
| 4 | 8735f92a7f18db944bc86277fbd3222 | Unknown | 1.72E-12 | 1.10E-08 |
| 5 | fcd80f0cf279eff3c50b66a78d98beeb | Amycolatopsis | 2.99E-12 | 1.52E-08 |
| 6 | 8599524cec26e00cc7df72e7ecc01220 | Unknown | 1.57E-11 | 6.64E-08 |
| 7 | d829bee4984f82ffc2453212157caf96 | Bradyrhizobium | 3.68E-11 | 1.68E-07 |
| 8 | cc761daf51f27c453da57f3f1f0ff5cc | Pantoea\* | 5.80E-11 | 1.68E-07 |
| 9 | 0a023b056a85b92a1ca8214e78a9c45a | Skermanella | 5.96E-11 | 1.89E-07 |
| 10 | 8154c989085dcab535c58fd5a7a18220 | Rubrobacter | 7.45E-11 | 1.89E-07 |
| 11 | a869b422007c6d75482b0e9e0338b95c | Unknown | 1.64E-10 | 3.79E-07 |
| 12 | 5f8db894a571d35c9d2fa4f8df8581f9 | Massilia | 2.16E-10 | 4.59E-07 |
| 13 | 5afec052157f7768bf459883f118a638 | Flavobacterium | 4.25E-10 | 8.32E-07 |
| 14 | 6abc517aa40e9e7b9c652902fe04bb1a | Unknown | 4.84E-10 | 8.80E-07 |
| 15 | 20425d99034cf4044217704b16934e27 | Noviherbaspirillum | 5.63E-10 | 9.54E-07 |
| 16 | 889f1bc31887efea2354ba099342a203 | Streptomyces | 6.36E-10 | 1.01E-06 |
| 17 | d40c63c872b5cfe4bb4caa9738d10c1f | Uncultured | 3.81E-09 | 5.49E-06 |
| 18 | 35d20da789dde8d76e4389fd6d30cc9d | Dactylosporangium | 3.10E-09 | 5.49E-06 |
| 19 | 09f944acc15518b31e5803e1e4cb4e43 | Duganella | 4.35E-09 | 5.49E-06 |
| 20 | 432b565bc288a18487cfa84b311b7469 | Unknown | 4.47E-09 | 5.49E-06 |
| 21 | 205e9006842d47d1a2d1caf6a96e0c88 | Microvirga | 4.53E-09 | 5.49E-06 |
| 22 | f6c528c217081be9871de0fc58b89408 | Variovorax | 5.66E-09 | 6.54E-06 |
| 23 | 6e4b50a611f333bfb12f3b9a4a9e8b61 | Uncultured | 1.09E-08 | 1.20E-05 |
| 24 | f37fc1dccfeba0004cbeb4f1ad6083c6 | Duganella | 1.68E-08 | 1.78E-05 |
| 25 | 120eba657e42a11a5c29f97b90f02035 | Streptomyces | 2.13E-08 | 2.17E-05 |
| 26 | 3a66a38841ba6877568198b9dac3a1dc | Lysobacter | 2.34E-08 | 2.29E-05 |
| 27 | ef0c7928901deab56b8d8abef337ac5c | Rubrobacter | 2.95E-08 | 2.78E-05 |
| 28 | cc34ab07649c94630cbc697762ac4b32 | Candidatus | 4.14E-08 | 3.76E-05 |
