

THE OCCURRENCE OF *HARMONIA AXYRIDIS* (PALLAS)
(COLEOPTERA: COCCINELLIDAE) IN CANADA

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In a study on the population dynamics of the predators of insect pests in apple orchards of Quebec, three specimens of the Asian coccinellid *Harmonia axyridis* were found. This is the first occurrence of this species in Canada.

Sampling was done from 1992 to 1994 in four apple orchards in the Montreal region (45°30'N, 73°36'W). At each site, coccinellids were recorded weekly from May to September by visual observation of 10 trees selected following a systematic design. Each tree was sampled at two vertical levels (bottom and top of the canopy) and four horizontal levels (four cardinal points). Random sampling was also carried out in different ecosystems across Quebec.

The first specimen of *H. axyridis* was a fourth larval instar found on 1 August 1994 in an apple orchard at Frelishburg, Quebec (45°30'N, 73°36'W). It was located at the bottom of the east side of the canopy of a dwarf apple tree in the presence of a large colony of the green apple aphid, *Aphis pomi* De Geer. The second specimen was an adult found on 5 August 1994 on wheat in the vicinity of an apple orchard at Ile Perrot, Quebec (45°30'N, 73°36'W). The third specimen was an adult found on 13 September at Baie St-Paul, Quebec (46°35'N, 72°12'W) on *Solidago* sp. All specimens were of the *succinea* form; the elytra are yellow orange with black spots arranged in 2-3-3-1 on each elytron (Ayala 1978). *Harmonia axyridis* is represented by more than 100 morphs (elytral pattern and color) (Iablokoff-Khnzorian 1982; Ayala 1978).

Principally arboreal, *H. axyridis* is found in orchards and on coniferous (McClure 1986) and deciduous trees (Iablokoff-Khnzorian 1982; Chapin and Brou 1991), but also in gardens and annual crops (Hodek 1973; Iablokoff-Khnzorian 1982; Sakurai et al. 1988; Schanderl 1987). It is principally aphidiphagous (Hodek 1973; Schanderl et al. 1985), but also feeds on scale insects (McClure 1987) and on psyllids (Iablokoff-Khnzorian 1982).

Harmonia axyridis is a Palearctic species originating from the Far East. The beetle occurs in Korea, Japan, Bonin Islands, China, Himalayas, Formosa, and Siberia (Iablokoff-Khnzorian 1982; Sasaji 1971; Timberlake 1943). It was introduced into France in 1982 from China and it is used as a biological control agent in orchards (Ongagna et al. 1993). Releases were also done in the Azores Islands, Portugal, by Schanderl et al. (1991). In North America, *H. axyridis* was successfully introduced in 1916, 1964, and 1965 to Hawaii and California from Japan (Iablokoff-Khnzorian 1982). More recently, from 1978 to 1982, it was released from a Japanese population to the eastern United States but it was not recovered until 1982 (Chapin and Brou 1991). It is now established in southern Louisiana and eastern Mississippi (Chapin and Brou 1991; Gordon and Vandenberg 1991). Large numbers were found in New Hampshire in 1994 (Eaton, pers. comm.).

This coccinellid shows two types of diapause: a hibernation (true diapause) and an estivation that is a facultative dormancy (Sakurai et al. 1988). In late autumn, the adults migrate to hibernating sites where they aggregate to survive winter (Obata 1986). According to Voronine (1965, in Iablokoff-Khnzorian 1982), who studied the species in Siberia, *H. axyridis* shows great resistance to winter conditions. After overwintering, mortality was 16.5% and adults supported temperatures reaching -30°C for a short period. However McClure (1987), who studied the beetle in Connecticut, suggested that its ability to survive winter conditions in the northeastern United States is poor. He found that only 10% of adults placed in field cages survived (McClure 1987). The experimental conditions were not

optimal and probably underestimated the ability of this coccinellid to survive winters with the heavy snow cover we experience in Quebec. Even with a mortality of 90%, the survival success of *H. axyridis* is similar to the rate found for the Nearctic coccinellid *Coleomegilla maculata lengi* Timb. in southern Quebec (Coderre, unpubl. data).

Harmonia axyridis was found to be the best biological control agent tested in the laboratory against the aphids *A. pomi* and *Aphis citricola* van der Goot, the spider mite *Tetranychus urticae* Koch, and the obliquebanded leaf roller, *Choristoneura rosaceana* Harris (Lucas 1994; Demougeot 1994). Its presence in Quebec, its high fecundity (2300–3800 eggs per female) (Hukusima and Kamei 1970, in Hodek 1973), and the possibility to rear this coccinellid successfully on eggs of *Anagasta kuehniella* Zell. (Lepidoptera: Pyralidae) (Schanderl et al. 1988) favor its mass production and inundative releases across Quebec. However, further studies on the possible negative impact of its presence on the native coccinellid species and other non-target arthropods must be done beforehand.

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