Effect of geographic variation on biology and cold tolerance of *Harmonia axyridis* in China

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With 2 figures and 3 tables

**Abstract:** *Harmonia axyridis* (Pallas) is a generalist predator native of east and central Asia. It is widely distributed and well established in Europe, South America, North America, and Oceania. In China, *H. axyridis* can be found from Heilongjiang (northeast China) to Hainan (south China) province. Although *H. axyridis* has been an important biological control agent to various insect pests, little research had been done to evaluate the geographical effects on the biology and cold tolerance of *H. axyridis*. In this study, we compared morphology, development, fecundity, longevity and survivorship of *H. axyridis* at -3 °C from three geographical populations: Jilin population (JLP) (43° 48’ N), Henan population (HNP) (30° 01’ N), and Guizhou population (GZP) (26° 07’ N). The results showed that no significant difference was found in body size, oviposition period, and female adult longevity among the three populations. However, the colour patterns of *H. axyridis* adults were different and the percentages of melanic individuals from JLP, HNP and GZP were 4.67%, 28.00% and 51.85%, respectively. The developmental time of *H. axyridis* from HNP (16.32 d) was significantly longer than those from JLP or GZP. The preoviposition period of *H. axyridis* from JLP (8.94 d) was significantly longer than those from HNP or GZP. The male adult longevity of HNP (86.78 d) was the longest among the three populations. Furthermore, we found that the *H. axyridis* male adults had significantly longer longevity than those of the female adults for all three populations. *Harmonia axyridis* from JLP had the highest survivorship, followed by those from HNP and GZP regardless of sex. Generally, there was a clear trend that egg development time, female fecundity, and adult survivorship at -3 °C increased with increasing latitude.

**Keywords:** *Harmonia axyridis*; geographical population; biology; cold tolerance; biological control