| 29 | 79029fa983ec4eda60117a273a52cfc0 | Caulobacter | 4.47E-08 | 3.92E-05 |
| 30 | 0f8ac0d81dd6449a43b34fcb184efd8f | Candidatus | 4.86E-08 | 4.12E-05 |
| 31 | cb5b9907447a49154182dee3ea78d16e | Acidibacter | 5.96E-08 | 4.89E-05 |
| 32 | 0f18144d308ada95632ab5193d92073f | Pseudomonas\* | 6.77E-08 | 5.38E-05 |
| 33 | bf321c05d79f766c0099afb9ecc42f52 | Streptomyces | 1.21E-07 | 9.32E-05 |
| 34 | b712f6d712748de96eb148834a623ba1 | Geodermatophilus | 1.91E-07 | 1.43E-04 |
| 35 | a285136eb52ed887013aaa7917ce5051 | RB41 | 3.79E-07 | 2.75E-04 |
| 36 | bc3676c17839094c4fa8e33268905268 | Candidatus | 4.40E-07 | 3.11E-04 |
| 37 | e08272633711f2ea424a3232ed337e8 | Unknown | 1.38E-06 | 9.45E-04 |
| 38 | 1d145835e7f0188562322f4eefb02657 | Uncultured | 1.72E-06 | 1.15E-03 |
| 39 | bc23d6db3bfb2c79f5eb1cec8f01f841 | Uncultured | 1.86E-06 | 1.21E-03 |
| 40 | 6e1575cfc367c39ec52c4d1e699a1fb2 | Cellvibrio | 2.14E-06 | 1.21E-03 |
| 41 | 132ffe9a542685a423a59236950b46b0 | Unknown | 2.27E-06 | 1.36E-03 |
| 42 | bb740c10ad31d5779e628bccffdb5015 | Skermanella | 2.30E-06 | 1.40E-03 |
| 43 | e8246466fe381d8a8d5c10cb90640eb3 | Sorangium | 2.49E-06 | 1.48E-03 |
| 44 | 9b4be26e7bb3a23d25e080a3bba619f6 | Arthrobacter\* | 2.72E-06 | 1.57E-03 |
| 45 | d5620170bb86a5572c5c1b92cd915f05 | Uncultured | 2.93E-06 | 1.66E-03 |
| 46 | 00337a2c0aa8af2c100ebca3424b94a1 | Uncultured | 4.37E-06 | 2.42E-03 |
| 47 | a08ee4a8aa1ece798d78fae2b9ad0401 | Uncultured | 5.24E-06 | 2.83E-03 |
| 48 | 278a455d0edc27f3fcfb16ad5243ce26 | Unknown | 5.62E-06 | 2.98E-03 |
| 49 | b8c4ed03d7d91546b9fad80b80135a3 | Blastococcus | 6.64E-06 | 3.45E-03 |
| 50 | 44e2ab81e5e7cff6d965651c707b9479 | Uncultured | 7.92E-06 | 4.03E-03 |
| 51 | caa68010e3e574c4f1069b0ea4e6437e | Blyi10 | 8.72E-06 | 4.31E-03 |
| 52 | fbcfe878584c87b171eafb171b8a0fef | Rubrobacter | 8.83E-06 | 4.31E-03 |
| 53 | 1c2b8892a0d7f828d72808cd01cfd199 | Devosia | 8.98E-06 | 4.31E-03 |
