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Manipulating nutrient inputs to reduce thrips in flower crops

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Introduction

Successful control of western flower thrips in greenhouse floriculture crops relies on a systems approach, a combination of biological control and plant resistance, supported by best environmental and crop production practices. Studies suggest that high fertilizer rates stimulate thrips reproduction, through the provision of high levels of organic nitrogen, stored in plant tissues. Floriculture crops are often over-fertilized, but reducing nutrients too much will negatively impact plant quality. Biostimulants (beneficial bacteria, fungi or extracts), may mitigate these negative effects while concurrently enhancing host plant resistance.
This research will determine if reduced nutrient regimes and biostimulant treatments reduce thrips population growth without negatively affecting plant quality; and if these treatments improve the relative efficacy of biocontrol strategies against thrips in a complete IPM strategy.

Methods

Since the start of the project in September 2018, two trials have been completed. For both trials, Chrysanthemum (var. Springdale Purple) cuttings were obtained from a commercial supplier, dipped in 0.1% Landscape oil, stuck into pots containing Fafard G6 growing media and rooted under mist for 2 weeks. Plants were grown following commercial practices including pinching, growth regulators and lighting/black-out. All fertilizer treatments were terminated at budding, switching to plain water. Regular sap analyses (Nova Crop Control) were done to determine nutrient levels in plants in each treatment. In addition, effects of fertilizer rate on plant growth and quality were monitored and validated by a commercial grower and crop consultant.
The first trial investigated a range of fertilizer rates to determine limiting and excessive rates for the growing conditions in the research greenhouse. NPK fertilizer at 17-5-17 was used at 0, 25, 50, 100 and 300ppm of N.
In the second trial, fertilizer rates were adjusted to 25, 50, 100, 200 and 300ppm of N. This time, plants were infested with western flower thrips after they were rooted under mist. Every two weeks, plants were sampled to determine thrips populations. At the end of the trial, final thrips populations and damage ratings were determined in addition to the measures described above.

Results

In the first trial (no pest infestation), organic nitrogen levels in chrysanthemum plant sap increased with increasing fertilizer rates (Figure 1). At the end of the trial, when plants were flowering, the three highest fertilizer rates (50, 100 and 300ppm of N) resulted in plants of acceptable quality, based on both plant quality measures and evaluation by industry experts. Based on this, the minimum acceptable rate in our experimental set-up was set at 50ppm of N.

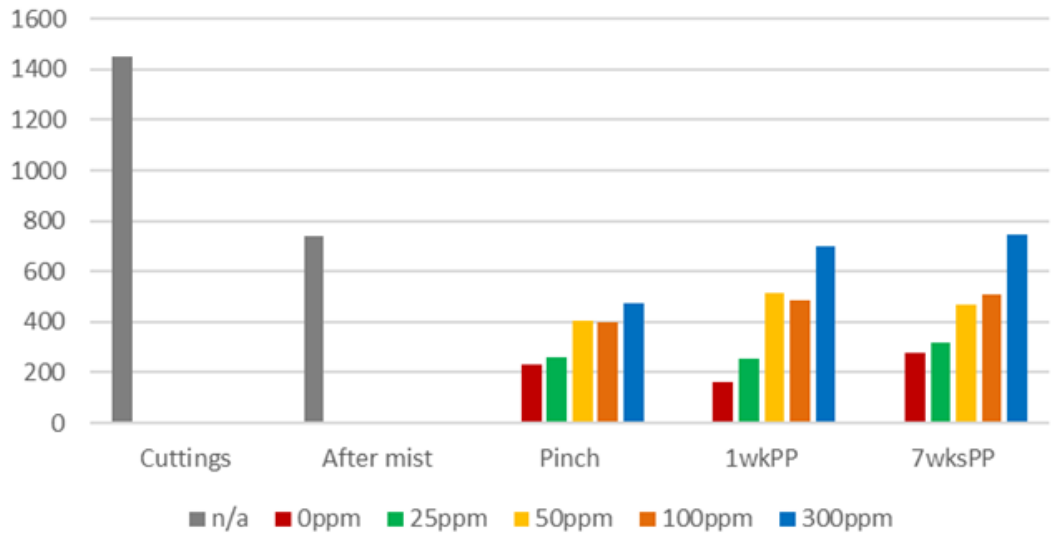

Figure 1. Trial 1. Organic nitrogen levels (ppm) in chrysanthemum leaf tissue of plants grown with different levels of complete fertilizer (ppm of N).

Due to an unintended infestation in the first chrysanthemum trial, thrips were observed in all treatments and benches. Although fertilizer treatments were randomized throughout the compartment, these observations on thrips plant choice have to be considered as preliminary observations. We found that thrips numbers (counted at 5 weeks after transplanting) increased with increasing fertilizer levels (Figure 2).

