The importance of host specialization in insecticide resistance of the green peach aphid Myzus persicae

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Abstract

Host-parasite interaction leads to dynamic arm race between host defense and parasite weapons. A possible consequence of this co-evolutionary arm race is host specialization leading to the emergence of host races. In herbivorous insects, the genetic isolation that results from this host specialization can have important impact on the response of the insect to anthropogenic pressure such as pesticide resistance. Host specialization alters spatial and temporal distribution of insecticide resistance but insecticide resistance can also alter host specialization.
In our study, we focused on the green peach aphid *Myzus persicae*, a polyphagous pest that have evolved resistance against all of the main insecticide classes. This species exhibit a complex reproduction system alternating sexual reproduction in autumn on *Prunus* sp. and parthenogenetic reproduction on a wide range of herbaceous host species. Resistant populations to pyrethroid and carbamates insecticides have been observed on a lot of cultivated hosts. On the contrary, populations resistant to neonicotinoids have mostly been isolated on peach tree, despite neonicotinoids were widely used in agriculture. Population genetic has suggested that aphid populations are strongly differentiated between peach tree and, rapeseed and tobacco.

We investigated whether plant specialization could explain the apparent host compartmentalization of *M. persicae* and whether insecticide resistance could alter it. Populations of *M. persicae* were sampled at the onset, during and at the end of the epidemics in two restricted geographical areas in South-Eastern France. We evaluated their resistance genotypes and compared their performance (establishment, fecundity) on different host plant species in the lab.
Our results suggest that migration between peach tree and rapeseed occurred but that aphid's fitness depends on plant host. Aphids perform better on their original host. The role of the detoxifying gene *Cyp6cy3* is confirmed for populations on tobacco. These results offer interesting hypothesis on why resistance to neonicotinoids have been mainly restricted so far to populations sampled on peach tree.

Keywords: insecticide resistance, host specialization, life history traits, holocyclic aphid

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