N O T E

Phenology and Blacklight Trapping of the Multicolored Asian Lady Beetle (Coleoptera: Coccinellidae) in a Minnesota Agricultural Landscape[1]

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The multicolored Asian lady beetle, *Harmonia axyridis* (Pallas), is an exotic biological control agent recently established in the U.S. (Chapin and Brou 1991, Proc. Entomol. Soc. Wash. 93: 630-635). The first Minnesota record of *H. axyridis* was made on 5 November 1994 in St. Paul (J. Luhman, pers. comm.). By 1998 and 1999, both adults and larvae of *H. axyridis* were consistently collected in sweet corn near Rosemount, MN, approximately 34 km southeast of St. Paul (Wold et al. 2001, J. Entomol. Sci. 36: 177-187). To further assess the summer phenology of *H. axyridis* we conducted a 3-yr study, using blacklight trapping and visual plant inspection, to determine the seasonal occurrence of the beetle in a southern Minnesota agricultural landscape.

During 2000-2002, field and blacklight trap monitoring was conducted at the Rosemount Research and Outreach Center, University of Minnesota, Rosemount, MN. The landscape at the research and outreach center (approximately 14,000 ha) is comprised primarily of field corn, soybeans, small grains and alfalfa, with fewer hectares of forest and small-plot research plots. In 2000, two 110-V AC-powered blacklight traps (Gempler's, Belleville, WI) were placed near corn fields to monitor populations of European corn borer, *Ostrinia nubilalis* (Hübner). While checking traps for *O. nubilalis,* we noticed a consistent abundance of *H. axyridis* in the nightly trap catches, and began recording daily counts of *H. axyridis.* We used two blacklight traps again in 2001, and one blacklight trap in 2002. For 2000 and 2001, mean trap catch was calculated for the two traps. For all 3 yrs, a 5-d running average was used to smooth daily counts of *H. axyridis* in blacklight trap catches (e.g., Bartels and Hutchison 1998, J. Econ. Entomol. 94: 1349-1354). Visual, whole-plant sampling was used to quantify the abundance of *H. axyridis* adults and larvae in sweet corn. Sample sizes used for sampling *H. axyridis* in sweet corn ranged from 30 to 90 randomly selected individual plants per sample date. Observations on the occurrence of *H. axyridis* were also made in a variety of other agricultural and non-agricultural habitats. Degree days

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were calculated from daily minimum and maximum temperatures recorded at Rosemount, using a double sine wave method (Allen 1976, Environ. Entomol. 5: 388-396), with a lower developmental threshold of 11.2°C (LaMana and Miller 1998, Environ. Entomol., 27: 1001-1005).

We observed two generations of *H. axyridis* (Fig. 1), while two and a partial third generation of *H. axyridis* have been observed in Oregon (LaMana and Miller 1996, Biol. Contr. 6: 232-237). In 2001 and 2002, peak abundance of the *H. axyridis* adults that had overwintered occurred at 125 and 200 degree d, respectively (Fig. 1). On 7 June 2000, *H. axyridis* adults and larvae were observed on boxelder trees, *Acer negundo* L., feeding on boxelder aphid, *Perihpyllus negundinis* (Thomas). This may indicate that the F_1 generation of *H. axyridis* is produced primarily in arboreal habitats early in the season when aphid densities are low in crops. The abundance of F_1 adults peaked in blacklight trap catches at 400 degree days in both 2001 and 2002 (Fig. 1). Peaks of *H. axyridis* larval abundance were found in sweet corn at 700 to 800 degree days, which consistently preceded the peak abundance of F_2 adult *H. axyridis* in blacklight trap catches (Fig. 2 A-C). Increasing densities of *H. axyridis* larvae in sweet corn generally coincided with increasing corn leaf aphid, *Rhopalosiphum maidis* (Fitch), infestations during late-whorl to early-tassel. Peaks of larval abundance in field corn (RLK, unpubl. data) and soybean (E. Hodgson, pers. comm.) were also observed to precede the peak abundance of the F_2 adult *H. axyridis* in the blacklight trap catches, but larval densities in these crops were relatively low. The blacklight trap catch of F_2 adults showed a consistent bimodality across the 3 yrs, with peaks at 900 and 1050 degree d (Fig. 1). Later in the 2002 season (approximately 1200 degree

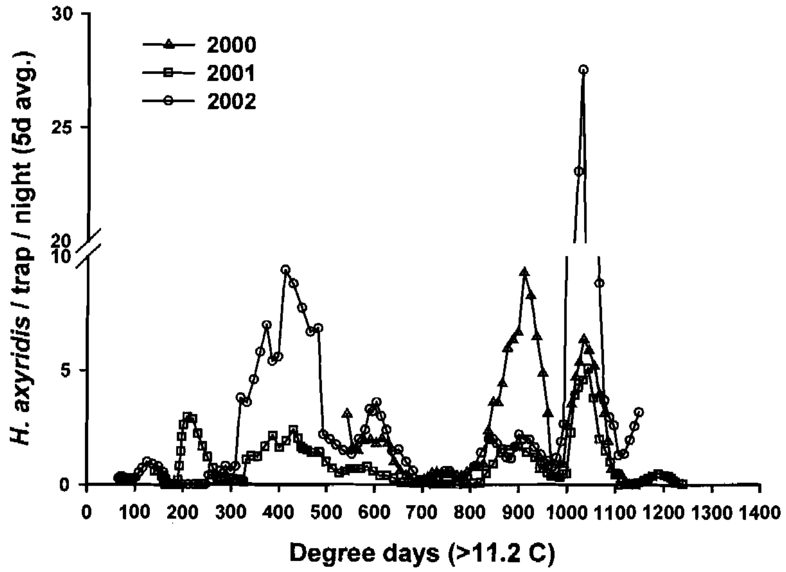

Fig. 1. Five day running average of daily counts of *H. axyridis* in blacklight traps at Rosemount, MN, for 2000, 2001, and 2002. Degree days were calculated with a lower developmental threshold of 11.2°C.

