PEST SELECT DATABASE: A NEW TOOL TO USE SELECTIVE PESTICIDES FOR IPM

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SUMMARY

Crop pests can be naturally controlled by a set of beneficial arthropods, as entomophagous predators or parasites, leading to a global reduction of pest occurrence and insecticide use. The selectivity of plant protection products for these beneficial arthropods is a key factor in the success of IPM strategies. An abundant scientific literature concerning this subject exists, but for the final pesticide users, the information is not always easily accessible or understood.
The IOBC working group "Pesticides and Beneficial Organisms" (PBO) has developed a new database to compile all data concerning pesticide selectivity on beneficial arthropods, obtained with methods that followed the IOBC test standard characteristics. These standards have been developed since the 70's by the Working group Pesticide and Beneficial Organisms, in the context of IPM. This database includes a first set of data previously published, coming from the different Joint Pesticide Testing Programs, with the addition of results published later in the IOBC Bulletin. The second set of data has been extracted from the Public verse of the Draft Assessment Report (DAR), established by the different EU member' states in the context of the registration process at the European Level and available online on the EFSA website. As nearly all active ingredients have to be tested on at least 2 to 4 selected beneficial arthropod species with methods that followed the IOBC standard characteristics, these DAR represent an important source of information for pesticide users dealing with beneficial arthropods and selectivity, with about 50% of the actual records. This source was previously only exploited for registration purposes and not accessible to a large public, but a lot of results, mainly from the first tier testing, have been compiled and interpreted for IPM.
The new database is available online on the area restricted to the IOBC-members (http:// www.iobc-wprs.org/restricted_member/toolbox.cfm). This database will be updated regularly on basis of the new IOBC publications, EFSA Draft Assessment Report and scientific publication results that followed IOBC standard characteristics.

Key words: pesticide; selectivity; natural enemies; beneficial insects

INTRODUCTION

The use of products that do not impact natural enemies of crop pest is one of the key factors for the success of IPM. Non-selective products have proved in the past that the disruption of the biological control often led to severe pest outbreaks and the development of secondary pests previously controlled by natural enemies (Ripper, 1956; Pimentel, 1961; Borgemeister and Poehling, 1989; Jepson, 1993). These situations increased insecticide use, with all the negative aspects that could follow, as the impact on the human health and the environment.
There is an abundant literature on the possible effects of pesticides on beneficial arthropods. However, for the pesticide user, it was not always possible to find pertinent and "ready to use" information. The IOBC/wprs working group "Pesticide and Beneficial Organisms" (PBO), created in the 70's has intensively worked on the assessment of the selectivity of plant protection products for beneficial organisms. The two major achievements of the group were to establish a standard for beneficial arthropod testing and to provide to the stakeholders easy-to-use information for IPM.

A first database was built by the IOBC around 2000 with the results of the different joint pesticide testing programmed carried out by the Working Group. Since this database, a large panel of new results were obtained, mainly coming from the registration process, and it was decided to build-up a new database, accessible online. The aim of the new IOBC database is to compile the information available obtained with IOBC standard related methods and make it available for the pesticide users in the context of IPM. The limitation of the database to these results was done because this information was abundant, developed for IPM, easy to use and obtained with methods that were prove to be consistent (Vogt *et al*., 1994). This is in any case a judgement on the accuracy and quality of the results obtained by other methods and other ways of testing.

ORIGIN OF THE DATA

The data actually retained for the database have three major origins. First, the different Joint Pesticide testing Programmes (JPTP) carried out in the 80's and 90's (Hassan *et al*., 1987, 1988, 1991, 1994; Sterk *et al*., 1999); secondly, the results obtained by the working group pesticide and beneficial organisms since the end of these JPTP and published in the IOBC bulletins; finally the data obtained in the context of the registration process at the European level and published in the different Draft Assessment report edited by the different EEC member state.

