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Abstracts

Residues of insecticides in leaves of *Aesculus hippocastanum* and effects on the horse chestnut leafminer (*Cameraria ohridella*) following trunk application

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In the last years the horse chestnut leafminer has spread over most parts of Europe. In the opinion of experts [1] there is currently no risk of the white *Aesculus hippocastanum* to die out due to the leafminer. Leaf damage results in an earlier fall of leaves and clearly reduces net primary production. Important functions for urban sites such as dust filtering and balancing of temperature amplitude are lost. All of these reasons bring tree nurseries closer to choose other tree species than *Aesculus hippocastanum* for new plantings at urban places. Some biological and chemical control measures against the horse chestnut leafminer were tested with different successes [2]. Especially in case of trunk (depot) application of plant protection products there is little knowlegde about the fate and behaviour of insecticides. Pesticide concentration in leaves is important from the ecotoxicological point of view to assess the effects on beneficial organisms and on the decomposition of fallen leaf litter. Organophosphate dimethoate was applied to adhesive tapes mounted to twenty years old horse chestnuts at full flowering in 2005 and at other trees at budding in 2006. In 2006 at the beginning of flowering, neonicotinoid acetamiprid was sprayed to trunks of twenty and eighty years old trees at different application rates. To estimate mortality, efficiency and parasitation, alive, dead and parasitizing leafminers were counted. Sampling took place at the end of the first and second leaf miner generation. Sampling of leaves for residue analyses was carried out four times beginning 6 days (acetamiprid) and 13 days (dimethoate) respectively after application until the end of September in all variants only in 2006. At flowering, pollen was collected for analysis of dimethoate. Sufficient control of leafminers was achieved only by dimethoate in the year of application. Maximum values of dimethoate applied in 2006 were 1-5 mg/kg. Acetamiprid residues were found only in the first samples taken after application and showed high deviations. All variants showed low efficency of acetamiprid independent of the application rate. For both pesticides, the parasitization rate of chalcidoid wasps was mostly higher in the treated variants than in untreated trees.

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Who benefits from low-input pesticide use within the tritrophic system: crop – aphid – predator?

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Effects of low-input pesticide use on the tritrophic system crop – aphid – predator were investigated in field and laboratory studies.

The field study was carried out in a conventional farm of the high-input crop protection area Magdeburger Boerde from 2004-2006 using half-field comparisons. Three fields were divided into two halves during the whole period of investigation representing low- and high-input variants. One half was characterized by 50% reduced pesticide doses and the other one by good plant protection practise (100%). Here, the results of one field are presented. The crop rotation of this field was: spring wheat (2004), winter wheat (2005) and pea (2006). The following bioindicators were investigated before and after insecticide application: densities of aphids and their predators on plants (counts) as well as activity densities and diversity of carabids on ground (pitfall trappings).

Cereal aphids (*Sitobion avenae*, *Metopolophium dirhodum*, *Rhopalosiphum padi*) and pea aphids (*Acyrthosiphon pisum*) were insufficiently reduced by insecticides in the low-input field. In all three years statistically significantly more aphids were found in the low-input variant in comparison to the high-input variant. The abundance of aphid specific predators, e. g. adults and larvae of coccinellids and syrphid larvae, was positively affected by the low-input pesticide use. In all years statistically significantly more aphid predators were observed in low-input-field than in high-input-field. But no clear effect of reduced insectides use on abundance, structure of dominance, and diversity of carabids could be observed.

It is concluded, that the potential of natural regulation was enhanced by reducing the insecticide input, but the regulation itself was not improved. Indeed, the risk potential of insecticides for predators was decreased. But aphids benefited to a greater extent than their predators from reduced insecticide use.

The laboratory study was carried out in climate chambers investigating the tritrophic systems: wheat – aphid – predator and weed – aphid – predator by applying different dosages of insecticides. In contrast to the field study aphids could be sufficiently reduced by low-input insecticide dosages. In some cases (weed – aphid- predator) the dosage of insecticide could be reduced even more by utilisation of the predator potential to receive a good pest control.

But its difficult to transfer the results of laboratory studies to field conditions. It could come to an overestimation of the potential of natural regulation by a predator.

Impact of Low-input pesticides usage on spider communities with special regard to accumulated effects

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Reduction programs are designed to reduce chemical plant protection to a minimum. The intensity of plant protection can be measured by the treatment frequency index (Behandlungsindex or BI). This study is interested in the ecological impact of a long-term reduction of chemical plant protection in commercial crop cultures. It investigates the effects of a 50 % reduction on *Araneae* at three fields in Ochtmersleben (Saxony-Anhalt). Each field was equally divided in a 100% and a 50% application variant. The analysis was based on qualitative and quantitative parameters such as activity density, species diversity, pattern of dominance as well as other computed parameters. Data on spiders were collected during a five-week-catch period in 2003 – 2006. In 2003, field 1 was cultivated with winter wheat (100 % application, BI 3.5 vs. 50 % application, BI 1.9), field 2 with spring wheat (100 %, BI 4.6 vs. 50 %, BI 0.8) and field 3 with sugar beet (100 %, BI 5.4 vs. 50 %, BI 2.7). In 2004 plots of peas (field 1 100 %, BI 2.9 vs. 50 %, BI 1.4), winter wheat (field 2 BI 5.4 vs. BI 3.3) and spring wheat (field 3 BI 5.8 vs. BI 4.0) and in 2005 winter wheat (field 1 3.8 BI vs. 2.1 BI), peas (field 2 4.1 BI vs. 2.2 BI) and winter wheat (field 3 6.25 BI vs. 3.3 BI) and in 2006 winter barley, (field 1 5.2 BI vs. 3.4 BI), winter wheat (field 2 4.5 BI vs. 3.4 BI), peas (field 3 3.8 BI vs. 1.9 BI) were investigated. Insecticides were applied from 2004 till 2006. Results: In 2003-2006, 20,511 spiders belonging to 69 species out of 15 families have been documented. Activity density peaked in the 50 % variant on all fields (field 1: 5,034, field 2: 3,858, field 3: 3,215 spiders). It was lowest in field 3 (100 %) with 1,949 spiders. In 2005 and 2006, *Araneae* activity was significantly higher in the 50% section of field 3 even before insecticide applications started. This could be interpreted as a hint to accumulated effects of long-term reduction programs. The intensity of plant protection also influenced the species diversity in 2 of 3 cases: field 1: 50 %, 38 species, 100 %, 43 species, field 2: 50 %, 40 species, 100 %, 29 species; field 3: 50 % 37, 100 %, 33 species. The Linyphiidae had the biggest share in the spider population. Typical open-land inhabitants were abundant (*Oedothorax apicatus, Erigone atra, E. dentipalpis*) in all treated plots.

