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Reliability of resistance monitoring on diapausing larvae of codling moth (*Cydia pomonella* (L.))

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Resistance monitoring in *Cydia pomonella* (L.) (Lepidoptera: Tortricidae) have been mainly performed on non-target instars, and currently, topical application on diapausing larvae is a widely used method. However, high differences in resistance ratios according to the developmental stage have already been documented, and laboratory results are not ever consistent with observed field situations. Relating the expression of resistance mechanisms with resistance of a given instar to various insecticides could simplify the monitoring procedure.

We used topical application on diapausing larvae to evaluate the susceptibility to ten insecticides of four laboratory strains and 47 field populations, on which resistance mechanisms were also analyzed. All populations seemed to be less susceptible than the susceptible laboratory strain for at least one insecticide. The resistance to five of the studied insecticides was significantly correlated with the activity of enzymatic detoxication systems mainly mixed function oxidases and Glutathion S-transferase, while target site mutations were not related to any reduction of susceptibility.

For a few populations, assays on first instar larvae and field trials were also performed. Results were not always consistent with those of topical applications. Monitoring tests using diapausing larvae tends to overestimate the magnitude of resistance. Otherwise, the spectrum of insecticide resistance cannot ever be explained by known resistance mechanisms. Bioassays therefore remain a necessary tool for resistance monitoring, and topical application on diapausing larvae allows a rapid and large-scale evaluation. However when a resistance is pointed out by such bioassay, it still has to be confirmed with a more reliable method involving the target instar of the insecticide.

Key words: *Cydia pomonella*, insecticide resistance, monitoring, bioassay, resistance mechanism

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