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Abstract: *Harmonia axyridis* is a stronger intraguild predator of other ladybirds than are many other ladybird species. A correlate of this is that *H. axyridis* is better at resisting the toxic effects of the alkaloids of allospecific ladybird prey. This makes *H. axyridis* an ideal species with which to investigate the adaptations of predators to feeding on potentially toxic chemically defended prey. In this paper we discuss recent studies that, for the first time, have thrown light on the nature of and mechanisms involved in *H. axyridis* alkaloid resistance. We focus on the finding that *H. axyridis* is relatively poorly adapted to prey containing novel alkaloids in areas where it is exotic and on the fate of suitable and unsuitable prey alkaloids after ingestion by the intraguild predator.

Abstract: Chemical defence has long been considered to play some sort of role in relation to colour pattern polymorphism in ladybirds. A recent idea is that intraspecific variation in colour or pattern is an indicator of the strength (i.e. concentration) of defensive chemicals in the individual. This has received support from a recent study showing that in non-melanic *Harmonia axyridis* the proportion of the elytra that is orange is positively correlated with the concentration of the alkaloid harmonine. In this paper I discuss palatability experiments with *H. axyridis* designed to test whether the finding can be extended across colour pattern morphs, specifically whether melanic *H. axyridis* are less well defended than non-melanics. Feeding experiments using spiders (*Araneus diadematus*) and earwigs (*Forficula auricularia*) gave no indication that melanics were less well defended than non-melanics. However, the spiders exhibited a generally high level of acceptance of ladybird prey, making the detection of intraspecific differences in prey palatability unlikely, while data from earwigs is currently of too small a scale to be unequivocal. Further palatability tests are required as well as additional analytical work covering the full range of *H. axyridis* morphs and defensive chemicals.

Abstract: That *Harmonia axyridis* (Coleoptera: Coccinellidae), a grievous alien invasive species, has established in southern Africa and is spreading though the region is presently not well known outside South Africa. The first known record for the region is a capture from 2001. Establishment is hypothesised to have taken place in the south-western part of the Western Cape Province. The geographic spread of the insect through southern Africa has been recorded since 2006 and retrospectively, with information largely obtained through citizen science. Until the end of 2009, the beetle has spread widely through the more temperate southern and higher-lying eastern and east-central parts of South Africa, and has also been recorded from Lesotho. In 2009 it has additionally been recorded from localities in the hotter, drier interior of South Africa for the first time. The invader has been found in a large variety of natural and transformed landscapes and habitats. The ecological effects it may exert may ultimately be unknowable because of the absence of baseline information on coccinellid community ecology in southern Africa.

Abstract: Development of the predator *Harmonia axyridis* was studied at four constant temperatures (15°, 20°, 25° and 30°C) on two prey, *Aphis fabae* and *Dysaphis crataegi*, in laboratory conditions. Total developmental time of the predator at 15°C and 30°C was shorter on

particularly the characteristics of the founding population(s). This will also complement data currently being gathered on microsatellite genotype and endosymbiont presence to provide a powerful dataset for understanding the invasion history of this species, and, more broadly, to attempt to determine what factors might make an invasive species successful.

Abstract: Surveys were carried out in Bulgaria in 2009 to monitor the presence of the invasive harlequin ladybird, *Harmonia axyridis* (Pallas, 1773) (Coleoptera: Coccinellidae). Ladybirds were collected by beating the branches of trees and shrubs and sweeping grasslands throughout the country. The species was found in 17 localities in Bulgaria: Ardino, Belogradchik, Bladoevgrad, Botevgrad, Dupnitsa, Elin Pelin, Gabrovo, Kresna defile, Montana, Pravets, Smolyan, Sofia, Varna, Veliko Turnovo, Velingrad, Vidin and Vratsa,. Except for the natural location Kresna defile, *H. axyridis* occurred mainly in urbanised landscapes. The species was more often found in Western part of the country. The species was found exclusively on broadleaved trees heavily infested by aphids: *Acer pseudoplatanus* L., *Cornus sanguinea* L., *Fraxinus excelsior* L., *Paliurus spina-christi* Mill., *Populus nigra* L., *Quercus rubra* L., *Quercus cerris* L., *Tilia cordata* Mill. and *Tilia tomentosa* Moench. The pathway of introduction of the ladybird in Bulgaria is not clearly known. Although releases of *H. axyridis* were carried out in Bulgaria and Greece in the 1990s, the present invasion is most probably due to populations coming from the West. The invasion of *H. axyridis* in Bulgaria is still at an early stage and despite the first observation of the species in 2008, it seems that it started to spread in summer 2009 from populations of Sofia.The infestation by *Eucallipterus tiliae* (L.) on *Tilia cordata* Mill. clearly facilitated the natural spread of *H. axyridis* in Bulgaria.