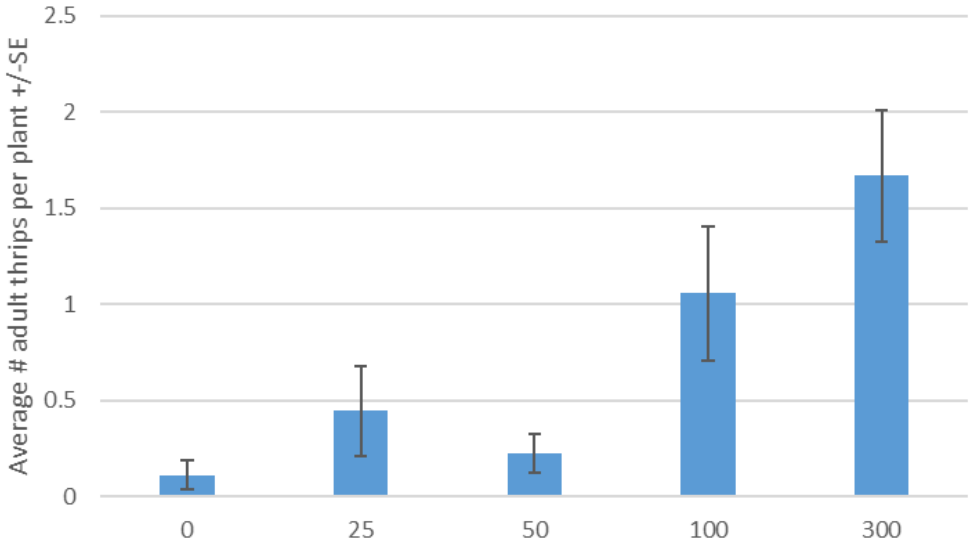

Figure 2. Trial 1. Number of thrips per plant 5 weeks after transplanting (right) of plants grown with different levels of complete fertilizer (ppm of N). Note: this was an unplanned infestation; results should be considered as preliminary.

The second trial (with planned thrips infestations) just ended, and we are still counting the thrips in the last samples. Results of the first sampling date indicate that thrips numbers were higher in treatments where plants were fertilized with 100ppm of nitrogen and higher (Figure 3). At the end of this trial, plant growth and quality parameters will again indicate which fertilizer rates produced plants of acceptable quality (results pending).

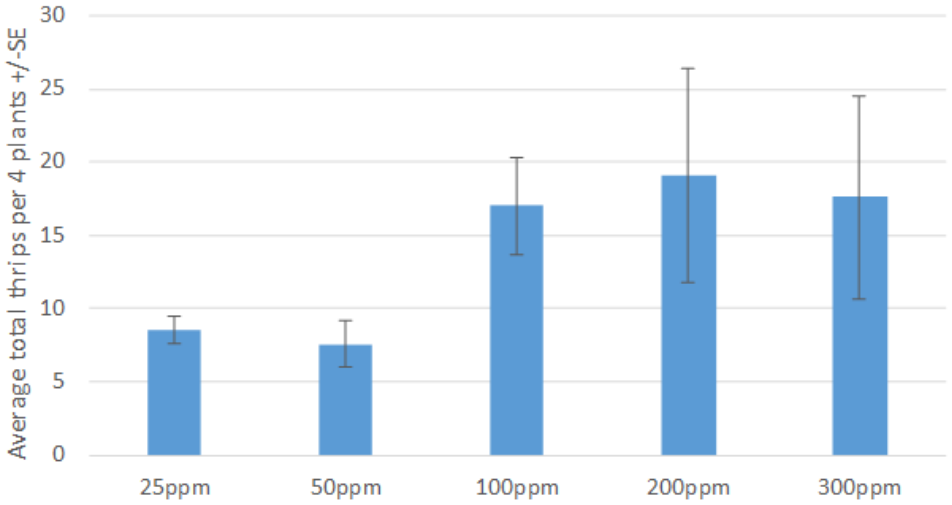

Figure 2. Trial 2. Number of thrips on plants grown with different levels of complete fertilizer (ppm of N), 5 weeks after transplanting.

Next steps

Findings until now confirm that there is a link between fertilizer rate, organic nitrogen levels in the leaf tissue and thrips numbers on the plant. The next experiments will investigate if biostimulants can mitigate the negative effect of reduced fertilizer on plant growth and quality, while maintaining the plants' reduced susceptibility against thrips. Several different biostimulant products will be tested, including mycorrhizae, beneficial bacteria and a microbe consortium. Once the most promising fertilizer and biostimulant combinations have been determined, effects on thrips biocontrol strategies will be investigated. Finally, commercial greenhouse trials will validate the integrated fertilizer-biostimulant-biocontrol strategy

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