CHAPTER 6

REFERENCES


# APPENDIX 1

Table A1. Probabilities of pair-wise differences between various fungal isolates and wheat and barley for percentage root growth.

| Isolate<sup>a</sup> | I1-C1 | I1-C2 | I2-C1 | I2-C2 | I3-C1 | I3-C2 | I4-C1 | I4-C2 | I5-C1 | I5-C2 | I6-C1 | I6-C2 | I7-C1 | I7-C2 | I8-C1 | I8-C2 | I9-C1 | I9-C2 | I10-C1 | I10-C2 | I11-C1 | I11-C2 |
|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| I1-C1               |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| I1-C2               | 0.000*|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| I2-C1               | 0.000*| 0.574 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| I2-C2               | 0.000*| 0.364 | 0.781 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| I3-C1               | 0.842 | 0.000*| 0.000*| 0.000*|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| I3-C2               | 0.004 | 0.200 | 0.137 | 0.087 | 0.042 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| I4-C1               | 0.000*| 0.313 | 0.517 | 0.636 | 0.001 | 0.101 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| I4-C2               | 0.000*| 0.000*| 0.001 | 0.002 | 0.000*| 0.000*| 0.000*| 0.067 | 0.042 |       |       |       |       |       |       |       |       |       |       |       |       |
| I5-C1               | 0.000*| 0.241 | 0.166 | 0.094 | 0.004 | 0.668 | 0.131 | 0.000*|       |       |       |       |       |       |       |       |       |       |       |       |       |
| I5-C2               | 0.000*| 0.035 | 0.243 | 0.382 | 0.000*| 0.014 | 0.957 | 0.008 | 0.007 |       |       |       |       |       |       |       |       |       |       |       |       |
| I6-C1               | 0.003 | 0.000*| 0.000*| 0.000*| 0.045 | 0.000*| 0.000*| 0.000*| 0.000*| 0.000*|       |       |       |       |       |       |       |       |       |       |       |
| I6-C2               | 0.026 | 0.000*| 0.001 | 0.000*| 0.228 | 0.220 | 0.006 | 0.000*| 0.017 | 0.000*| 0.000*|       |       |       |       |       |       |       |       |       |       |
| I7-C1               | 0.000*| 0.332 | 0.832 | 0.801 | 0.000*| 0.089 | 0.800 | 0.008 | 0.108 | 0.659 | 0.000*| 0.001 |       |       |       |       |       |       |       |       |
| I7-C2               | 0.000*| 0.003 | 0.025 | 0.044 | 0.000*| 0.001 | 0.321 | 0.156 | 0.001 | 0.167 | 0.000*| 0.000*| 0.127 |       |       |       |       |       |       |
| I8-C1               | 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.012 | 0.802 | 0.000*| 0.000*| 0.000*| 0.000*| 0.063 |       |       |       |       |       |       |       |
| I8-C2               | 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*|
| I9-C1               | 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*|
| I9-C2               | 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*| 0.000*|
| I10-C1              | 0.264 | 0.054 | 0.038 | 0.025 | 0.411 | 0.400 | 0.032 | 0.000*| 0.205 | 0.005 | 0.014 | 0.952 | 0.026 | 0.001 | 0.000*| 0.000*| 0.000*| 0.000*| 0.394 | 0.601 |       |
| I10-C2              | 0.066 | 0.056 | 0.025 | 0.038 | 0.000*| 0.002 | 0.206 | 0.410 | 0.002 | 0.114 | 0.000*| 0.000*| 0.087 | 0.640 | 0.397 | 0.798 | 0.674 | 0.428 | 0.000*| 0.236 | 0.061 |

<sup>a</sup><sup></sup>Isolate<sup>a</sup> = Bipolaris sorokiniana, I2 = Fusarium equiseti, I3 = F. chlamydosporum, I4 = F. solani, I5 = F. oxysporum, I6 = F. nygamai, I7 = F. subglutinans, I8 = Phoma medicaginis, I9 = Periconia macrospinosa, I10 = Rhizoctonia solani, I11 = Sclerotium rolfsii.

<sup>b</sup><sup></sup>Crop<sup>b</sup> = wheat, C2 = barley

*P=0.000 = P<0.0001
Table A2. Probabilities of pair-wise differences between various fungal isolates and wheat and barley for percentage shoot growth.