There were no significant shifts in dominance structures between the variants. The results indicate that the impact of insecticides on the spider population was the stronger the earlier insecticides were applied. In summary, a 50 % long-term reduction of chemical plant protection did have positive effects on spider coenoses.

Effects of different control measures against the olive fruit fly (*Bactrocera oleae* (Gmel)) on beneficial arthropod fauna: Methodology and first results of field assays

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The olive fruit fly (*Bactrocera oleae* (Gmel)) is the most important pest in olive groves, causing every year important quantitative and qualitative losses in the main olive crop areas. In olive IPM programs bait sprays (insecticide and attractant mix) and mass trapping are recommended against this pest. Bait sprays are applied to a small part of the foliage to minimize effects on non-target organisms, but it is necessary to study how these treatments damage beneficial arthropods in real conditions. On the other hand, mass trapping devices attract and kill many other arthropods than olive flies but this effect has never been evaluated. Finally, protective barriers of kaolin are been tested against olive pests in the last few years with good results, but their effects on natural populations of beneficial arthropods are also unknown.

To study these effects on beneficial arthropods in an olive grove in Madrid, beneficial arthropod fauna was monitored in test plots under four different pest control strategies against the olive fruit fly: Trichlorphon bait sprays (Trichlorphon + protein hydrolyzate (Nulure®), Spinosad bait sprays (Spintor® Cebo), Kaolin sprays and Mass-trapping (Easy-trap® + Nulure®). Arthropods were sampled monthly or every other week by a beating method and captured specimens were classified in 4 groups: olive pests, predators, parasitoids and other arthropods.

During the studied period (1 year) bait treatments (Spintor or Trichlorphon) and mass-trapping did not cause significant effects on populations of beneficial arthropods, but a progressive reduction of parasitoids and predators was observed in samples from plots sprayed with Kaolin. However, a longer time period of study will be necessary to confirm the effect of the different control strategies on the evolution of arthropod populations.

Impact of Success Bait (a.i. spinosad) against *Rhagoletis cerasi* on insect fauna in field test

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Cherry fruit fly is the most important pest of cherries in Croatia. Pest control against the cherry maggot in commercial orchards is difficult because of cherry fruits ripening time and long life of insecticides. In Croatia organophosphate insecticides and synthetic pyrethroids are recommended for the control of *Rhagoletis cerasi*. In the frame of IOBC definition for Integrated Production, priority should be given to ecologically safer methods, minimizing the undesirable side effects to enhance the safeguards to the environments and human health.

Spinosad is one of the Naturalytes that is recommended against Vine moths in Croatia. Plant protection against fruit flies in IPP uses attract and kill technique as ecologically safer method.

Success Bait is recommended for control of Med fly in citrus orchards and olive fruit fly on olives in Croatia. We want to know efficacy of Success Bait against *Rhagoletis cerasi* and its advantages in comparison with common insecticides against European cherry fruit fly.

Investigation was carried out in a commercial sour cherry orchard of Borinci near Vinkovci, Slavonia County in Croatia. Experiment with Success Bait was done on 0.5 ha of cherries; organphosphate insecticides and synthetic pyrethroids treated on the other part (25 ha) of the cherry orchard. When the cherries were ripe infestation evaluation was checked on several hundreds of fruits. The fauna observation was carried out in both plots eight days after treatment by branch-beating method.

The first results of the experiment have shown the same efficacy on *Rhagoletis cerasi* in the different tretaments, and more beneficial insects were present in the part where Success Bait was used than in the part where pyrethroids and OPs insecticides were used.

Effects of bait sprays to control the European cherry fruit fly (*Rhagoletis cerasi* L.) on aphid predators

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The European cherry fruit fly (*Rhagoletis cerasi* L.) is the most serious pest of cherries in Europe. For long years broad spectrum and acute toxic insecticides, mainly organophosphates, have been used for its control. In search of environmentally safer control methods, good results have been obtained in first experiments using bait sprays (Köppler et al., 2006, 2007). They consist of a mixture of food baits (proteins, sugar) with small amounts of insecticides and are only applied to parts of the tree canopy. To study the effects of these bait sprays on beneficial insects, we carried out laboratory, extendend laboratory and semi-field tests, according to IOBC methodology. We used a 20% solution of GF-120™ Naturalyte Fruit Fly Bait (a.i. 0.02 % spinosyn A and D; water, sugars, proteins 99,98%) and a self made Neem bait, containing 5 % NeemAzal®-T/S (a.i. 10g/l Azadirachtin), mixed in a sugar-brewers yeast solution (4:1:7). Test organisms were *Chrysoperla carnea* and *Coccinella septempunctata*.

In **laboratory tests** (exposure on glass arenas to 5 x 5 µl bait trops, food *ad libitum*), the effects (according to Abbott) on lacewing larvae were low, whereas survival and development to healthy adults of coccinellids was reduced by 50% in the GF-120 treatment and by 100% in the neem treatment. Survival of adult lacewings, exposed for 3 days to 5 x 5 µl bait trops and provided with food supply, was reduced by 40 % in the GF-120 treatment, whereas no mortality was observed in the neem treatment. Both bait treatments did not affect adult coccinellids within 3 days, when these were exposed in the same way as the lacewings adults.