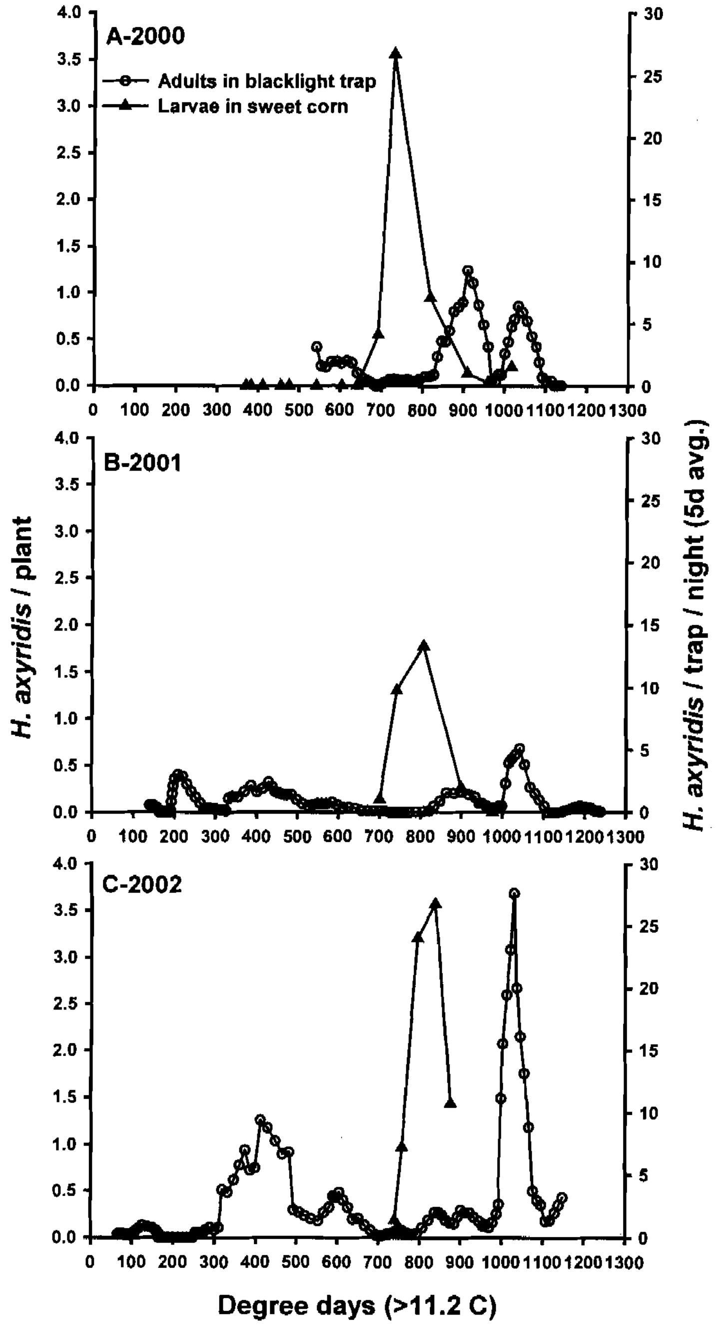

Fig. 2. Five day running average of daily counts of *H. axyridis* in blacklight traps, and abundance of *H. axyridis* in sweet corn at Rosemount, MN. Degree days were calculated with a lower developmental threshold of 11.2°C.

days), trap catches reached 226 beetles per night (RLK, unpubl. data), possibly indicating the start of adult movement to overwintering sites.

Peak wavelengths of light produced by blacklights are more efficient than the wavelengths produced by other types of lights for trapping coccinellids (Nabli et al. 1999, Biol. Contr. 16: 185-188). The present data indicate that blacklight trapping is an effective method for monitoring field populations of adult *H. axyridis*. Tedders (in: Weaver-Missik 2000, USDA ARS News and Information http://www.ars.usda.gov/is/pr/2000/001030.htm) also found that a modified blacklight trap design worked well for mass trapping adult *H. axyridis* within enclosed buildings. Within our Minnesota agricultural landscape, blacklight trapping was much less efficient for other coccinellids. For example, throughout the entire 2002 season (i.e., 14 May to 4 September), only 66 *Hippodamia tredecimpunctata tibialis* (Say), 2 *Coccinella septempunctata* L., 1 *Coleomegilla maculata* (DeGeer) and 1 *Cycloneda munda* (Say) were caught in the blacklight trap, compared with 325 *H. axyridis*. Several possible explanations exist for the disparity in trap catches of *H. axyridis* compared to other coccinellids. Trap placement may lead to certain species being caught, while others are not (e.g., Honêk 1977, Acta Ent. Bohemoslov. 74: 345-348). The combination of local aphid abundance and temperature may also influence catches of coccinellids in light traps (Honêk and Kocourek 1986, *In* Hodek [ed.], Ecology of Aphidophaga. Prague and Dr. W. Junk, Dordrecht). Finally, following several years of establishment, the abundance of *H. axyridis* across the landscape may now be substantially greater than that of the aforementioned coccinellids.

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