| 54 | 8177ba9a29c738a90c530f54f4561cb1 | Unknown | 9.37E-06 | 4.41E-03 |
| 55 | 0fa9b44d52836d2f173f4ac532f8a013 | Skermanella | 1.03E-05 | 4.75E-03 |
| 56 | a9164d01308501b57afa0625a15b0f | Allorhizobium | 1.36E-05 | 6.16E-03 |
| 57 | d99a0b2472cd7caecdd8d63ac9cb3fdf | Rubrobacter | 1.38E-05 | 6.16E-03 |
| 58 | 26005dfb7ad2e8cdbb139846af329663 | Bacillus | 1.41E-05 | 6.19E-03 |
| 59 | c222885a993cabb139b7d8744e6ff7fc | Labrys | 1.50E-05 | 6.39E-03 |
| 60 | ef98cc2984cd3ce0ca6a46589a6df194 | Unknown | 1.51E-05 | 6.39E-03 |

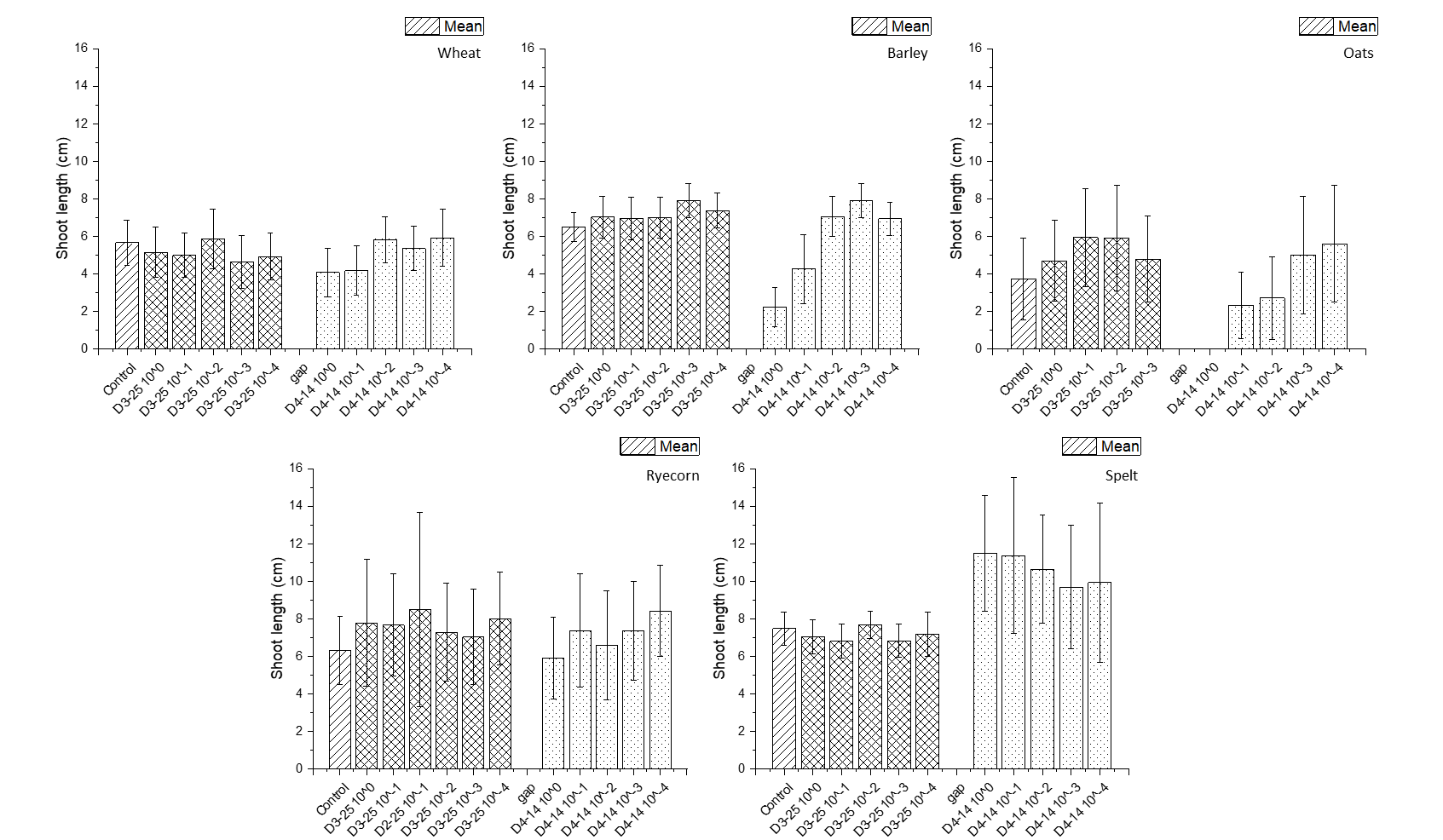
\*genus was isolated from wheat seeds

Supplementary Table 3 – ANOVA analysis identified the 60 most significant OTUs when comparing microbiomes of drought tolerant lines and microbiomes of drought susceptible lines.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| OTU number. | OTU ID | Genera | P-value | BH Q-value |
| 1 | 2e94aaded5896273b56726409d750804 | Unknown | 1.50E-11 | 3.81E-07 |
| 2 | 9c262c0fed9522982fd2297202ee5a83 | Uncultured | 4.61E-10 | 5.86E-06 |
| 3 | aebd4d0ae6384594a5882a958796ded | Uncultured | 5.09E-08 | 0.0004317 |
| 4 | f1be300df01babcf1897e6103507179f | Uncultured | 1.08E-07 | 0.0006843 |
| 5 | 8b49e37e3c87b34b3cf8fa98e87b9e56 | Unknown | 6.76E-07 | 0.003438 |
| 6 | d2e8afc64cc3c6dde961a4db0a44d26e | Gemmatimonas | 8.68E-07 | 0.00368 |
| 7 | 111e8e48a5111d4360329eef12acd3b7 | Uncultured | 1.87E-06 | 0.006801 |
| 8 | ce7ee6ce5f9dd8b3191a0fecd7745de4 | Unknown | 2.14E-06 | 0.006805 |
| 9 | d6bda8545c415bbc3cffa95f43e51e5f | Uncultured | 5.41E-06 | 0.01529 |
| 10 | cc2a396f24d8239e540d765b422b04eb | Uncultured | 6.29E-06 | 0.01599 |
| 11 | 568bee5fcaa9b6912463e88ef964f3e9 | Uncultured | 7.11E-06 | 0.01644 |
| 12 | 8795f8559d860648a3ccc7fe26f49283 | Uncultured | 8.89E-06 | 0.01885 |
| 13 | 320fc5aa1aec10458407aedf8f39698f | Unknown | 9.73E-06 | 0.01904 |
| 14 | 02b19fa4ce6a9bd677693ab7e4fceea7 | Uncultured | 1.20E-05 | 0.02174 |