In order to imitate more realistic conditions, **extended lab tests** with bean plants were carried out. Trays with 24 bean plants, 6 of these treated with the bait spray were used as test arena. The bean plants were infested with pea aphids (*Acyrthosiphon pisum*) as food supply. The experiment was run in a greenhouse. GF-120 reduced larval development of *C. carnea* to healthy adults by 44 %, the neem bait by 40 %. Both treatments resulted in lower egg production: neem exposed adults produced 39%, GF-120 exposed adults 20% less fertile eggs. The same test with coccinellid larvae resulted in very harmful effects of the neem bait (98% Abbott), whereas GF-120 was harmless. When the number of bean plants treated with neem bait was reduced to 1, 2, or 3 plants of 24, Abbott mortalities of the coccinellids amounted to 77.4, 88.7 and 96.2 %, respectivley.

A further test with coccinellid larvae following this scheme was run as **semi-field test** under partial exposure to outdoor conditions in July. In this test, we used neem baits with lower concentration of the insecticide, i.e. 0.5 %, 1 % in comparison to the 5% mixture, and only 2 bean plants of 24 were treated. Still, the neem bait caused high mortalities > 90 %.

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Earwig phenology shapes predation potential and side-effect vulnerability

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Prolonged use of natural occuring beneficial arthropods in a perennial crop system requires complete understanding of their phenology. Knowledge on abundance of specific life stages allows the prediction of highest potential impact against specific pests through correlation with pest life cycles. Furthermore, this knowledge enables growers to minimize side-effects of potentially toxic crop protection by adapting application timing. This is especially important in beneficials with a univoltine life cycle, which may suffer cumulative side-effects throughout their lifetime.

The common earwig, *Forficula auricularia* is an important generalist predator which is beneficial in top fruit, but can be a pest in soft fruit crops. For two years, we monitored the presence of earwigs in apple and pear orchards. Earwigs occupy three different strata during different periods in their life cycle: earwig adults hibernate underground, where females provide broodcare to the first larval instar. Subsequent instars move first to undergrowth, then into the fruit trees. Migration from soil to tree of third instar nymphs is steered by temperature rather than prey seeking as we see no difference in timing in different pear or apple orchards, each with specific pest spectra. In most, but not all orchards, earwigs produce a small second brood in summer, this has an important effect on total population at the main mating and pair bonding period in September.

When comparing earwig phenology with common crop protection schemes in apple and pear orchards, we can identify danger periods for products with specific modes of action. Direct exposure of different life stages is possible from end of May until October, early spring applications should only pose problems through possible indirect exposure as females and brood live in underground nests. At this moment it is unclear whether foraging females might be exposed while foraging or bring contaminated food items to their brood.

Side effects of pesticides on the European earwig *Forficula auricularia* L. (Dermaptera: Forficulidae)

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Studies on the population of the European earwig *Forficula auricularia* L. (Dermaptera: Forficulidae), a generalist predator in organic and integrated managed orchards in Belgium revealed some inter-orchard differences in dynamics and size. In apple and pear orchards, only sufficiently large earwig populations can contribute to pest control. As earwigs have a single generation per year, potential side effects of crop protection is likely to influence population dynamics.We conducted several field trials in spring and summer of 2005 and 2006. Some insecticides proved to reduce earwig numbers, and some long lasting effects could be observed. On the contrary, results between trials were not always homogenous, so possibly some external factors (application timing, life stages,...) could influence the outcome of the trials. In 2007, a series of laboratory experiments were set-up to screen multiple active ingredients. We compared direct spraying, indirect contact and transmission through food items. A combination of contact with and ingestion of sprayed bean leaves is tested on a larger scale and will be discussed.

KEYWORDS: *Forficula auricularia*, insecticides, beneficial

A 2-year field study of *Coccinella septempunctata* in peach orchards treated with chemically modified and normal Bt-based insectide

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In order to improve the stability of Bt-based insecticide, the parasporal crystal of *Bacillus thuringiensis* (Bt) was modified chemically with para-Aminobenzoic acid. The study took place during the vegetation seasons of 2005 – 2006 in peach yards in Pinggu country, North China. Chemically modified Bt-based insecticide and normal Bt-based insecticide were sprayed respectively in peach yards. The test peach yards were colonized by a typical beneficial organism *Coccinella septempunctata* assemblage. *Coccinella septempunctata* abundance was higher in the peach yard where chemically modified Bt-based insecticide was used than in that where the normal Bt-based insecticide was used. The results show that the chemically modified Bt-based insecticide is more beneficial to *Coccinella septempunctata* than normal Bt-based insecticide.

Keywords: *Coccinella septempunctata*, chemically modified Bt-based insecticide, peach orchard, field monitoring

About the presence of beneficials in overwintering sites of *Anarsia lineatella* (Lepidoptera, Gelechiidae) in peach orchards of Northern Greece

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A report is given about the presence and abundance of beneficials in overwintering sites of *Anarsia lineatella* Zeller (Lepidoptera, Gelechiidae). The study was conducted in two important regions of peach production in Northern Greece (Veria 40.32^{o}N and Velvendo 40.16 ^{o}N). For 3 years (2005-2007) hibernacula of overwintering larva were collected from conventional and IPM peach orchards and transferred to the laboratory in order to ascertain the level and type of beneficials activity. The presence of two Braconid parasitoids was very high causing a significantly high larval mortality. In some cases almost 57% of samples inspected were parasitized. In addition, a comprehensive number of beneficial mites was also observed insight the hibernacula. Despite the fact that some of them are not directly linked with the predation of *A. lineatella,* they had a high presence during the years. Moreover, most of the observed species belonged to the families Phytoseiidae, Pyemotidae and Tydeidae. The observations attest the fact that the overwintering sites of *A. lineatella* provide an important microenviroment of beneficials activity. Considering the increasing interest in biological control and the fact that all the above mentioned beneficials are subject to mortality induced by pesticides, the different strategies for the control *A. lineatella* in Northern Greece peach orchards are discussed.

Request for information on the need of taxonomists of pest organisms and beneficials

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This presentation is not a result of any studies but rather a call for information.

The request concerns the present situation related to the lack of taxonomists. Especially experienced taxonomists holding a permanent position in museums or other related institutions and who can assume long-termed responsibility for a specific taxa group are rare. The situation is even worse for specialists in the field of pest organisms or taxa important for biological control. Already a rough query of taxonomists employed by German museums and their special fields demonstrates a strong bias towards "popular" taxa, while no German museums hold e.g. a specialist for aphids.

