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"Resilience of agricultural systems against crises"

Characterisation of Insecticide Resistance in Clonal Cultures of *Myzus persicae* (Homoptera: Aphididae) Obtained from an Italian Field Population in 2010

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Abstract

Green peach aphid, *Myzus persicae* (Sulzer) is globally known as a polyphagous sucking pest insect on a wide variety of host plants and provides damage by direct feeding, transmission of plant viruses and honeydew excretion. To keep the pest under economic thresholds it is usually controlled by chemical insecticides belonging to different mode of action classes. Due to the frequent use of insecticides such as pyrethroids, carbamates, organophosphates and neonicotinoids, *M. perscae* developed resistance and is no longer affected by recommended rates of many compounds. This study was conducted to characterise the resistance mechanisms in clonal cultures derived from an Italian aphid population collected in 2010. Eight clones were investigated for their susceptibility towards three different insecticide modes of action by discriminating dose bioassays. The results revealed high resistance levels to pirimicarb (carbamate) and deltamethrin (pyrethroid), but moderate levels of resistance to imidacloprid (neonicotinoid). All clones were also biochemically investigated for the presence of metabolic resistance mechanisms such as esterase overexpression as well as target-site resistance, *i.e.* the presence of SNP´s (single nucleotide polymorphisms) in genes of target proteins which convert into amino acid substitutions leading to target-site insensitivity. A high level of esterase E4/FE4 was present in all clones. Acetylcholinesterase inhibition studies revealed insensitivity to pirimicarb which is linked to a heterozygously present S431F mutation as shown by pyrosequencing. Furthermore the well-known kdr mutation (L1014F) was identified in the voltage-gated sodium channel. Interestingly we did not detect the commonly known M918T super-kdr mutation, but identified for the first time in Italian *M. persicae* a M918L mutation, another super-kdr-like mutation. All these mutations result in pyrethroid resistance. The implications of the presence of multiple mechanisms of resistance in resistance management strategies are discussed.

Keywords: Insecticide resistance, *Myzus persicae*, pyrosequencing

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