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SPOTTED LANTERNFLY NYMPHAL RESPONSES TO TEMPERATURE

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ABSTRACT

Accurate phenology models based on the responses of Lycorma delicatula (SLF) to a broad range of temperatures are needed for predicting when monitoring for SLF should occur, when the right stage is present for application of control methods, and what regions of the US are likely to support SLF populations. In 2019, a total of 96 SLF egg masses from the wild from five different sites in Pennsylvania were collected for the experiment. A group of 20 first instar SLF that hatched the same day were placed in a rearing tube containing a single potted Ailanthus altissima plant. Six rearing tubes containing first instar SLF were placed at each of the following constant temperatures: 10°C, 15°C, 20°C, 25°C, 30°C, 35°C, and 40°C. Newly molted SLF were relocated to a freshly prepared rearing tube with others that molted the same day for that temperature treatment. Number of days in each instar or of survival for each individual were calculated.

Most first instar larvae died between 21 and 35 days at 10°C. At 35°C the first instars that were unable to molt died before 35 days. First Instar survival in the15-30°C treatments was between 60-80% until 63 days then all but 30% of the 15°C nymphs died slowly to 105 d. At the second instar, most nymphs died by 35 d at 15 and 35°C. Survival of second instars was similar at 20 and 25°C (>85%) but lower at 30°C (~65%). Survival of the third (<30% molting) and fourth (<20% molting) instars was similar between 20 and 30°C.

Based on the Briere model, the lower and upper thresholds for development for the first instar were estimated to be 13 and 44 °C, respectively. The lower threshold for second instars was estimated to be 12°C using the Briere and 9°C for the linear model. The upper threshold for the second instar was estimated to be 35°C. The Briere model was not a good fit for the third instar data but the linear model estimated the lower threshold to be 8°C. No fourth instar models could be fit because there were too few individuals that made it to adult. Temperatures at which first instars could develop were broader that those at which the later instars could develop. Using the developmental thresholds degree day requirements for each of the first three instars were estimated. The degree day (DD) requirements for each instar increases but the base temperature decreases. The estimated DD ranges were close to those observed in the field but extend to higher DD which might be expected since we used a broad temperature range that included temperatures near the upper and lower developmental thresholds. Future work will be needed to estimate the developmental thresholds and DD for the fourth instar and to evaluate temperature effects on adults.