IOBC Joint Pesticide testing Programs

The different JPTP have generated results of about 200 different pesticides on a set of 10 to 25 different species in the laboratory, with standardised methods involving the assessment of lethal and sublethal effects. 7 of the JPTP have been published and some of the results of the 8th and 9th programs have been presented at different IOBC WG meetings and available in different IOBC/wprs bulletins. These results have been integrated in the database, with the exception of some results of the 1st and 2nd JPTP, where the methods used were still in development.

IOBC Working group meeting publications

Since the end of the organisation of the JPTP, several IOBC members have continued to assess the effects of pesticides on beneficial arthropods in a similar way, with the aim to produce data for IPM. Most of these results have been published in the IOBC bulletin relative to the meeting of the working group, that were held every 2 years, and have been used for the database, after a quality assessment (methods, control mortality, etc...).

Draft Assessment report (DAR) – rapporteur member state

In the context of the registration process at the European level, each active substance has to be assessed on a panel of selected species, with at least tests performed in the laboratory on two standard species (*Aphidius rhopalosiphi* and *Typhlodromus pyri*) and for a lot of product on 2 to 4 additional species relevant to the product use. The results of these studies and the assessments made by the authorities are available under the form of Draft Assessment report – public verse, edited the rapporteur member state and available online on the EFSA website. As all the laboratory tests were performed with methods strictly based on IOBC standards, that were ring-tested and validated for this purpose (Candolfi *et al*., 2001), these data were

extracted from the DAR, evaluated and added to the database. The evaluation was based on the presence of sublethal effect results and the reduction of beneficial capacity was calculated to standardise the results with those coming directly from the IOBC.
The DAR, as they concern all products, the new ones and older active ingredients in revision, is a very large source of valuable data that was previously not used. In the actual database, it concern about 50% of the data. Furthermore, they provide information on all new compounds as soon as they are on the market.

PRESENTATION OF THE DATABASE

The database is available for the IOBC members online on the IOBC/wprs website: http://www.iobc-wprs.org/restricted_member/toolbox.cfm. An example of presentation of the database is given in Figure 1.
For each data, the database gave the formulation of the pesticide used (commercial name or code name used during the registration process) and the concentration, the species tested and its group, the type of test, the dose tested, the corresponding result and the reference. For field tests, the crop system and the location are also indicated, as these elements have a great importance on the results.
The details on the information available and the organisation of the data are given on the website.

Imidacloprid OR Select Test Species ... OR Select Species Group ...

search | clear search

Legends

Active Ingredient	Product	g/l or kg	Cat.	Test Species	Species Group	Cat. of test	Dose tested (a.i./ha)	IOBC toxicity class	Effects and duration of activity	Field site (crop - country)	Remarks	Ref.
Imidacloprid	Gaucho FS600	600	I	*Aleochara bilineata*	Soil dwelling predator	Extended lab	52g	1			seed dressing	DAR
Imidacloprid	Gaucho WS 70	700	I	*Aleochara bilineata*	Soil dwelling predator	Extended lab	945g	1			seed dressing	DAR
Imidacloprid	Confidor 200SL	200	I	*Amblyseius californicus*	Predatory mite	Field aged	40 g	3-1	3 5DAT, 1 15DAT			Van de veire et al., 2001
Imidacloprid	SL200	200	I	*Aphidius rhopalosiphi*	Parasitic hymenoptera	Extended lab	1.0g	4				DAR
Imidacloprid	SL200	200	I	*Aphidius rhopalosiphi*	Parasitic hymenoptera	Extended lab	0.32g	1				DAR
Imidacloprid	SL200	200	I	*Aphidius rhopalosiphi*	Parasitic hymenoptera	Extended lab	2x100g (14D)	4-1	4 (0-7DAT), 1 (14DAT)			DAR
Imidacloprid	SL200	200	I	*Aphidius rhopalosiphi*	Parasitic hymenoptera	Extended lab	2x100g (14D)	4-1	4 (0DAT), 3 (7-14DAT), 1			DAR

Figure 1. Example of search result by product and presentation of the information available.