Though there is a rising awareness for the need of taxonomists (e.g. the "Global Taxonomy Initiative" as a programm of the "Convention of the Biological Diversity", a German campaign towards the establishing of endowed professorships in the field of botany, zoology and mycorrhiza), it is suspected that still no emphasis will be given on pest taxa or taxa important for biological control in the future. Moreover, from a German point of view, a federal master plan as a tool for directing the allocation of the taxonomists in all of the German museums does not exist.

The intention of the presented questionnaire is to illustrate and summarize the need for enhancing and engaging taxonomists of pest organisms and beneficials in the countries the participants of this meeting are coming from. The outcome of the questionnaire is planned to be used in an application for a R&D project that will be submitted to a German Federal Agency.

Fascination Insect Microcosmos: The Life of Predators and Parasitoids

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Fascinating video-macrofilm about the biology of beneficial insects and mites , their hunting and parasitizing behaviour – or – how to survive!

Is the use of some selected insecticides compatible with two noctuid endoparasitoids: *Hyposoter didymator* and *Chelonus inanitus*?

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About 10% of the horticultural crop production in Spain is concentrated in the Southeastern region, in Almeria province, where the surface of protected crops yields about 37.500 ha. Predominant species over a range of horticultural insect pests include the noctuids *Autographa gamma* (Linnaeus), *Chrysodeixis chalcites* (Esper), *Helicoverpa armigera* (Hübner), *Spodoptera littoralis* (Boisduval) and *Spodoptera exigua* (Hübner). Traditionally, the main strategy to control these pests has been the use of insecticides, and this has resulted in the development of high levels of resistance, especially within the genus *Spodoptera*. An alternative control tactic that could mitigate the development of resistance is the use of natural enemies in an integrated pest management (IPM) program. The surface under biological control has sharply increased in the last years in Spain. However, effective natural enemies of the key pests are not always available, and frequently, natural enemies of one pest must coexist with the pesticides applied to control others.

Studies were conducted in laboratory to evaluate the toxicity of three insecticides applied in the intensive horticultural areas of Spain (imidacloprid, fipronil and natural pyrethrins+piperonyl butoxide) to pupae and adults of *Hyposoter didymator* and *Chelonus inanitus*, both of them solitary endoparasitoids of several noctuid larvae. Topical application on pupae, and residual, topical and ingestion bioassays on adults of the two parasitoids, at field rates, were used to assess mortality and life span. Out of the three compounds tested, only fipronil reduced significantly the life span of emerged adults after topical treatment of *H. didymator* and *C. inanitus* pupae (90 and 75%, respectively). The life span of adults treated at field rates was significantly reduced in both parasitoids by all tested insecticides irrespective of the uptake route, with the exception of *C. inanitus* adults treated with imidacloprid. Fipronil was clearly the most toxic insecticide.

The extended laboratory test for *Aphidius rhopalosiphi*: some continued areas of debate for the methodology.

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After several years of slow evolution, a final draft version of the extended laboratory test guideline was put forward by the *Aphidius* Ring-Test Group in 2006. However, upon wider circulation, some proposals made in the guideline were challenged. It is hoped that by explaining the reasons behind certain decisions and by discussing them further (ideally at this meeting), we can move forward and finalise the long-overdue publication of the guideline.

The test method involves the treatment of pots of seedling barley, over which adult female wasps are then confined using Perspex cylinders. Since the insects are capable of flying away from repellent residues and settling on the walls of the arena, observations of the numbers walking on the plants are typically taken during the initial 3 h to confirm that exposure to the fresh residues has occurred. Wasp mortality is assessed over 48 h. The surviving wasps (ideally 15 per treatment) are then individually confined over pots of untreated aphid-infested barley for a further 24 h period and the numbers of aphids in which wasp pupae (or 'mummies') subsequently develop is recorded.

There appear to be three main areas of continued debate.

a] Why are only female wasps evaluated ?

b] How important are the repellency assessments and what happens where settling rates on the treated plants are poor ?

c] Which of the surviving wasps should be selected for the reproduction assessments; only those classed as 'alive and unaffacted', or also those appearing to be 'affected' ?

These issues will be expanded upon and, with regard to topic c], a suggestion will be made for an alternative approach to calculating treatment effects on reproduction.

Building selectivity list for open field produced vegetables

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Selectivity of pesticides to beneficial arthropods is a key data for the implementation of IPM program. In the context of field vegetables crop, a set of 16 fungicides, 16 herbicides and 13 insecticides commonly used in Belgium were tested on 5 indicator species: the parasitic hymenoptera *Aphidius rhopalosiphi* (De Stefani-Perez) (Hym., Aphidiidae), two aphid predators *Adalia bipunctata* (L.) (Col., Coccinellidae) and *Episyrphus balteatus* (Dipt., Syrphidae) and two ground-dwelling predators *Aleochara bilineata* (Col., Staphyllinidae) and *Bembidion lampros* (Col., Carabidae). Pesticides were tested according a testing scheme including a first assessment on inert substrate (glass plates for adults of *A. rhopalosiphi,* larvae of *A. bipunctata* and *E. balteatus,* sand on adults of *A. bilineata* and *B. lampros)* and, for product that were toxic, a second assessment on natural substrate (barley seedlings for *A. rhopalosiphi*, French bean plants for *A. bipunctata* and *E. balteatus* and two type of soil for *B. lampros* and *A. bilineata*). The effects of the product were assessed on basis of mortality, except for *A. bilineata* where reduction in onion fly pupae parasitism was measured. According to the final results obtained at the end of this testing scheme, the products were listed in toxicity class: green list if effect ≤30%, yellow list 30% < effect ≤ 60% and orange list 60% < effect ≤ 80%. Products with toxicity higher than 80% on plants or on soils, or that reduce parasitism more than 80% on soil were put in red list and are not recommended for IPM. Results showed that all fungicides and herbicides were included in the green list except tebuconazole and boscalid + pyraclostrobin that were labeled as yellow for *A. bipunctata*. In opposite, no foliar insecticide was totally selective for all beneficial tested. However some products are in green list for one or several species. Soil insecticides were all are very toxic for ground dwelling arthropods and classed in red list. All results obtained during this study and further upgrade will be available on www.cra.wallonie.be/selectivite. In conclusion, fungicides and herbicides tested are compatible with IPM programs. For foliar insecticides, some treatments can be used carefully according to the selectivity. But for soil insecticide treatments, their toxicity raise the question of their use in IPM programs in vegetables and the need of new compounds or development of alternative pest control programs.

