Functional Response of Green Lacewing, *Chrysoperla spp.* (Neuroptera: Chrysopidae), Under Simulated Winter High Tunnel Conditions

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Background

- New England growers have developed a dependence on season extension tools. Most commonly: the high tunnel.
- High tunnels create a suitable winter environment for pests in the absence of natural predators
- The larval form of the Green Lacewing, *Chrysoperla spp.,* is widely known for its predatory capacity for soft-bodied pests
- No research has been conducted on this predator's performance in the suboptimal conditions within a winter high tunnel
- This study measured the number of Green Peach Aphids (*Myzus persicae*) consumed by *Chrysoperla spp.* within a 24-hour period after an acute cold exposure treatment

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Methods

- Three trials: Predators either exposed to a room temperature treatment (Control), 15 minutes in the freezer (F), or 24 hours on ice (I)
- Six predators from each treatment were placed in an arena with aphids for 24 hours
- The number of Green Peach Aphids (*Myzus persicae*) consumed by *Chrysoperla spp.* within a 24-hour period was recorded
- All data analyses were carried out in JMP (SAS Inst.; Cary, NC).

Cup arena including infested spinach leaf and a 3x enlarged photo of *Chrysoperla spp.*

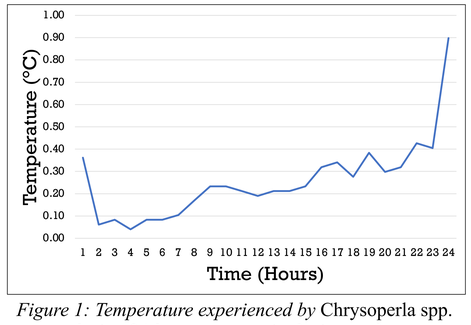

Figure 1: Temperature experienced by Chrysoperla spp. *during 24-hour exposure in the ice cooler.*

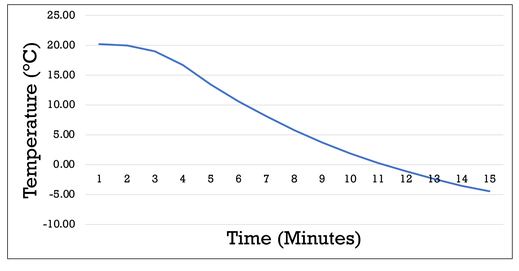

Figure 2: Temperature experienced by Chrysoperla spp. *during 15-minute exposure in the freezer.*

Results

- Insects within the freeze and ice treatments took significantly longer to emerge from chill coma than the control ($F_{2,46} = 7.4$, $p = 0.0016$; Fig. 3)
- Sample sizes across the three treatments varied because participants in the F and I treatments did not all respond to the assay (11±2.7% and 25±4.8% participation, respectively)
- We observed significant decreases in aphid populations after 24 hours in all predator assays as compared to the control assays with no predator, but there was no difference between predator treatments ($F_{3,66} = 24.7$, $p < 0.0001$; Fig 4).

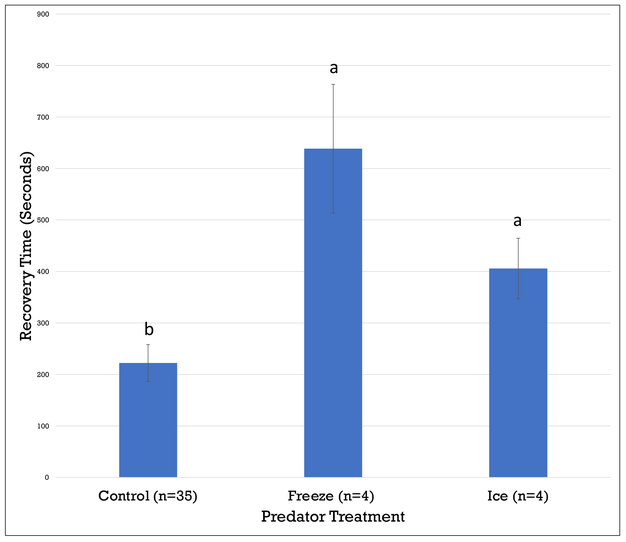

Figure 3: Mean (±SEM) Chill Coma Recovery Time across the three treatments. Bars with the same letter are not significantly different according to ANOVA followed by Tukey's HSD (α = 0.05).

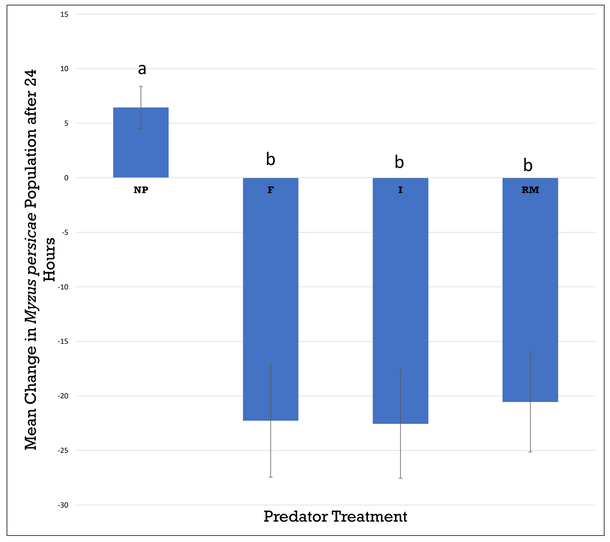

Figure 4: Mean (±SEM) Change in M. persicae *Population After 24 Hours in Four Predator Treatments: No Predator, Freezer, Ice, and Room Temperature. Bars with the same letter are not significantly different according to ANOVA followed by Tukey's HSD (α = 0.05).*

- ❖ Cold treatments simulated nighttime high tunnel temperatures and significantly disabled the insect as compared to the room temperature treatment
- ❖ *Chrysoperla spp.* was successful in maintaining normal levels of predation and suppressing aphid populations after exposure to acute cold treatments
- ❖ Promising results for the use of *Chrysoperla spp.* larvae as augmented biocontrol agents in the suboptimal conditions of winter high tunnels

Acknowledgments

This work is supported in part by the Specialty Crop Research Initiative (SCRI) [grant no. 2021-51181-35858/project accession no. 1027430], NH's Agricultural Experiment Station (Hatch Project NH 11H696), CPPM-EIP grant no. 2021-70006-35477 from the USDA National Institute of Food and Agriculture.