Novel approaches in monitoring effects of pesticide products on wild small mammals

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ABSTRACT

A field experiment was conducted in Southwest France where small mammal populations were monitored in azinphos-methyl (OP insecticide) treated pome fruit orchards. Small mammal abundance within the orchards was regularly measured by live trapping which followed a Capture-Mark-Recapture design. The presence of rodents and their surface activity was further determined by thermal image camera observations before and after azinphos-methyl applications. In order to closely monitor the fate of selected individuals after application, rodents were tagged with radio transmitters. The radio tags were provided with a thermo-sensitive unit which controlled the frequency of the emitted signal according to (body-)temperature. The special feature of these tags allowed not only locating animals at any time but also to check the vital status and detect any incidents at the same time. Thorough carcass searches at different days after the application were also undertaken. No effects from the applications of azinphos-methyl were observed. The different methods applied were considered a robust approach to assess potential impacts on the natural small mammal community under practical use conditions of a plant protection product in the field.

INTRODUCTION

EU Directive 91/414/EEC requires that crop protection products should have no unacceptable effects on non-target organisms like wild vertebrates. The present study aims at refining the risk resulting from azinphos-methyl by investigating the impact of commercial spray applications with this OP insecticide on the natural small mammal community in pome fruit orchards in Southwest France.

METHODS

The study was conducted in a typical pome fruit growing area in Southern Europe. The trial sites were located to the west of Montauban, in Southwest France. Six applications of Gusathion WP (25% w/w azinphos-methyl, 750 g and 450 g a.s./ha) were monitored in four independent pome fruit orchards. A combination of different methods was applied to assess potential impacts of azinphos-methyl on the natural small mammal community.

Scansampling with thermal image camera

to asses small mammal surface activity before and after azinphos-methyl applications. Defined areas within orchards were regularly scanned for presence of small mammals from dusk till dawn at DAT -1, 1 and 3.


thermal image camera


wood mouse in view-finder of thermal image camera

Live trapping following a CMR (Capture-Mark-Recapture) design

to assess small mammal abundance (**MNA**, Minimum Number Alive) from one week prior to the application until two weeks after the last application of azinphos-methyl and to follow the fate of marked individuals after applications. Trapping was conducted with 100 live traps each per trial orchard on two consecutive nights per week.


Ugglan live trap


individual marking with PIT (Passive Integrated Transponder)

Effect-telemetry using thermo sensitive radio collars

to monitor the fate of selected individuals until DAT 8. Monitoring implied checking the location and survival. By means of the thermo sensitive unit of the tag, the signal frequency enabled an estimation of the animal's vital status. If the signal was fast (if thermo sensitive unit is cooler than body temperature), the tag was searched to check whether the animal had died or just lost the tag. Radio-tagged small mammals (wood mice, common vole) were repeatedly checked for 24h after the application and then daily for presence and survival until DAT 8.


vole with thermosensitive radio tag

Carcass searches

to detect any lethally affected mammals after the application of azinphos-methyl. These searches were performed on DAT 0, 1, 4 and 7 by a team of at least 4 staff members slowly walking between the tree lines and thoroughly searching for carcasses.


carcass search

RESULTS AND DISCUSSION

Surface activity and abundance of small mammals inside the orchards observed by thermal image scan sampling (number of mice and voles/ha) and live trapping ('Minimum Number Alive') were not affected by azinphos-methyl applications. In 29 out of 38 telemetry periods, the survival of the radio-tagged rodents was proved until DAT 8. For the remaining 11 telemetry periods survival was proved until the animal left the study area, lost its tag or died from predation (three weasel kills) or other reasons not related to azinphos-methyl as verified by laboratory analysis. No carcasses were found during carcass searches.

None of the applied methods revealed any impacts on the survival of small mammals due to application of azinphos-methyl in pome fruit orchards.

The range of different methods applied represents a robust approach in detecting possible impacts on small mammals exposed to applications of azinphos-methyl in the field under practical use conditions of the product, both on the community level by thermal image scansampling and carcass searches, and on the individual level by live trapping and telemetry.