Concerns and solution in non-target arthropod risk assessment for pesticide regulatory

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The criteria for risk assessment to non target organisms for pesticide regulatory in European Union (EU) are established by the Directive 91/414/EC. This directive, and the guidance document ESCORT 2 provide recommendations on how to assess the risk for the Non-Target Arthropods (NTA). The risk assessment for these organisms is divided in two parts, the in-field risk and the off-field risk, with different focus for each part. The in-field focus is an acceptable effect on NTA or, if not, especially in case of compounds with insecticide properties, a possible recovery has to be demonstrated. The off-field focus is an acceptable effect on populations being exposed to the drift-rate.

The main concerns that have to be resolved to perform these risk assessments are:

- → interpretation and extrapolation of available field studies to other crops and or areas;
- → selection of species to focus the risk assessment on for each intended use (crop);
- → selection of the type of test for each type of risk (in-field and off-field);
- → consideration of the production of active degradation products/metabolites in soil and/or plants into the risk assessment: relevance to consider each compound separately, relevance of a "toxic potency" (i.e. that would take into account the overall toxic potency of residues) concept?
- → relevance of the one-year recovery period, without consideration for uses on several crops of the rotation and of ecological considerations, particularly with regard to species diversity and ecosystem function;
- → relevance of the conclusions of the risk assessment in the sections for NTA and of soil macro organisms: as an example, how to deal with a species such as *Folsomia candida* into the risk assessment?
- → relevance of buffer zones as risk mitigation measures for NTA as suggested by the specific precautionary sentences (SPe3) of Annex V, in terms of the overall acceptability of risks;
- → need for a guidance document for plant protection products being not applied as spray of aerial crop parts.

These concerns highlight needs to better distinguish in- and off-field risks into the risk assessment. ESCORT 2 brought a significant help in assessing in-field risks, through a pragmatic tiered approach in testing, thus avoiding unnecessary tests. Off-field risks remain in part unresolved, as it is mainly considered as a field extension from which recovery will occur, and it is addressed based on the same data set as in-field risks. It has to be kept in mind however that off-field (non cropped) areas represent diverse reservoirs for both NTA population but also other organisms, so that the risks posed by plant protection products has to be dealt with at the ecosystem scale.

Toxicity of certain pesticides to the predatory mite *Euseius finlandicus* (Acari: Phytoseiidae)

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The acute and residual toxicities of certain widely used pesticides in plum orchards in Greece to the predatory mite *Euseius finlandicus* were determined with laboratory and semi-field experiments. The acute toxicity was evaluated under laboratory conditions using detached bean leaf disks sprayed with a Potter spraying tower calibrated to give approximately 1.5 mg wet deposit per cm^2. Protonymphs of *E. finlandicus* were transferred on freshly sprayed leaf disks and subsequently pre-imaginal survival and adult survival and fecundity were determined according to the IOBC protocols. Based on mortality and fecundity, the pesticides carbaryl, cypermethrine, acetamiprid, methomyl and deltamethrin were considered as harmful, diflubenzuron slightly harmful and *Bacillus thuringiensis* harmless to *E. finlandicus*. The residual toxicity of the tested pesticides to *E. finlandicus* was evaluated using 3 year old potted plum trees (cv. Vanilia) which were sprayed till run-off with a hand sprayer and maintained in the field. At regular time intervals of 3, 7, 10, 15, 20 and 25 days after spraying, leaves were cut from the plants and protonymphs of *E. finlandicus* were transferred on them. Based on the mortality percentages, the pesticides carbaryl, cypermethrine, acetamiprid and methomyl were found highly toxic to the predator for more than two weeks whereas diazinon for 7 to 10 days. These results could be useful for pesticide selection and their use in integrated pest management in orchards in northern Greece.

The side-effects of pesticides used in vineyards areas of Aegean region on predatory mite *Typhlodromus perbibus* Wainstein&Arutunjan (Acari: Phytoseiidae) under laboratory conditions

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Typhlodromus perbibus Waınsteın et Arutunıan (Acari: Phytoseiidae) is a new species of Turkish fauna found in vineyards of Aegean region. In this study the side-effects of pesticides used in vineyards on predatory mite *T. perbibus* were tested under laboratory conditions during the period 2002-2004. The tests were performed according to the standard laboratory test method of the IOBC/WPRS Working Group "Pesticides and Beneficial Organisms". As a result of these tests Quinalphos, Parathion – Methyl, Carbaryl, and Propineb revealed to be harmless and Sulphur had a moderately toxic effect.

Keywords: Vineyard, *Typhlodromus perbibus*, pesticides, side-effects, laboratory

Effects of ten pesticides on *Anystis baccarum* (Anystidae)

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Anystis baccarum (L.) (=*Anystis agilis* (Banks)) (Acari: Anystidae) is present in organic apple orchards and vineyards where IPM programs are used. It is a voracious predator feeding on any prey it can overpower. In this study, we report the residual 48h toxicity of ten pesticides to adults collected from orchards. The neonicotinoids acetamiprid, imidacloprid, thiamethoxam, as well as, the insecticides spinosad and methoxyfenozide were found to be non-toxic. In contrast, lambda-cyhalothrin and carbaryl were very toxic. The field rate of carbaryl (0.0051 g ai/L) was 784 times the LC_{50} (0.0025g ai/L). Of the three fungicides evaluated, only mancozeb was moderately toxic. It caused 46.5 % mortality of adults at the field rate(1.6000g ai/L). Sulphur and kresoxim-methyl were harmless. These findings are only part of the toxicity picture of these compounds as only adults were studied. Once a rearing technique is developed, effects on egg hatch, immatures and fecundity has to be studied in order to complete the toxicity picture.