| Isolate* | I1-C1 | I1-C2 | I2-C1 | I2-C2 | I3-C1 | I3-C2 | I4-C1 | I4-C2 | I5-C1 | I5-C2 | I6-C1 | I6-C2 | I7-C1 | I7-C2 | I8-C1 | I8-C2 | I9-C1 | I9-C2 | I10-C1 | I10-C2 | I11-C1 | I11-C2 |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|
| I1-C1    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |        |        |        |        |
| I1-C2    | 0.000 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |        |        |        |        |
| I2-C1    | 0.000 | 0.216 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |        |        |        |        |
| I2-C2    | 0.000 | 0.832 | 0.411 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |        |        |        |        |
| I3-C1    | 0.087 | 0.000 | 0.020 | 0.003 |       |       |       |       |       |       |       |       |       |       |       |       |       |        |        |        |        |
| I3-C2    | 0.000 | 0.734 | 0.265 | 0.663 | 0.003 |       |       |       |       |       |       |       |       |       |       |       |       |        |        |        |        |
| I4-C1    | 0.000 | 0.068 | 0.021 | 0.072 | 0.000 | 0.182 |       |       |       |       |       |       |       |       |       |       |       |        |        |        |        |
| I4-C2    | 0.000 | 0.122 | 0.040 | 0.124 | 0.000 | 0.273 | 0.836 |       |       |       |       |       |       |       |       |       |       |        |        |        |        |
| I5-C1    | 0.000 | 0.008 | 0.303 | 0.058 | 0.112 | 0.049 | 0.003 | 0.006 |       |       |       |       |       |       |       |       |       |        |        |        |        |
| I5-C2    | 0.000 | 0.502 | 0.118 | 0.484 | 0.000 | 0.912 | 0.159 | 0.254 | 0.006 |       |       |       |       |       |       |       |       |        |        |        |        |
| I6-C1    | 0.907 | 0.000 | 0.000 | 0.000 | 0.106 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |       |       |       |       |        |        |        |        |
| I6-C2    | 0.000 | 0.131 | 0.898 | 0.320 | 0.021 | 0.212 | 0.015 | 0.030 | 0.339 | 0.073 | 0.000 | 0.000 |       |       |       |       |       |        |        |        |        |
| I7-C1    | 0.000 | 0.348 | 0.193 | 0.336 | 0.001 | 0.648 | 0.335 | 0.469 | 0.012 | 0.664 | 0.000 | 0.073 |       |       |       |       |       |        |        |        |        |
| I7-C2    | 0.000 | 0.493 | 0.159 | 0.461 | 0.001 | 0.794 | 0.262 | 0.377 | 0.023 | 0.840 | 0.000 | 0.119 | 0.846 |       |       |       |       |        |        |        |        |
| I8-C1    | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.101 | 0.092 | 0.502 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.044 | 0.024 |
| I8-C2    | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.014 | 0.770 | 0.570 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.060 | 0.033 |
| I9-C1    | 0.000 | 0.001 | 0.000 | 0.006 | 0.000 | 0.078 | 0.884 | 0.902 | 0.000 | 0.029 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| I9-C2    | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.005 | 0.526 | 0.367 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| I10-C1   | 0.000 | 0.000 | 0.020 | 0.001 | 0.392 | 0.003 | 0.000 | 0.000 | 0.213 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| I10-C2   | 0.000 | 0.356 | 0.667 | 0.420 | 0.000 | 0.868 | 0.145 | 0.239 | 0.001 | 0.869 | 0.000 | 0.032 | 0.655 | 0.846 | 0.000 | 0.000 | 0.000 | 0.012 | 0.000 | 0.000 | 0.000 |
| I11-C1   | 0.624 | 0.001 | 0.012 | 0.003 | 0.521 | 0.002 | 0.000 | 0.000 | 0.054 | 0.000 | 0.604 | 0.013 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| I11-C2   | 0.000 | 0.562 | 0.641 | 0.966 | 0.038 | 0.143 | 0.208 | 0.269 | 0.629 | 0.000 | 0.580 | 0.466 | 0.588 | 0.019 | 0.025 | 0.026 | 0.081 | 0.012 | 0.072 | 0.599 | 0.019 |

*P<0.000 = P<0.0001

---


*C1 = wheat, C2 = barley*
Table A4. Probabilities of pair-wise differences between various fungal isolates and wheat and barley for percentage shoot mass.

<table>
<thead>
<tr>
<th>Isolate&lt;sup&gt;a&lt;/sup&gt;</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
<th>C2</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-C1</td>
<td>0.901</td>
<td>0.900</td>
<td>0.900</td>
<td>0.900</td>
<td>0.867</td>
<td>0.900</td>
<td>0.900</td>
<td>0.900</td>
<td>0.900</td>
<td>0.900</td>
<td>0.900</td>
<td>0.900</td>
<td>0.900</td>
<td>0.900</td>
<td>0.900</td>
<td>0.900</td>
<td>0.900</td>
<td></td>
</tr>
<tr>
<td>11-C2</td>
<td>0.006</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>12-C1</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td></td>
</tr>
<tr>
<td>12-C2</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td>0.568</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>Isolate<sup>a</sup> = Bipolaris sorokiniana, C1 = wheat, C2 = barley

---

Table A3. Probabilities of pair-wise differences between various fungal isolates and wheat and barley for percentage shoot mass.

