Temperature dependence of the functional response of the common green lacewing, *Chrysoperla carnea* on the black citrus aphid, *Toxoptera aurantii* and the green citrus aphid, *Aphis spiraecola*

Amir Hossein Toorani¹, Jalil Eshaghi Sani², Habib Abbasipour¹, Behnam Amiri² and Saeid Heydari¹

¹Department of Plant Protection, Faculty of Agricultural Sciences, Shahed University, Tehran, Iran, amirhoseyn.toorani@gmail.com

²Plant Protection Department of Crop Science, University of Agricultural Sciences and Natural Resources of Sari, Mazandaran, Iran

Common green lacewing, *Chrysoperla carnea* (Stephens) (Neuroptera: Chrysopidae) is one of the most important natural enemies of pests. Functional response study is an important criterion for the selection of natural enemies for application in biological control programs. With respect to role and importance of temperature in creating a successful biological control, in this study, the functional response of 2nd and 3rd larval instars of *C. carnea* feeding on *A. spiraecola* and *T. aurantii* aphids was evaluated at three different temperatures. An experiment was conducted at three constant temperatures of 20, 25 and 30 °C, 75 ± 5% relative humidity and 16L: 8D hr photoperiods. To study the functional response, different densities of 2, 4, 8, 16, 32, 64, and 128 bait insect were used. To determine the type of functional response and estimation of parameters of attack rate ($a$) and handling time ($T_h$), the two step technique of Juliano in SAS software was used. In evaluation of the functional response of 2nd and 3rd larval instars of *C. carnea* on nymphs of *T. aurantii* aphid, functional response curve of 3rd larval instar at 25°C and 2nd larval instar at 20 and 30°C were of type II. Also in temperatures 20 and 30°C for 3rd instar larvae and at 25°C for 2nd instar larvae, curve was of type III. With increasing temperature from 20 to 30°C, the handling time was significantly decreased for the both 2nd and 3rd instar larvae. Functional response type feeding on *A. spiraecola* aphid at 20 and 25°C was obtained as type II, however, at 30°C it was type III. Also no significant differences were observed in the parameters of attack rate and handling time in the mentioned three temperatures. According to the obtained results in this study, it seems that 2nd and 3rd larval instars of *C. carnea* at 30 °C, can have more effective role in controlling black and green citrus aphids.

**Keywords:** *Aphis spiraecola, Chrysoperla carnea, functional response, temperature, Toxoptera aurantii*