Influence of some insecticides and acaricides on beneficial mites and *Coccinella septempunctata* (Coleoptera: Coccinellidae) larvae

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During the period 2004-2007 a wide range of studies have been conducted under laboratory and field conditions to assess the influence of some insecticides and acaricides on beneficial mites and *Coccinella septempunctata* larvae.

The toxicity of the following insecticides was investigated under laboratory conditions: Envidor 480 SC (spirodiclofen, 0.4 l/ha), Actara 25 WG (thiamethoxam, 0.2 kg/ha), Aztec 140 EW (triazamte, 0.7 l/ha), SpinTor 480 SC (spinosad, 0.3 l/ha).

On the other hand, the influence of the following pesticides on populations of two species of predatory mites, *Typhlodromus pyri* (Phytoseiidae) and *Zetzellia mali* (Stigmaeidae), was tested under field conditions: Aztec 140 EW (triazamate, 0.7 l/ha), Calypso 480 SC (thiacloprid, 0.2 l/ha), Pirimix 100 PC (pirimicarb, 1.5 l/ha), Rimon 100 EC (novaluron, 0.75 l/ha), SpinTor 480 SC (spinosad, 0.3 l/ha), Steward 30 WG (indoxacarb, 0.3 kg/ha), Owadofos 540 EC (fenithrotion, 2.25 l/ha), Nissorun 050 EC (hexythiazox, 0.9 l/ha), Nissorun 10 WP (hexythiazox, 0.5 kg/ha), Ortus 05 SC (fenpyroximate, 1 l/ha; 1.5 l/ha), Omite 570 EW (propargite, 2 l/ha), Sanmite 20 WP (pyridaben, 0.75 kg/ha), Pennstyl 600 SC (cyhexatin, 0.6 l/ha).

The results indicate that the most of used insecticides were harmless to predatory mites and *Coccinella septempuctata* larvae. The highest mortality of beneficial mites was observed when acaricides and spinosad were applied.

Effect of the entomopathogenic fungus *Lecanicillium muscarium* on the predatory mite *Phytoseiulus persimilis* as a non-target organism

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Effects of *Beauveria bassiana, Heterorhabditis bacteriophora, H. megidis* and *Steinernema feltiae* on the Mediterranean fruit fly *Ceratitis capitata* and the very sensitive braconid *Psyttalia concolor* in the lab

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Entomopathogenic fungi and nematodes are considered nowadays as valuable alternatives for the control of some pests due to their favourable characteristics, and among the candidates are tephritid flies because there is an urgent need of finding alternatives to neurotoxic compounds. In the latest years, quite a deal of information has been published on effects of these biopesticides on some fruit fly species, but there is however, much limited information on their effects on the important natural enemies of these flies.

In this study, effects of three commercial nematodes available in Spain (maximum recommended dose 100 IJ/cm^2): *Steinernema feltiae* Filipjev (Steinernema system®, Biobest), *Heterorhabditis bacteriophora* Poinar (Larvanem®, Koppert), *H. megidis* Poinar (Heterorhabditis system®, Biobest) and one fungus: *Beauveria bassiana* (Bals.) (Naturalis L®, Agrichem, maximum dose 1l/hl) has been tested on *Ceratitis capitata* (Wied.) and the braconid *Psyttalia concolor* (Szèpl.), parasitoid of the olive fruit fly and an indicator species based on its high susceptibility to pesticides. The neurotoxic malathion (Malafin® 50, Bayer), used worldwide for the control of this pest, was used as positive standard (300 ml/hl).

The tested nematodes were applied to the pupation medium of *C. capitata* under two relative humidities (30 and 60%), and part of the contaminated L_3 larvae were offered to *P. concolor* for parasitization. The fungus was tested in adults of the pest and the enemy by residual contact, topical application and ingestion, as well as by treatment of the oviposition gauze and direct spray in the pest, and *vía* contaminated hosts in the enemy.

S. feltiae and *H. bacteriophora* were as effective as malathion, inhibiting practically 100% of *C. capitata* adult emergence when the pupation substrate was treated at a 2-fold maximum recommended dose under 60% r.h.. The nematode less effective was *H. megidis.* Relative humidity was a key factor on the efficacy of commercials nematodes, being much higher at 60% r.h. than at 30% r.h. irrespective of the dose used. The three nematodes decreased the progeny size of *P. concolor* when the enemy parasitized treated *C. capitata* larvae, but only significant reductions were scored for *S. feltiae*.

B. bassiana did not cause mortality at 3 days or affect reproduction of *C. capitata* by any of the studied exposure methods (malathion gave 100% mortality), except when applied at a 10-fold maximum dose at the oviposition gauze (significantly decreased fertility by 21.7%). The biopesticide did not cause mortality of the parasitoid in contrast with malathion (100%), but it significantly decreased its beneficial capacity by residual contact or *vía* treated host larvae (lesser progeny size) or by ingestion (lesser number of attacked hosts).

Aged-residue method for evaluating toxicity of plant protection products to *Stethorus punctillum* (Weise) (Coleoptera: Coccinellidae)

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Stethorus punctillum (Weise) (Coleoptera: Coccinellidae) is known as an obligate predator of spidermites. Currently there are no widely recognised laboratory methods for testing the effects of plant protection products (PPP) to this species.

Here we present a method for evaluating the toxicity of PPP under extended laboratory conditions or as a persistence / aged residue study, combining field applications with laboratory bioassays. *S. punctillum* larvae were exposed to treated apple leaf disks and their development through to pupation and adult emergence monitored. An assessment of reproduction was also performed. Example data are presented to demonstrate the performance of the test design.

POSTER

Different methods of pesticide application – Different laboratory test strategies

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Some pesticides can be applied as seed treatment or they can be sprayed. The assessment of effects of seed treatments on beneficial arthropods in the field is usually based on the results of spray applications, if results of seed treatments are not available. However, laboratory tests with the active ingredient imidacloprid using equal imidacloprid rates per ha for seed treatment and spray application showed different effects on the larvae of the carabid beetle *Poecilus cupreus*. The aim of the investigations was to explain the different effects on the larvae of *Poecilus cupreus* in extended laboratory tests by residue analyses of the soil.

