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Alternaria toxin-induced resistance in rose plants against rose aphid (*Macrosiphum rosivorum*): effect of tenuazonic acid



Key words:

Toxin, Induced resistance, Fungus-plant-insect system, Plant-mediated interaction, Tenuazonic acid, HPLC, *Alternaria alternata*, *Macrosiphum rosivorum*, *Rosa chinensis*

Research Summary

- The indirect plant-mediated interactions between fungi and insects on the shared host plants remains unclear.
- The *Alternaria* toxin is non-harmful to the rose plant and the rose aphids, and was used to study the effects of infection of the plants by the fungus, *Alternaria alternata*, on the rose aphids. Thus, in this study, the direct effects of the fungus to the aphids can be iliminated.
- The results showed that the toxin can significantly induce the systemic resistance to the aphids and the most important active component in it is tenuazonic acid (TeA).

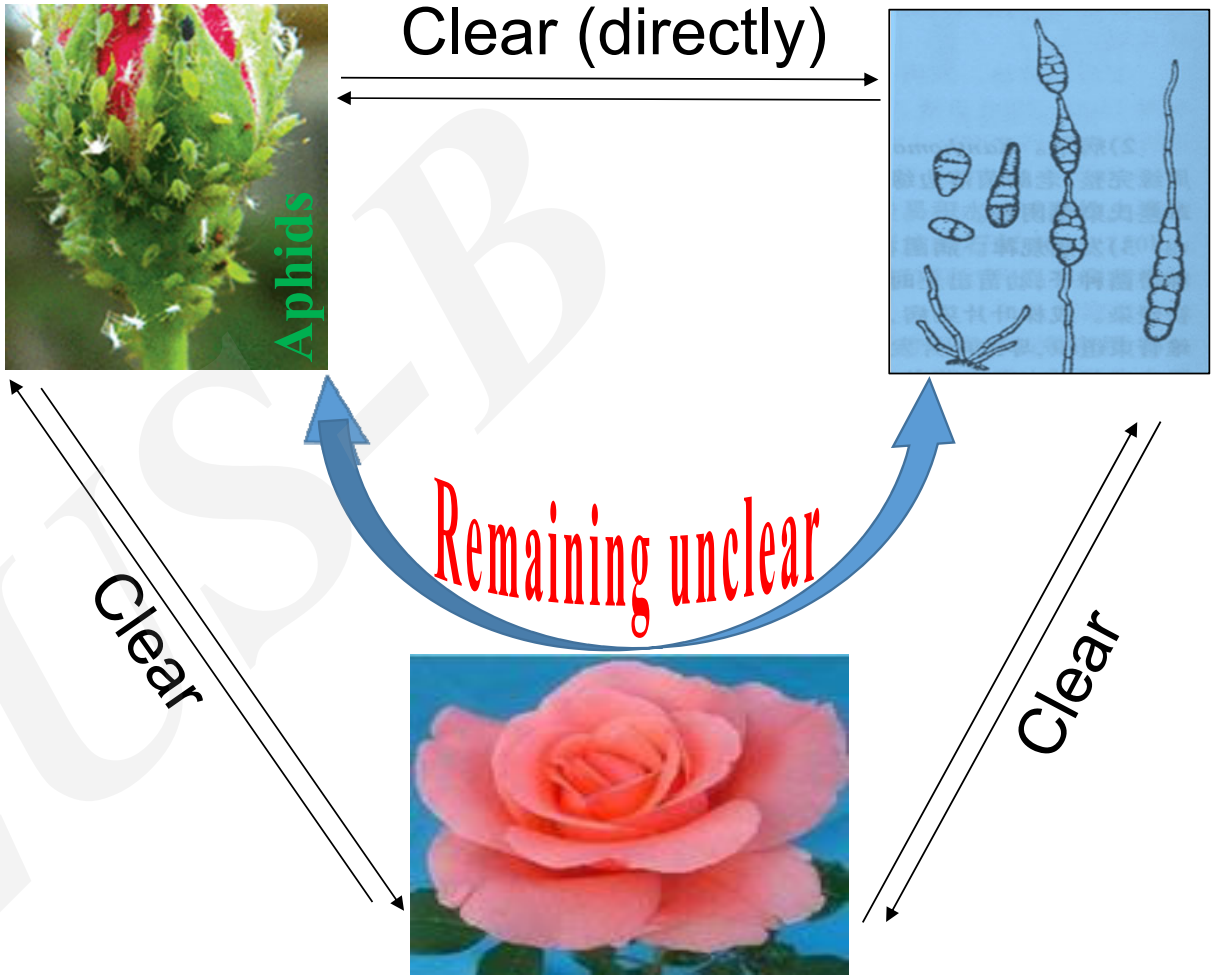


Fig. 1 Four types of interactions among fungi, plant, and insects

The activities of the *Alternaria* toxin and TeA

The *Alternaria* toxin

- Is non-harmful to the rose plant.
- And the rose aphids.
- But can significantly inhibit the multiplication of the rose aphid.
- Thus, can induce the systemic resistance in the rose against the aphids.



