Translation (by FNL) of a German press release of the JKI Julius Kühn-Institut Federal Research Institute for Crops – 16-7-2013

Home field advantage for seven-spotted lady-bird: Which predators of aphids benefit from climate change

Scientists at the Julius Kühn-Institute compare feeding behaviour of domestic and Asian lady-birds at elevated temperatures

Kleinmachnow (16.7.2013)**: The domestic seven-spotted lady-bird *Coccinella septempunctata* as well as the Asian lady-bird *Harmonia axyridis* are efficient predators of the cereal aphid *Sitobion avenae* on winter wheat. Scientists at the Julius Kühn-Institute were eager to learn which of the two antagonists is likely to gain higher benefits from the expected climate change. To answer this question, feeding habits and other behavioural / life patterns of both species were investigated in controlled atmosphere chambers as part of a research project sponsored by the German Environment Federation. Present results indicate that under an estimated 3 degrees increase in temperature, the domestic seven-spotted lady-bird has the edge.**

Two Asian lady-birds on wheat (© Krengel / JKI)

"*We were able to see that our domestic seven-spotted lady-bird takes up more food under higher temperatures, compared with the present normal conditions. There is an increased gain in body mass and body fat contents. In comparison, Harmonia axyridis also takes up more food, but body weight as well as body fat contents stagnate",* reports Dr. Sandra Krengel. The junior scientist evaluated the studies from the controlled atmosphere chamber as part of her PhD thesis. In doing so, male and female adults were compared with regard to the duration of their development and growth, amounts of food taken up, as well as body weights and body fat contents. With her results, Krengel mitigates assumptions that the Asian lady-bird – being looked at somewhat suspiciously anyway – might take better advantages of climate change. The higher food uptake of the Asian lady-bird consistently measured so far could not be validated by the JKI-scientists in their trials with the cereal aphid. The Asian lady-bird was imported to Europe in the 1980s and thanks to its high rate of reproduction is now common all over Germany.

In the course of an increase in temperature, the numbers of aphids and the activities of their predators will equally rise. "This can be observed because the optimum temperature of the cereal aphid lies at about 22 degrees C whereas the optimum for both lady-bird species lies slightly higher at about 23 to 25 degrees C", explains Prof Dr Bernd Freier. According to the JKI insect specialist, the Asian species is

considered highly competitive and aggressive towards related species. Following results from other countries, there is a high probability that the Asian lady-bird will establish itself as predator of aphids in German wheat fields as well, expects Prof Freier. “We are therefore interested in the behaviour of the lady-birds under a direct competition setting and changing temperatures in the field”, he says.

In co-operation with the Potsdam Institute for Climate Impact Research (PIK), highly realistic daily temperature curves were simulated in the controlled atmosphere chamber of the JKI-site in Kleinmachnow. Indeed, both species get along with the higher temperatures well and take up more food. However, both species are different in terms of how they use the additional energy input. “The species pursue different strategies”, offers Dr Krengel as interpretation of her data. The seven-spotted lady-bird only breeds once per year and then starts preparing for the time in winter shelter by storing fat reserves. In comparison, the Asian lady-bird tries to have several generations of offspring per year. That is why particularly females invest all the energy taken up in reproduction. In order to achieve more distinct results on which of the two lady-bird species allows for higher results as beneficial organism under rising temperatures in the field, further research is needed.

Background:
The studies performed as part of this research project were financed by a dissertation fellowship between 2009 and 2012 by the German Environment Federation. The total amount of 40,000 Euros was paid in monthly scholarship rates. Scientific supervision was carried out by Prof Dr Bernd Freier at the Julius Kühn-Institut in Kleinmachnow. The doctoral examination procedure was handled by Martin-Luther-University Halle-Wittenberg (MLU).

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Please also see the following publications:
Krengel S, Stangl GI, Brandsch C, Freier B, Klose T, Moll E & Kiowski A (2012): A comparative study on effects of normal versus elevated temperatures during preimaginal and young adult period on body weight and fat body content of mature *Coccinella septempunctata* and *Harmonia axyridis* (Coleoptera: Coccinellidae). **Environmental Entomology 41(3): 676-687.**

Krengel, S.; Freier, B. ; Brandsch, C. & Stangl, G.I. (2012): Comparative climate chamber investigation of the effects of different temperature profiles on the development, feeding, weight and fat body content of *Coccinella septempunctata* and *Harmonia axyridis*. **Mitt. Dtsch. Ges. allg. angew. Ent. 18: 35-39**
(Entomologentagung 2011)