The results can be sort out by active ingredient, test species (see Figure 2) or by group of test species (e.g. parasitic hymenoptera, predatory mites, plant dwelling predators, ground dwelling predators, insect pathogen).

Active Ingredient	Product	g/l or kg	Cat.	Test Species	Species Group	Cat. of test	Dose tested (a.i./ha)	IOBC toxicity class	Effects and duration of activity	Field site (crop - country)	Remarks	Ref.
1-naphtylacetic acid	Rhodofix	10	H	*Coccinella septempunctata*	Plant dwelling predator	Initial toxicity	9g	1				Hassan et al., 1987
2,4-D amine	Luxan 2,4-D	500	H	*Coccinella septempunctata*	Plant dwelling predator	Semi-field	1300g	1				Hassan et al., 1991
Acephate	Orthen	500	I	*Coccinella septempunctata*	Plant dwelling predator	Initial toxicity	450g	4				Hassan et al., 1987
Acrinathrin	AE F076003 00 EW	75	I	*Coccinella septempunctata*	Plant dwelling predator	Initial toxicity	0,007g	1				DAR
Alpha-naphtylacetamide	Dirigol-N		H	*Coccinella septempunctata*	Plant dwelling predator	Semi-field	120ml	1				Hassan et al., 1991
Amidosulfuron	Gratil	750	H	*Coccinella septempunctata*	Plant dwelling predator	Initial toxicity	45g	1				DAR
Amitraz	Mitac	200	I	*Coccinella septempunctata*	Plant dwelling predator	Initial toxicity	360g	3				Hassan et al., 1987
Anilazine	Dyrene Flussig	480	F	*Coccinella septempunctata*	Plant dwelling predator	Semi-field	770g	1				Hassan et al., 1994
Azadirachtin	Neeamazal R	340	I	*Coccinella septempunctata*	Plant dwelling predator	Extended lab	2,6g	3				DAR
Azadirachtin	Neeamazal R	340	I	*Coccinella septempunctata*	Plant dwelling predator	Extended lab	6,4g	4				DAR
Azadirachtin	Azatin	150	I	*Coccinella septempunctata*	Plant dwelling predator	Extended lab	2,6g	3				DAR
Azadirachtin	Azatin	150	I	*Coccinella*	Plant	Extended	6,4g	3				DAR

Figure 2. Example of search result by species

USE OF THE DATABASE AND LIMITATION

The database compiled all the information available from the IOBC and from the registration process. However, it must be stressed that there is no specific interpretation of the results on the database itself. As each result is clearly depending on the method used and the tested rate, they cannot be used out of this context.

The IOBC methods are organised as a testing scheme and the first tests (initial toxicity) are only used as a worst-case scenario to prove the harmlessness of the product. In this case, a rating 1 or 2 is the indication of the absence of adverse effects. For the 3 and 4 category, the results are indicating a potential risk under a worst-case scenario but it won't say that the product is toxic under a more realistic approach. The product has then to be tested in conditions close to the practice (e.g. extended lab, semi-field or field) and assessed on basis of these last results. A great part of the products rated 3 and 4 in the lab have been shown to be finally harmless in the field.

If most of the dose tested in the context of the JPTP and the following IOBC publications were related to the possible commercial use of the product, this last one can be variable from crop to crop and from country to country. A lot of studies performed in the context of the registration process aimed at determining an LR50 effect. Therefore, the doses were most of the time selected in regards of the possible response of the test organisms to establish the LR50 and were sometimes completely disconnected to the commercial use of the products. This is mainly the case for non-selective insecticides, were the doses assessed during the studies were sometimes 10 to 1000x less important than the intended doses to use by the farmers according to the normal agricultural practice.

Finally, non-selective products can be used in IPM. By example, if there is no risk of exposure of the beneficial (e.g. application at the beginning of the pest infestation, not controlled by natural enemies), these products are sometimes the most interesting product to use at this moment, in term of efficacy or for resistance management.

UPDATES

The actual database was established in May 2012. Yearly updates are planned with the new DAR and IOBC publication. An assessment of the scientific literature available is also planned.

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