<table>
<thead>
<tr>
<th>Isolate&lt;sup&gt;b&lt;/sup&gt;</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
<th>C2</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-C1</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>11-C2</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>12-C1</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>12-C2</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
</tbody>
</table>

<sup>b</sup>Isolate<sup>b</sup> = Bipolaris sorokiniana, C1 = wheat, C2 = barley

---

<sup>c</sup>Isolate<sup>c</sup> = Bipolaris sorokiniana, C1 = wheat, C2 = barley
Table A4. Probabilities of pair-wise differences between various fungal isolates and wheat and barley for total disease score.

| Isolate<sup>a</sup> | II-C1 | II-C2 | I2-C1 | I2-C2 | I3-C1 | I3-C2 | I4-C1 | I4-C2 | I5-C1 | I5-C2 | I6-C1 | I6-C2 | I7-C1 | I7-C2 | I8-C1 | I8-C2 | I9-C1 | I9-C2 | I10-C1 | I10-C2 | I11-C1 | I11-C2 |
|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| - Crop<sup>b</sup>  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| II-C1               | 0.000* |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| II-C2               | 0.000* |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| I2-C1               | 0.000* | 0.856 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| I2-C2               | 0.000* | 0.114 | 0.157 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| I3-C1               | 0.361 | 0.000* | 0.000* | 0.000* |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| I3-C2               | 0.000* | 0.449 | 0.436 | 0.707 | 0.000* |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| I4-C1               | 0.000* | 0.334 | 0.324 | 0.926 | 0.000* | 0.727 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| I4-C2               | 0.000* | 0.000* | 0.000* | 0.001 | 0.000* | 0.001 | 0.014 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| I5-C1               | 0.000* | 0.012 | 0.070 | 0.001 | 0.006 | 0.024 | 0.035 | 0.000* |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| I5-C2               | 0.000* | 0.007 | 0.026 | 0.457 | 0.000* | 0.325 | 0.717 | 0.005 | 0.000* |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| I6-C1               | 0.251 | 0.000* | 0.000* | 0.124 | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* |       |       |       |       |       |       |       |       |       |       |
| I6-C2               | 0.229 | 0.434 | 0.023 | 0.000* | 0.152 | 0.138 | 0.000* | 0.275 | 0.001 | 0.000* |       |       |       |       |       |       |       |       |       |       |       |
| I7-C1               | 0.000* | 0.692 | 0.643 | 0.490 | 0.000* | 0.784 | 0.567 | 0.001 | 0.054 | 0.190 | 0.000* | 0.268 |       |       |       |       |       |       |       |       |       |       |
| I7-C2               | 0.000* | 0.025 | 0.038 | 0.354 | 0.000* | 0.259 | 0.567 | 0.023 | 0.000* | 0.716 | 0.000* | 0.006 | 0.161 |       |       |       |       |       |       |       |       |       |
| I8-C1               | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.001 | 0.031 | 0.262 | 0.000* | 0.001 | 0.000* | 0.000* | 0.000* | 0.000* | 0.044 |       |       |       |       |       |       |
| I8-C2               | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* |       |
| I9-C1               | 0.000* | 0.144 | 0.198 | 0.838 | 0.000* | 0.822 | 0.827 | 0.001 | 0.001 | 0.315 | 0.000* | 0.228 | 0.581 | 0.261 | 0.000* | 0.000* |       |       |       |       |       |
| I9-C2               | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.245 | 0.703 | 0.000* |       |
| I10-C1              | 0.022 | 0.000* | 0.000* | 0.000* | 0.485 | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* |       |
| I10-C2              | 0.000* | 0.025 | 0.171 | 0.002 | 0.000* | 0.055 | 0.069 | 0.000* | 0.441 | 0.000* | 0.000* | 0.610 | 0.118 | 0.001 | 0.000* | 0.000* | 0.000* | 0.002 | 0.000* | 0.000* |       |
| I11-C1              | 0.568 | 0.000* | 0.000* | 0.000* | 0.295 | 0.000* | 0.000* | 0.000* | 0.001 | 0.000* | 0.991 | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.000* | 0.082 | 0.000* |       |
| I11-C2              | 0.006 | 0.149 | 0.213 | 0.033 | 0.081 | 0.091 | 0.078 | 0.000* | 0.871 | 0.008 | 0.002 | 0.428 | 0.143 | 0.009 | 0.000* | 0.000* | 0.000* | 0.004 | 0.000* | 0.126 | 0.570 | 0.016 |       |

<sup>a</sup>II = Bipolaris sorokiniana, I2 = Fusarium equisetii, I3 = F. chlamydosporum, I4 = F. solani, I5 = F. oxysporum, I6 = F. nygamai, I7 = F. subglutinans, I8 = Phoma medicaginis, I9 = Periconia macrospinosa, I10 = Rhizoctonia solani, I11 = Sclerotium rolfsii.

<sup>b</sup>C1 = wheat, C2 = barley

*P=0.000 = P<0.0001