| 15 | d9fe8350aa00c86b865d2f3e18ab18cd | Unknown | 1.59E-05 | 0.02693 |
| 16 | 1c29266ba1c7bc49e8c16e1d5b773041 | Uncultured | 2.96E-05 | 0.04697 |
| 17 | a86ecef5ef052958cda9d725ee257cae | Gemmatimonas | 3.56E-05 | 0.05243 |
| 18 | 3e12c438e2563f99c446b789e0d13525 | Gemmatirosa | 3.71E-05 | 0.05243 |
| 19 | d1a113d32ccfe6f0c510a20b40a45d91 | Gemmatimonas | 4.02E-05 | 0.05377 |
| 20 | 7177a92fed62adf72cc159802ac88113 | Gemmatirosa | 5.70E-05 | 0.07248 |
| 21 | 07f7a53f8a49890a6938be8e5f997f42 | Gemmatimonas | 6.01E-05 | 0.07283 |
| 22 | 81cf26ae410f4dc2c3782b60aeda6bad | Uncultured | 8.38E-05 | 0.09685 |
| 23 | 097ced6193211c4c49697375f9c0b5e5 | Uncultured | 9.62E-05 | 0.1063 |
| 24 | 3576c76306e73ff487d82960da64c73d | Uncultured | 1.09E-04 | 0.116 |
| 25 | 71864b88007f7d9b132ea92e97e7a090 | Uncultured | 2.97E-04 | 0.3025 |
| 26 | 710cbf014a0c8791cfc0c6262e928b04 | Unknown | 3.62E-04 | 0.3544 |
| 27 | 56841717d2ee29838c93a714e6967889 | Uncultured | 4.00E-04 | 0.3771 |
| 28 | c8e6b05e1033d85877e0b41d1a575b9c | Gemmatimonas | 4.64E-04 | 0.4211 |
| 29 | f34b8c1235d47d75f97eb9680f0a5e4c | Unknown | 5.34E-04 | 0.468 |
| 30 | 1e542d2112237ddb072880742ade6180 | Gemmata | 5.57E-04 | 0.4725 |
| 31 | eeb52cc84b4e2c5cea79df01c6787481 | Jahnella | 6.00E-04 | 0.4923 |
| 32 | 6d987a16ec34bb6be3b91dc00febd060 | Ellin6055 | 7.09E-04 | 0.5411 |
| 33 | 13bb87c1dcac1cb19f6d9a1d2eee1518 | Unknown | 7.54E-04 | 0.5411 |
| 34 | 77a6d64e7b0ba0a9207d305cbd46dc5e | Uncultured | 8.25E-04 | 0.5411 |
| 35 | 314d1f2b81ed24b612e719d7b6669170 | Uncultured | 1.09E-03 | 0.5411 |
| 36 | 920a901a455687d1c52d3db8a988a8da3 | Uncultured | 1.23E-03 | 0.5411 |
| 37 | f42b602657b3a6357196f2bbfae84ea4 | Uncultured | 1.30E-03 | 0.5411 |
| 38 | 75f0d252adb751ac1592928a7d45d070 | Unknown | 1.42E-03 | 0.5411 |
| 39 | f85631d4c3ad28c56dbfd5389ae3d656 | Unknown | 1.45E-03 | 0.5411 |
| 40 | ab3abeeb031bdd59155c64c511597f76 | Unknown | 1.54E-03 | 0.5411 |
