Trichoderma: A possible solution for Aphanomyces?

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Trichoderma: A possible solution?

- This ascomycete has been established as one of the most acceptable and successful biocontrol agent for a range of soil-borne pathogens.

- Across the globe, more than 50 *Trichoderma*-based products are commercially available as biofungicides, biostimulants, and biological soil amendments (Woo and Lorito, 2007).

- *T. harzianum*, *T. viride* and *T. hamatum* are some of the most successful species.

- There are a few reports for successful control of the other root-rot oomycete pathogen, *Pythium*, by *Trichoderma* (Mbarga et al. 2012).

- Dandurand et al. (2000) reported synergistic effect of *T. harzianum* and *Brassica napus* seed meal for complete suppression of *Aphanomyces euteiches* root rot in pea.
**Trichoderma in lentil**

- Few successful reports for control of soil-borne pathogens particularly *Fusarium oxysporum*

<table>
<thead>
<tr>
<th>Reference</th>
<th>Strain</th>
<th>Pathogen</th>
<th>Disease</th>
<th>Effects</th>
<th>Place</th>
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<tbody>
<tr>
<td>Garkoti et al. (2014)</td>
<td><em>T. harzianaum</em> + <em>P. fluorescens</em></td>
<td><em>F. oxysporum</em> f. sp. lentis</td>
<td>Wilt</td>
<td>• Reduced disease incidence</td>
<td>India</td>
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<td></td>
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<td>• Improved grain yield</td>
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<td>El-Hassan et al. (2013)</td>
<td><em>T. hamatum</em> (Isolate from lentil crop, Syria)</td>
<td><em>F. oxysporum</em> f. sp. lentis</td>
<td>Vascular Wilt</td>
<td>• Delayed infection time</td>
<td>UK</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>• Higher pathogen mortality</td>
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<td>• Reduced pathogen colonization</td>
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<td>Hannan et al. (2012)</td>
<td><em>T. harzianaum</em> + <em>Rhizobium leguminosarum</em></td>
<td><em>F. oxysporum</em> + <em>Sclerotium rolfsii</em></td>
<td>Foot Rot</td>
<td>• Reduced post-emergence plant death</td>
<td>Bangladesh</td>
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<td>• 19/85% higher emergence</td>
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<td>• Higher plant stand</td>
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<td>• Up-to 75.56% higher biomass</td>
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<td>Kashem et al. (2011)</td>
<td><em>T. harzianaum</em> (Native isolate from pulse crop)</td>
<td><em>F. oxysporum</em> Schlecht</td>
<td>Foot &amp; Root Rot</td>
<td>• Reduced disease incidence of 6.9% against 39.0% in control fields</td>
<td>Bangladesh</td>
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<td>• Improved seed germination, plant stand and seed yield</td>
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Our Objectives

To isolate and screen native as well as other strains of *Trichoderma* and their secondary metabolites (SMs) for antagonistic potential against *Aphanomyces euteiches* in lentil.

To evaluate these antagonistic *Trichoderma* strains and SMs for plant growth promoting (PGP) effects on lentils.

To select best *Trichoderma* strain for providing control to Aphanomyces root rot (ARR) and to enhance plant growth characteristics in different lentil cultivars.
We intend to look into the three-way biological interaction between the pathogen, *Trichoderma*/SMs and the root polyphenols with an aim to develop sustainable strategy for disease control and plant growth promotion.
Preliminary work

A. Lentil screening

• 10 lentil varieties were screened under controlled conditions, for characterizing the response towards pathogen *Aphanomyces euteiches* (Isolate from Saskatchewan, Banniza et al. 2013).

• It has been found as an aggressive pathogen.

• However, variation has been observed among different genotypes.

• *L. odemensis, L. lamottei, L. ervoides* (IG 72815) and the zero tannin (white and gray) were found to be more susceptible than *L. orientalis, L. ervoides* (L01-827A), *L. tomentosus* and *L. culinaris* (Eston and Maxim).
Trichoderma Strains

Native isolates

• Isolated 3 antagonistic *Trichoderma* isolates from root and soil samples collected from lentil cultivated soil in Saskatoon region.

• They have shown some antagonistic potential against *Aphanomyces euteiches* in the plate cultures.

Commercially available options

• Different *Trichoderma* strains available with commercial sources will be obtained

• Particularly *Trichoderma harzianum* and *Trichoderma virens*. 

S4A5  
S5P3  
S9A2
Lentil response to *Aphanomyces euteiches* infection

Uninfected

Infected
Root Polyphenols

- My colleague Dr. Navid Bazghaleh is looking into this aspect.

- His poster provided an insight for some initial trend that was observed for the root polyphenols of a few lentil cultivars.

- On the basis of the preliminary observations it may be said that there might be a relation between the root polyphenol profile and the disease response.

- So, it might be interesting to look if *Trichoderma* /SMs influences the root polyphenol profile and thus the interaction of plant (root) with *Aphanomyces euteiches*. 