Field hybridisation is rare between two forms of *Pyrenophora teres*

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**Pyrenophora teres**

- *Pyrenophora teres* is a foliar pathogen of barley

- *Pyrenophora teres f. teres*

- *Pyrenophora teres f. maculata*

- Causes barley yield losses of 10-40% and annual production loss of AUD $62 million

- Stubble borne pathogens that co-exist in the same field

- Both forms have asexual and sexual reproduction
Sexual Reproduction

- Heterothallic in nature \((MAT\ 1-1\ and\ MAT1-2)\)

- Reproduction within forms occurs frequently

- Reproduction between forms of \(P.\ teres\) is inducible in the laboratory

- Artificially produced form \(teres\ x\ maculata\) hybrids could be highly virulent

- To date four hybrids have been identified in the field; one recently in Australia (McLean et al., 2014).

Objectives of the study

1. Molecular characterisation of *P. teres* collected from barley growing regions to determine if hybrids were missed due to lesion resemblance with their parents.

2. Investigate occurrence of hybrids in the field experiments designed to facilitate hybridisation
Molecular characterisation of Australian *P. teres*

- 319 *P. teres* collection made during 1976-2016 from barley growing regions of Australia

- Sequence specific (Poudel *et al.*, 2017) markers amplified across the collected samples

- No hybrids were identified

Field experiments

- The two field experiments were conducted at Hermitage Research Facility, Queensland, Australia for three successive years.

  **Field Site 1: (2013-2015)**
  - Barley cultivar: Henley
  - Inoculated with
    - *f. teres* (NB050) – *MAT1-1*
    - *f. maculata* (SNB320) – *MAT1-2*

  **Field Site 2: (2014-2016)**
  - Barley cultivars: Oxford/Grimmette
  - Inoculated with
    - *f. teres* (NB053) – *MAT1-2*
    - *f. maculata* (SNB74) – *MAT1-1*

- 688 conidia and 223 ascospores collected from these fields

- Sequence specific (Poudel et al., 2017) and mating type markers (Lu et al., 2010) used for molecular characterisation

Results for Field Site 1

- Number of conidia collected during three years of the field experiments

<table>
<thead>
<tr>
<th>Site 1</th>
<th>Pyrenophora teres f. teres</th>
<th>Pyrenophora teres f. maculata</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MAT1-1</td>
<td>MAT1-2</td>
</tr>
<tr>
<td>Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>2014</td>
<td>49</td>
<td>31</td>
</tr>
<tr>
<td>2015</td>
<td>102</td>
<td>65</td>
</tr>
</tbody>
</table>

- More teres isolates than maculata in the field.

- No hybrids between two forms were detected in the field populations

- Ascospores collected were recombinants of same forms (i.e. two P. teres. f. teres isolates)
Results of Field Site 2

- Number of conidia collected during three years of the field experiment

<table>
<thead>
<tr>
<th>Site 2</th>
<th>Pyrenophora teres f. teres</th>
<th>Pyrenophora teres f. maculata</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>MAT1-1</td>
<td>MAT1-2</td>
</tr>
<tr>
<td>2014</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>2015</td>
<td>98</td>
<td>55</td>
</tr>
<tr>
<td>2016</td>
<td>87</td>
<td>68</td>
</tr>
</tbody>
</table>

- More *teres* isolates than *maculata* in the field

- No hybrids between two forms were detected in the field populations

- Ascospores collected were recombinants of same forms (i.e. two *P. teres f. maculata* isolates)
Summary

- Hybrids between forms are rare in the field population in Australia.

- Hybridisation within isolates of the same form more is likely to occur causing a reproductive barrier for reproduction between forms.

- To investigate conditions under which hybridisation may occur in the field, experiments needs to be conducted in confined areas with controlled environment.
Acknowledgement

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Thank you for your kind attention