AQUAPONIC WATER: A NOVEL SOURCE TO ISOLATE BCAS AGAINST *PYTHIUM APHANIDERMATUM*?

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INTRODUCTION

Aquaponic (AP) systems, define as recirculating soilless systems combining aquaculture and hydroponics (HP), are at the core of innovative researches. However, plant pest and more especially plant pathogens management is still unclear. In fact, in this kind of one loop device, where the nutrient plant solution returns to the fish part, chemical pesticides and disinfecting agents are not allowed due to the presence of fishes. Furthermore, they might be toxic for beneficial bacteria present in the system, such as nitrifying bacteria.

Among the large possibility of diseases occurring in soilless systems, oomycetes pseudo-fungi, responsible of root rot diseases like *Pythium aphanidermatum* (Edson) Fitzp, are problematicats due to their capacity to produce a mobile form, making the dispersion of the disease easier.

Two recent articles put forward the hypothesis of a natural protective action of AP water or fish effluents against plant pathogens during *in vitro* trials (Gravel et al., 2015; Sirakov et al., 2016). This phenomenon could be linked to the presence of antagonistic microorganisms or inhibitory compounds in fish water. Assumptions that don’t seem aberrant in light of suppressive action already observed in HP systems (Postma et al., 2008).

*In vitro* experiments with AP water have been carried out and completed for the first time with *in vivo* trials to assess its capacity to procure a suppressive action towards *P. aphanidermatum*.

RESULTS AND CONCLUSIONS

**In vitro test**

A comparison of *P. aphanidermatum in vitro* mycelium production was made between inoculated broth control (standard V8 CaCO3 broth) and inoculated V8 CaCO3 broth containing either 25% of AP water or 25% of 0.2 µm filtered AP (F-AP) water. A very highly significant decrease of mycelium production was observed when 25% of AP water was added. No difference was observed between the control and the broth containing 25% of 0.2 µm filtered AP water.

Based on this test, inhibitory action of AP water seems to be linked to a microbial action. Nevertheless, an indirect action on pathogens by the way of plant stimulation by water compounds cannot be totally excluded.

**In vivo test**

Aquaponic lettuces inoculated with *P. aphanidermatum* mycelium presented significantly less disease symptoms and a better root yields compared with inoculated lettuces grown with HP water adjusted to mineral concentration of AP water. Consequently, suppressive action of AP water could be considered and potentially linked to antagonistic microorganisms and/or plant defences stimulation.

<table>
<thead>
<tr>
<th>Modality</th>
<th>Symptoms scoring (0-6)</th>
<th>Fresh root mass (g)</th>
<th>Dried root mass (g)</th>
<th>Fresh leaf mass (g)</th>
<th>Dried leaf mass (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inoculated AP</td>
<td>1,00</td>
<td>2,11</td>
<td>0,06</td>
<td>28,16</td>
<td>1,20</td>
</tr>
<tr>
<td>Inoculated HP</td>
<td>2,00 *</td>
<td>1,97</td>
<td>0,05 *</td>
<td>27,27</td>
<td>0,97</td>
</tr>
</tbody>
</table>

* Significant difference compared to inoculated AP lettuces (*AV1* test)

These results highlight that aquaponic water could contribute to find a novel source of BCAs adapted to aquatic environments and able to fight Oomycetes pathogens.

References