Residues of imidacloprid in soil were obtained using a method developed by Schöning [1]. The effects on larvae of *Poecilus cupreus* were calculated according to methods of Heise et al. [2]. Residue analyses indicated differences in the distribution of the active ingredient in the soil depending on the application method. Point exposure (coated sugar beet seeds), exposure limited to the seed row (coated winter wheat seeds) and exposure of the whole area (spray application) were detected.

Point exposure and exposure limited to the seed row had lower effects on the larvae of *Poecilus cupreus* than spray application. The results suggest that seed density in the field is one major criterion which has to be considered in tests with plant protection products applied as seed coating in laboratory.

[1] Schöning, R. (2001): Pflanzenschutz-Nachrichten Bayer 54 (3), 413–450.
[2] Heise, J., Heimbach, U. & S. Schrader (2004): Influence of insecticide coated seeds on larvae of *Poecilus cupreus* (L.) (Coleoptera: Carabidae) using different container sizes and quantities of substrate. IOBC/WPRS 27 (6) 73-79.

POSTER

Assessment of side-effect of water-soluble nitrogen fertilizers applied as foliar spray on the parasitic wasp *Aphidius rhopalosiphi* (Destefani-Perez) (Hym; Aphidiidae)

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In several crops, nitrogen fetilizers can be routinely applied as foliar spray at period when beneficial arthropods are active and, thus, exposed to these products in a same way as pesticides. Wheras side-effects of pesticides on beneficial arthropods are well documented, little is know about possible negative impact of nitrogen formulations on beneficial arthropods. In this research, the effects of 3 nitrogen fertilzers applied as foliar spray were tested on the parasitic wasp *A. rhopalosiphi* in the laboratory on glass plates and on plants. This species was selected because it is very sensitive to pesticides and used as "standard species" for ecotoxicological tests in the context of registration at European level. It is also a key beneficial arthropod for aphid control. The nitrogen formulations tested were the product Nutriforce ® (liquid urea), pearled urea and a nitrogen solution (nitrate, urea and ammoniac in solution). These fertilzers are widely used in crops such as cereals or potatoes. They were tested at their maximum recommended field rate, corresponding to an application of 15-20 N units/ha according to the product. The nitrogen formulations were first tested on glass plates, according to the IOBC Tier I testing scheme. All formulation exhibit a high toxicity, mainly due to mechanical effects, with re-crystallization of urea and high hygroscopicity of residue. Results clearly showed that Tier I test methodology was not adapted for nitrogen formulation at field rate. Nitrogen formulations were further tested on plants in the laboratory, according to IOBC Tier II testing scheme. Fertilizers were applied on barley seedlings infested with cereal aphids. Both mortality and repellence were followed through a 48h period and aphid mummies were left to develop 10-12 days. They were counted by plants and assessed for parasitoid emergence. Both lethal (mortality) and sublethal effects (aphid mummies production and emergence) were used to calculate reduction in beneficial capacity, compared to a water-treated control. When they were applied on barley seedlings, the three nitrogen formulation were only slightly toxic for adult wasp, with a minimum of 14% corrected mortality with the nitrogen solution and a maximum of 44% with pearled urea. However, a strong reduction in female reproduction capacity was observed with 50.4 aphid mummies/female for control and only 13.4, 9.0 and 17.8 aphid mummies/female with pearled urea, nitrogen solution and Nutriforce ®, respectively. Emergence rate of the mummies were comparable to control values. Due to effects on reproduction, the reduction of beneficial capacity was between 69.8% and 85.4%. According to IOBC toxicity classes, Nutriforce was considered as moderately harmful (class 3) and pearled urea and nitrogen solution as harmful (class 4). Magnitude of the effects was similar as for classical insecticides, indicating that foliar nitrogen application can have a biological signification for beneficial arthropods and probably also on other organisms exposed to foliar spray.

POSTER

Field toxicity of four acaricides on the predatory mites *Amblyseius andersoni* (Chant) and *Euseius stipulatus* (Athias-Henriot) (Acari: Phytoseiidae) in apple orchard at Northwest of Portugal

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The complex of species of predatory mites dominated by *Amblyseius andersoni* (Chant) and *Euseius stipulatus* (Athias-Henriot) (Acari: Phtyoseiidae) has been recognized as highly important in regulating phytophagous mites in apple orchards in northwest region of Portugal. In order to utilize these species in integrated pest management programs in apple orchards, it is essential to obtain information about the field toxicity of commonly used pesticides on these predators.

During the period of 2002-2004, three bioassay experiments were undertaken to assess the field toxicity of four acaricides Vertimec® (abamectin), Dinamite® (fenpyroximate), Magister® (fenazaquin) and Envidor® (spirodiclofen), on phytoseiids *A. andersoni* and *E stipulatus*, in apple orchard in the region of Braga, Portugal, according to the standard guidelines of IOBC/wrps Working Group "Pesticides and Beneficial Organisms".

Vertimec® was found to be harmless to slightly harmful, Dinamite® and the novel acaricide Envidor® were assessed as slightly to moderately harmful to the phytoseiid mites, while Magister® revealed to have a poor selectivity to these predators, that was moderately harmful to harmful.

Key-words: apple tree; integrated pest management; predatory mites; acaricides, side-effects

POSTER

Influence of a short exposure to teflubenzuron residues on the predation of thrips by *Iphiseius degenerans* (Acari: Phytoseiidae) and *Orius laevigatus* (Hemiptera: Anthocoridae)

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A short duration (24-h) leaf-disc bioassay was used to determine the effects of teflubenzuron residues on the predation levels of two predators; *Iphiseius degenerans* (Berlese) and *Orius laevigatus* (Fieber), foraging on immature stages of two species of thrips; *Frankliniella occidentalis* (Pergande) and *Heliothrips haemorrhoidalis* (Bouché) on a range of different species of plants. Teflubenzuron did cause thrips mortality during the 24-h bioassay; it was more active against *H. haemorrhoidalis* than *F. occidentalis.* Teflubenzuron did not cause significant mortality to either species of predator, although on some plants the effectiveness of both predators was reduced in the presence of teflubenzuron.

