Thiamine treatments alleviate aphid infestations in barley and pea

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Abstract:

Treatment of plants with thiamine (Vitamin B1) has before been shown to activate plant defence against microorganisms. Here, we have studied the effects of thiamine treatments of plants on aphid reproduction and behaviour. The work was mainly carried out with bird cherry-oat aphid (Rhopalosiphum padi L.) on barley (Hordeum vulgare L.). Aphid population growth and aphid acceptance on plants grown from seeds soaked in a 150 lM thiamine solution were reduced to ca. 60% of that on control plants. R. padi life span and the total number of offspring were reduced on barley plants treated with thiamine. Healthy aphids and aphids infected with the R. padi virus were similarly affected. Spraying or addition of thiamine at 150 lM to nutrient solutions likewise resulted in reduced aphid population growth to ca. 60%, as did plant exposure to thiamine odour at 4 mM. Thiamine treatments resulted in reduced aphid population growth also when tested with grain aphid (Sitobion avenae F.) on barley and pea aphid (Acyrthosiphon pismum H.) on pea (Pisum sativum L.). There was no direct effect of thiamine on aphid reproduction or thiamine odour on aphid behaviour, as evaluated using artificial diets and by olfactometer tests, respectively. Two gene sequences regulated by salicylic acid showed higher transcript abundance and one gene sequence regulated by methyl jasmonate showed lower transcript abundance in thiamine-treated plants but not in control plants after aphid infestation. These results suggest that the aphid antibiosis and antixenosis effects may be related to priming of defence, but more studies are needed to explain the effects against aphids.

Keywords:

Hordeum vulgare Pisum sativum Acyrthosiphon pisum Rhopalosiphum padi Sitobion avenae Aphid resistance Thiamine Vitamin B1

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