Abstract: Larval development time and fresh body mass of newly emerged adults are widely used quantitative parameters characterizing food suitability. These parameters were measured in the ladybird *Harmonia axyridis* with nine different aphid species. We calculated suitability parameter SL = *m*/*t* (mass divided by developmental time), and ranked the aphid species studied accordingly: *Aphis philadelphi* (2.6), *Aphis fabae* on *Rumex* (2.5), *Aphis spiraephaga* (2.0), *Acyrthosiphon pisum* (1.8), *Rhopalosiphum padi* (1.7), *Acyrthosiphon ignotum* (1.6), *Dysaphis plantaginea* (1.5), *Hyadaphis tataricae* (1.4), *Aphis sambuci* 2009 (1.3), *Aphis sambuci* 2008 (1.1). Conspecific eggs were moderately suitable (1.7). When larvae were reared together in 0.5l glass jars, the developmental parameters were better than when reared individually in 7 or 15cm Petri dishes in combination with most aphid species. Sexual differences in fresh mass (females being 1.1 to 1.2 times heavier) but not in developmental time were found. Some prey species which are well suitable for large larvae were found not so good for young ladybird larvae due to the large body size of these aphids.

Abstract: In its introduced range, the invasive coccinellid *Harmonia axyridis* (Coleoptera: Coccinellidae) threatens many non-pest insects through competition and predation, and this raises the need for appropriate control measures to be investigated. One strategy could be to consider the introduction of natural enemies (predators, parasites and pathogens) that regulate *H. axyridis* populations in its native range. Indeed, escape from natural enemies is likely to have contributed to its invasive success (the so-called ‘enemy release hypothesis’). However, re-uniting *H. axyridis* with its own enemies requires rigorous and time-consuming risk assessment to ensure there are no

unwanted side effects on native species. Moreover, the introduction of alien enemies may be unnecessary if the organisms that attack native ladybirds in Britain also attack harlequins. Here we present field data which indicates that two species of parasitoid wasp: *Dinocampus coccinellae* (Hymenoptera: Braconidae) and *Oomyzus scaposus* (Hymenoptera: Chalcidoidea); and two species of parasitoid fly: *Phalacrotophora fasciata* and *Phalacrotophora berolinensis* (Diptera: Phoridae) may be adapting to *H. axyridis* in Britain as a novel and abundant host. This may provide some level of natural population control.

No abstract

Abstract: Although *Harmonia axyridis* has been recorded as an intraguild predator of various aphidophagous coccinellids, little is known about its interactions with other aphid natural enemies. We assessed the intraguild interactions between *H. axyridis* and four non coccinellid aphid natural enemies (two species of parasitoid plus two larval stages of lacewing). Petri dish trials showed that *H. axyridis* is an intraguild predator of 2nd instar lacewing (*Chrysoperla carnea*) larvae but not 3rd instar larvae. Predation of *Aphidius ervi* and *Praon volucre* parasitoid pupae was only observed occasionally. Experiments at a larger spatial scale and in more complex environments are needed to determine whether these interactions are ecologically important. The effect of alternative prey density and alternative prey species was assessed on whole plants in insectary cages. The density of alternative prey (pea aphid) did not affect predation of 2nd instar *C. carnea* by *H. axyridis* on bean plants. In contrast, aphid species may have an effect on aphid predation and intraguild predation.

Abstract only

Abstract: Nordmann fir (*Abies nordmanniana*) Christmas trees are a high value crop and quality demands are high. The adelgid *Dreyfusia nordmannianae* is the key pest in the production of Christmas trees, feeding on current-year foliage and causing needle distortion. Laboratory assays were carried out to evaluate the potential of *Harmonia axyridis* as a biocontrol agent in Christmas tree plantations. Differences appeared in the predation efficiency of larvae and adults as well as in the suitability as prey of different adelgid generations and developmental stages. *Harmonia axyridis* preferred and performed better on aphids belonging to Aphidoidea than on an adelgid diet. Our laboratory results indicate that *H. axyridis* may not be a highly effective biocontrol agent against *D. nordmannianae*. However, *H. axyridis* may assist in the natural regulation of the increasingly common lachnid *Cinara confinis* in Christmas tree plantations.