Bioassimilable sulfur (NATURDAI S-SYSTEM) provides effective control of Powdery mildew in tomato enhancing plant immune system

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Abstract
Development of alternatives to the use of chemical pesticides to control pests are focused in the induction of natural plant defenses. The study of new compounds based on liquid bioassimilable sulfur and its effect as inductor of the immune system of plants would provide an alternative option to farmers to enhance the plant resistance against pathogen attack such as powdery mildew. In order to elucidate the efficacy of this compound in tomato against powdery mildew, we tested several treatments curative foliar, preventive foliar, preventive in soil drench and combining preventive in soil drench and curative foliar. In all cases, we analyzed the infection development, physiological parameters and high level of chlorophyll. We also monitored parameters involved in plant resistance through evaluation of ROS response, callose deposition and hormones levels. The results indicate that preventive and curative treatments can be highly effective for the prevention and control of powdery mildew in tomato plants and foliar treatments are able to stop pathogen development when applied as curative. Soil drench treatments induce immune response mechanisms of plants, increasing significantly callose deposition and promoting plant development.

Keywords: Bioassimilable sulfur, powdery mildew, tomato, induced resistance

Introduction
Development of alternatives to the use of chemical pesticides to control pests are focused in the induction of natural plant defenses (Kravchuk et al., 2011; Llorens et al., 2013; Arenaga et al., 2014). The study of new compounds based on liquid bioassimilable sulfur (NATURDAI S-SYSTEM) and its effect as inductor of the immune system of plants would provide an alternative option to farmers to enhance the plant resistance against pathogen attack such as powdery mildew. The main goal of this study was to elucidate the efficacy of NATURDAI S-SYSTEM in tomato against powdery mildew.

Material and Methods
Several treatments with NATURDAI S-SYSTEM were tested. Following treatments combinations were performed: curative foliar, preventive foliar, preventive in soil drench and combining preventive in soil drench and curative foliar. In all cases, we analyzed the infection development, physiological parameters and the level of chlorophyll. We also monitored parameters involved in plant resistance through evaluation of peroxide accumulation (DAB method), callose deposition (aniline blue staining) and hormones levels (mass spectrometry). All methods described in Llorens et al., 2013.

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Results and Conclusions
The product reduces the incidence of Powdery mildew infection in all treatments tested. Naturdai Bio-S has an enhancing effect of plant growth and chlorophyll levels in soil treatment or combined with foliar curative treatment (Table 1). The tested product reduces peroxide accumulation up to 90% and increase callose deposition. SA and JA pathways, related with induced resistance, increase their activity with the treatment (Table 2).

Table 1: Effect of treatment with S-SYSTEM NATURDAI on the infection rate and physiological parameters. The data show the average of three independent experiments. Different letters represent statistically significant differences (p<0.05 least-significant difference test).

<table>
<thead>
<tr>
<th></th>
<th>Ratio of infection</th>
<th>Height (cm)</th>
<th>Chlorophylls (SPDA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0</td>
<td>26.8±0.9 b</td>
<td>31.4±1.1 bc</td>
</tr>
<tr>
<td>Control infected</td>
<td>2.4±0.3 a</td>
<td>23.2±0.9 c</td>
<td>28.5±3.4 c</td>
</tr>
<tr>
<td>Foliar</td>
<td>1.0±0.1 c</td>
<td>27.0±0.6 b</td>
<td>28.7±3.4 c</td>
</tr>
<tr>
<td>Foliar preventive</td>
<td>0.2±0.1 d</td>
<td>26.5±1.1 b</td>
<td>29.7±1.1 c</td>
</tr>
<tr>
<td>Soil</td>
<td>0.9±0.2 c</td>
<td>36.8±2.1 a</td>
<td>35.4±0.8 a</td>
</tr>
<tr>
<td>Soil + Foliar curative</td>
<td>1.2±0.2 b</td>
<td>36.4±0.7 a</td>
<td>33.2±0.7 b</td>
</tr>
</tbody>
</table>

Our results demonstrated that liquid bioassimilable sulfur (NATURDAI S-SYSTEM) could be a potential organic tool in crop protection for the control of Powdery mildew.

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References


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