POSTER

Study on side-effects of three pesticides on the predatory mite, *Phytoseius plumifer* (Canestrini & Fanzago) (Acari: Phytoseiidae) under laboratory conditions

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The predatory mite, *Phytoseius plumifer* is one of the most abundant natural enemies of phytophagous pests and mites especially in the north of Iran. Experiments were carried out to assess the compatibility of commonly used pesticides against phytophagous pests in order to determine pesticides which have the least side-effects on the predator and are more suitable in integrated control programmes. In this study side-effects of abamectin, malathion and phosalone were evaluated in laboratory.

Laboratory tests based on sequential decision making scheme were done using 'Detached leaf' method. Percentages of mortality and escape of predators up to 5 days after the adult stage and reproduction during the first 5 days were assessed. The effect of abamectin, malathion and phosalone at the maximum field recommended rates on *P. plumifer* was above the upper tolerance threshold and classified these insecticides as harmful for the predator. All three tested pesticides caused 100% mortality 24 hours after treatment. Therefore they were not adequate for integrated control programmes. Effects of abamectin, malathion and phosalone in the optional rate at 0.1 recommended field rate were above the upper tolerance threshold, too. Assessing the optimal time of releasing the predator based on the residue test was not possible, because abamectin, malathion and phosalone again caused 100% mortality 3, 10 and 15 days old residues.

Further investigations showed high toxicity of tested pesticides so that LC50 of phosalone was 0.74 mg/ml for *Phytoseius plumifer*. Results of the toxicity tests suggest that *Phytoseius plumifer* may be used as a biological indicator of the safe shelters.

Key words: Side-effects, *Phytoseius plumifer*, Abamectin, Malathion, Phosalone

Chlorantraniliprole (DPX-E2Y45, Rynaxypyr™) (Coragen™ 20SC and Altacor™ 35WG) - a novel DuPont anthranilic diamide insecticide - demonstrating low toxicity and low risk for beneficial insects and predatory mites

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Chlorantraniliprole (DPX-E2Y45, Rynaxypyr™) is a new anthranilic diamide insecticide with a novel mode of action activating arthropod ryanodine receptors via stimulation of the release of calcium stores from the sarcoplasmic reticulum of muscle cells (i.e. for chewing insect pests) causing impaired regulation, paralysis and ultimately death of sensitive species. In worst-case Tier 1 glass plate tests the two sensitive indicator species, *Aphidius rhopalosiphi* and *Typhlodromus pyri*, were not sensitive to either Coragen™ 20SC or Altacor™ 35WG at 750 g chlorantraniliprole per ha, the maximum rate tested (>12-times the highest single application rate) indicating low risk for non-target arthropods. The paper reviews GLP (and additional non-GLP) tests on the effects of chlorantraniliprole on beneficial arthropod including laboratory studies with *Chrysoperla carnea*, *Coccinella septempunctata*, *Episyrphus balteatus* and *Orius laevigatus* field studies with natural predatory mite populations in apple and vines. Overall it can be concluded that the insecticide chlorantraniliprole demonstrated low intrinsic toxicity for several non-target arthropod species and therefore should cause low risk for natural population of non-target arthropods under practical use conditions.

Key words: Insecticide, chlorantraniliprole, Rynaxypyr™, ryanodine receptor, beneficial insects, predatory mites, side-effects, laboratory and field testing

Influence of organic matter on bio-availability of two pesticides and their toxicity to two soil dwelling predators

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In order to determine the influence of soil organic matter content on bioavailability of products applied to the soil and their side-effects on soil dwelling beneficial arthropods, a set of experiments with chlorpropham and carbosulfan as test products, *Bembidion lampros* and *Aleochara bilineata* as beneficial insects and pure sand with addition of 3, 6 and 9% compost as substrate was carried out in the laboratory. Additional trials on pure sand were also carried out to complete the data and calculate LR50 on inert surface, in order to compare these values with those obtained on sand + organic content. Both beetle mortality or reduction in onion fly pupae parasitism by rove beetle and pesticide bioavailability were determined and compared. Products were tested at different rates according to standard IOBC methods. Bioavailability of pesticide residues was determined by chemical analysis by HPLC, comparing total extract of the substrate to a CaCl2 aqueous extract that only extract pesticide residues that are not fixed on organic matter complex.

Results showed that toxicity was strongly correlated to tested dose and organic content of the substrate. At the maximum recommended field rate, Chlorpropham lead to 96 % mortality of *B. lampros* and 93 % parasitism reduction by *A. bilineata* on pure sand. With addition of organic matter, toxicity rapidly decreased and the effects of the herbicide only reached 3% for *B. lampros* and 0% for *A. bilineata* with sand + 9% of compost. Similar results were obtained with carbosulfan at 1% of the recommended field rate, with 50% mortality for *B. lampros* on pure sand and 7% on sand + 9% compost and 100% parasitism reduction for *A. bilineata* on pure sand and 0% parasitism reduction on sand + 9% compost. Intermediate results were obtained with sand + 3% or 6% compost. Decrease in toxicity appeared to be progressive when organic matter was added to the sand and were indicating a strong relationship between effects, applied doses and organic matter content.

Pesticide residue analysis confirm that bioavailable doses were negatively correlated with the addition of organic matter. When expressed in percentage of the dose applied, the bioavailable part was only depending of the organic matter content of the substrate. A comparison of dose-response relationship established on pure sand, when bioavailability was assessed and reached 93.2-98.6% of the dose applied and dose-response relationship established on basis of effects obtained on sand + organic matter and bioavailable doses were indicating that the dose-response were strongly related for the 4 systems (2 products x 2 insects). These results confirm that organic matter is a major component of the soil able to immobilise pesticide residue and reduce their toxicity to beneficial organism. This propriety is discussed in regard of testing scheme for soil beneficial (selection of substrate) and in the global context of pesticide use, as the fixation of pesticide on organic matter has probably also a great impact on efficacy of products and selection of dose to be applied in the field.