TeA

- Is non-harmful to the rose plant.
- And the rose aphids.
- But can significantly inhibit the multiplication of the rose aphid.
- Thus, can induce the systemic resistance in the rose against the aphids.

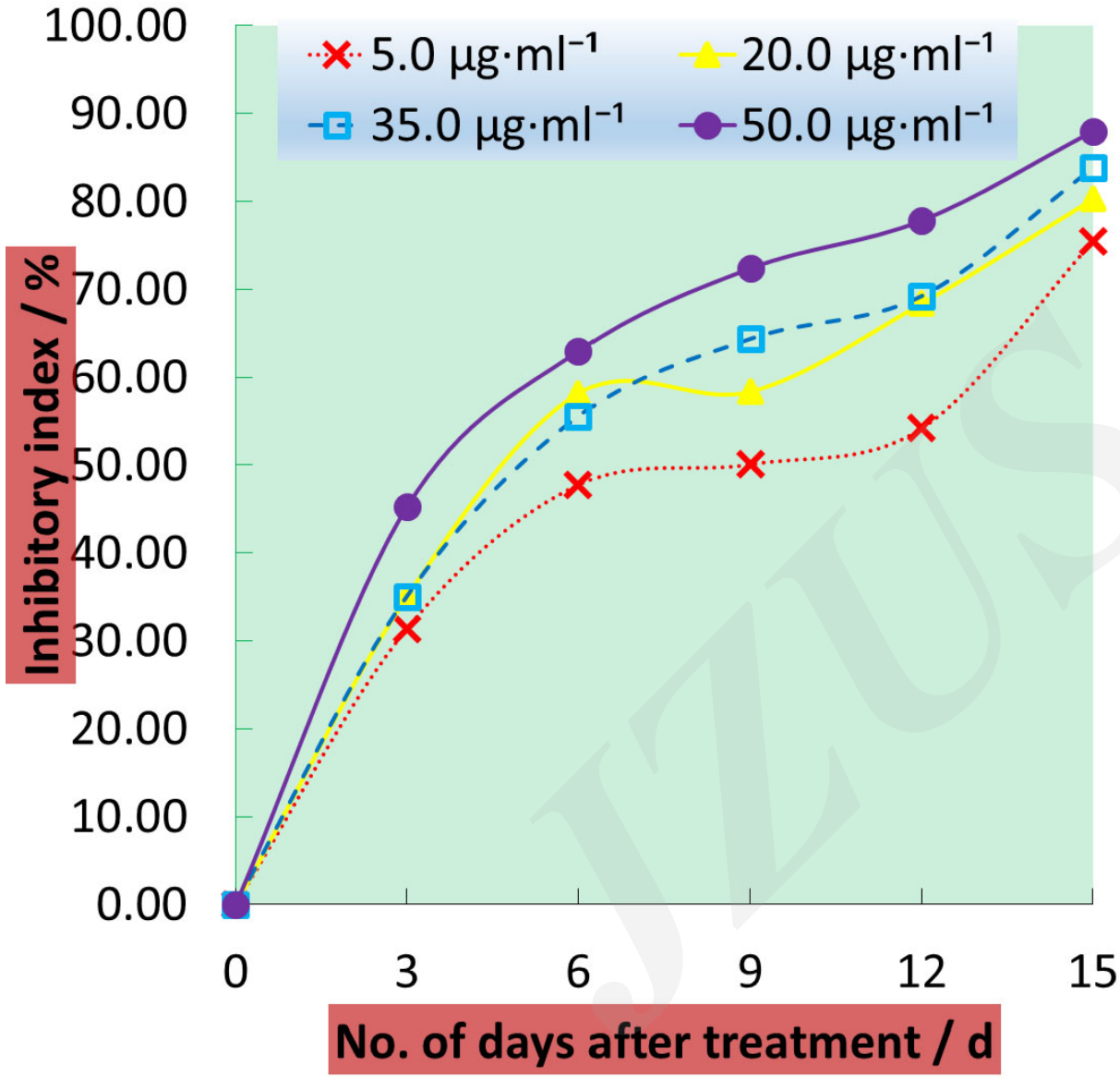


Fig. 2 Resistance of crude *A. alternata* toxin against rose aphids. The rose plants were sprayed with the toxin at different concentrations, and were infested with 10 aphids per plant one day after the treatment to calculate the inhibitory index (II) for rose aphid multiplication using the following formula: Inhibitory index% = (Control number – Treated number)/Control number × 100% (Control number = the mean number of aphids on control plants (only water used); Treated number = the mean number of aphids on toxin-treated plants). Six replicates were conducted for each concentration.