| 41 | 8bffc39805f7a62a7b6f44ed0857f583 | Gemmatirosa | 1.57E-03 | 0.5411 |
| 42 | 8ce415fd299c36132bf28fce66958a18 | Unknown | 1.61E-03 | 0.5411 |
| 43 | 3d254eae6330c3af118ad55d15587525 | SH-PL14 | 1.71E-03 | 0.5411 |
| 44 | 8076cdbe1ee2b24b7c678c67b3ff8c5f | Uncultured | 1.77E-03 | 0.5411 |
| 45 | 02db0dd35b045af9590bd3f21b7dc533 | Gemmatirosa | 1.83E-03 | 0.5411 |
| 46 | 81add03374eb9a0ac1ac216c305e3fef | Unknown | 1.98E-03 | 0.5411 |
| 47 | 2cdb2f0813b89875f92c58e216b6a3d2 | Uncultured | 2.10E-03 | 0.5411 |
| 48 | 71939f43e866e0c70c95d653f060abef | Uncultured | 2.32E-03 | 0.5411 |
| 49 | 6643beaeb166111252c7c651d7224f58 | Blastocatella | 2.48E-03 | 0.5411 |
| 50 | 895f12b52aba800883fb938fa3bdcd3 | Unknown | 2.53E-03 | 0.5411 |
| 51 | 8cdb149aee5a869c9e7a68b271f0a6cf | Litorilinea | 2.64E-03 | 0.5411 |
| 52 | c1427c78632ef67b22025f95e7c34dd7 | Gemmatirosa | 2.68E-03 | 0.5411 |
| 53 | ba7b222723a8230a615cab9eff291e99 | Uncultured | 2.96E-03 | 0.5411 |
| 54 | 222415525d7e7a1e93033daceb032922 | Chtoniobacter | 2.99E-01 | 0.5411 |
| 55 | e5b8aa4e9ca9b255a6e1e7ea5f0c576e | Uncultured | 3.10E-03 | 0.5411 |
| 56 | edd59c94a0cb54b3e84c87f42f0e8a6a | Uncultured | 3.21E-03 | 0.5411 |
| 57 | a53e67cee42c20eed1034edf03df170f | Mucilaginibacter | 3.25E-03 | 0.5411 |
| 58 | 497a26126c9e726c768bdec79e8c4e9b | Curtobacterium\* | 3.29E-03 | 0.5411 |
| 59 | 30242ff322d5761fc7c180f70f895606 | Uncultured | 3.37E-03 | 0.5411 |
| 60 | 5fb8051249a15e13713bc46335d32c25 | Unknown | 3.39E-03 | 0.5411 |

\*genus was isolated from wheat seeds

Supplementary Figure 3 - Shoot lengths of evaluation of microbiome bacteria for biostimulation of Triciticeae



Root length (cm) of wheat, barley, oat, ryecorn and spelt seedlings seedlings inoculated with different concentrations (100, 10-1, 10-2, 10-3 and 10-4) of CF D3-25 or Ar. sp D4-14. Stars indicate inoculum concentrations that had significantly longer roots.