HPLC determination

- The results showed that TeA exists in the *Alternaria* toxin.
- TeA is the most important active component in the toxin.
- The percentage of TeA in the toxin reached 0.1199%.
- TeA applied onto the rose plants can be degraded completely within 7 days under natural conditions according to the results with the HPLC method.

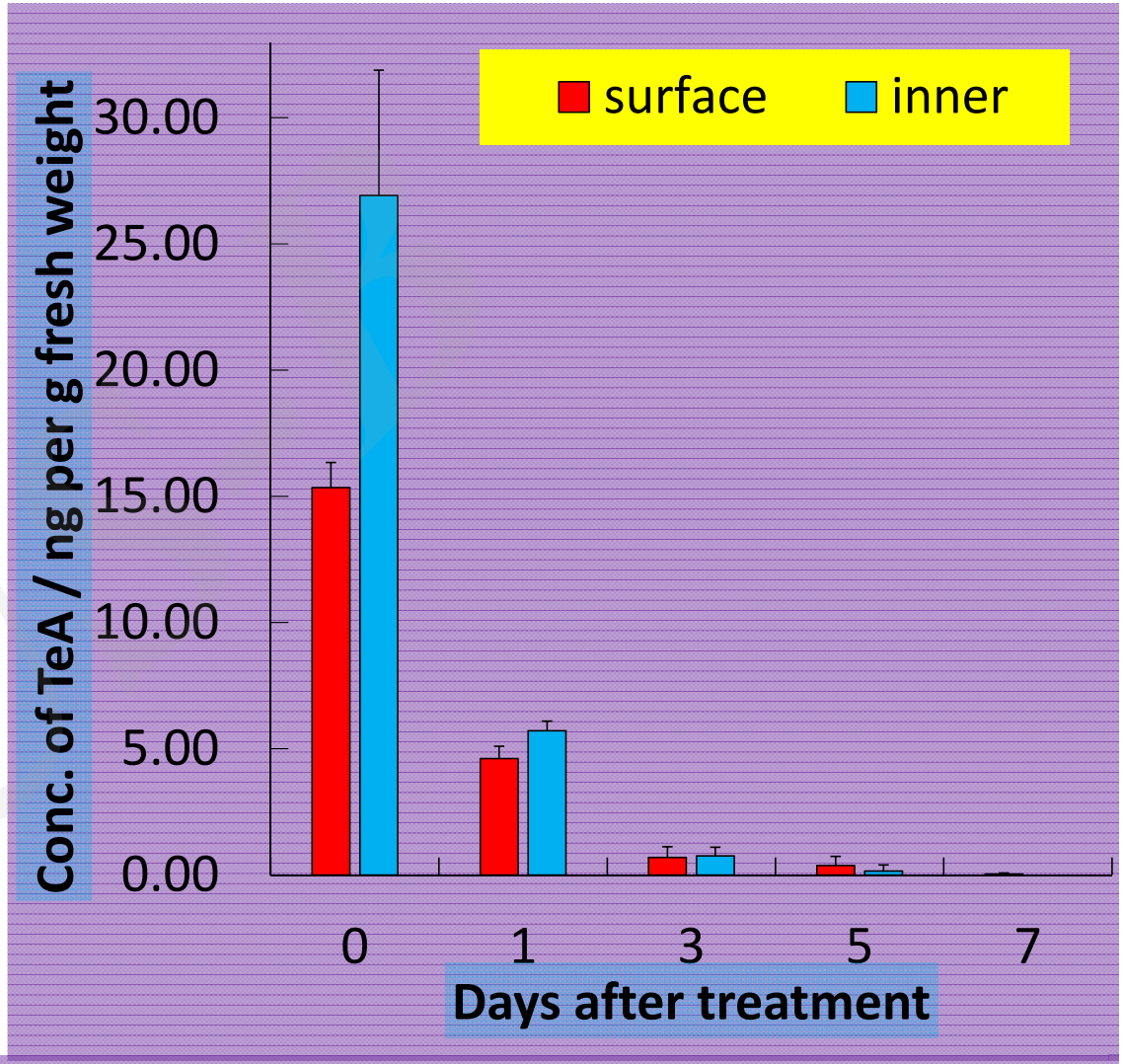


Fig. 6 Mean + SD concentration of TeA in rose plants treated with TeA for three days. After the treatment, TeA was separately extracted with methanol from the surfaces and the inner portion of the plants for HPLC analyses. Three replicates were performed for each treatment.