AN ALTERNATIVE METHOD FOR ESTIMATING RISK TO NTA'S

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Abstract

An alternative method for assessing risk to foliar dwelling NTA's is presented. Extended lab toxicity (LR_{50}) values are compared to revised exposure estimates (WEBFRAM 4) to indicate if exposures likely to be experienced in the field (according to crop type, growth stage) will result in adverse effects. Calibration against field effects data is presented.

Introduction

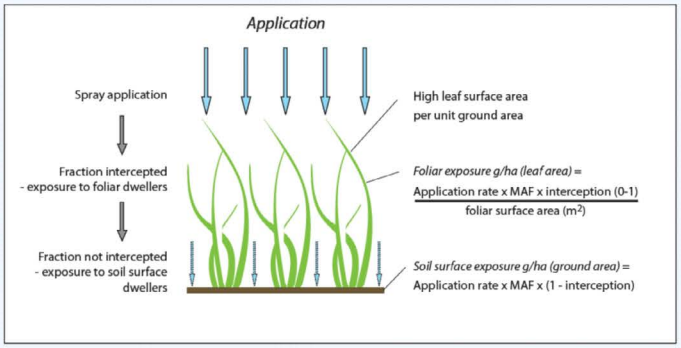
Current risk assessment methods for NTA's (ESCORT 2) are unrealistic. Exposure is assumed to equal application rate (g/ha) and does not take account of 3-dimensional effects of crop structure and interaction with spray. Further, tier 1 toxicity studies use glass plate substrates. In order to add realism to the risk assessment, new ways of estimating exposure and comparing to effects are required.

Here, an alternative risk assessment method using 3-dimensional exposure estimates and extended laboratory data, tested against field effects studies, is presented.

Materials & Methods

Exposure estimates

Alternative exposure estimates, following the procedures developed under the PSD-funded WEBFRAM project (PS2307), were calculated to estimate the exposure to foliar dwelling NTA's following application according to the GAP. The procedure for deriving mean exposure estimates is outlined below:



The following crop characteristics were used to derive exposure estimates (crop growth stages matched those from field trials used in validation):

Crop type	Percent interception of spray, growth stage				
	0-9	10-19	20-39	40-89	90-99
Cabbage	0	25	40	70	90
Cereals	0	25	50	70	90
OSR	0	40	80	80	90
Beet	0	20	70	90	90

Crop type	Foliar area per ground area (m^2), growth stage				
	0-9	10-19	20-39	40-89	90-99
Cabbage	0	1	N/A	4	N/A
Cereals	0	1	4.5	6	4.5
Spring OSR	0	2	3.5	3	2.5
Winter OSR	0	2.5	4	3.5	3
Beet	0	1.5	N/A	4	3

Comparing exposure & toxicity data

Extended laboratory toxicity data (LR_{50} values from studies conducted on leaf discs) for tier 1 species were provided. These were compared to the re-calculated exposure estimates to determine if risk to NTA's would be anticipated following application under normal agricultural conditions.

The following results were obtained from this initial screening phase:

Indicator	Compound	Extended lab LR_{50} (g as/ha)	Recalculated foliar exposure (g as/ha)	TER
T.pyri	A 150 g as/ha	65.4	16.7	3.9
Aphidius		>500	16.7	29.9
T.pyri	B 480 g as/ha	134.7	56	2.4
C. carnea		15.46	56	**0.3**

Compound A: cereals, GS 39; compound B: cereals, GS 59

Screening phase

According to the screening phase, effects on *C. carnea* following application of compound B would be expected. Effects on *T. pyri* may also be expected from compounds A & B, respectively, as TER values are relatively low and peaks in exposure may occur, eg in upper leaves.

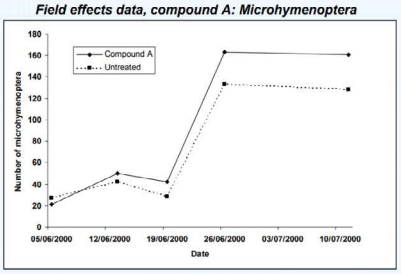
Validation – use of field data

Field data were consulted to determine if the effects predicted from the initial screen were borne out under field conditions.

Compound A

The most appropriate data related to microhymenoptera. Field effects data showed no difference between compound A and untreated control from pitfall traps. This is consistent with the screening phase TER for *Aphidius* (Hymenoptera).

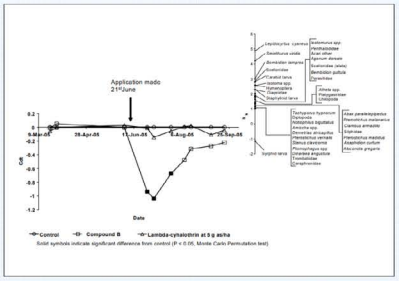
Field effects data, compound A: Microhymenoptera

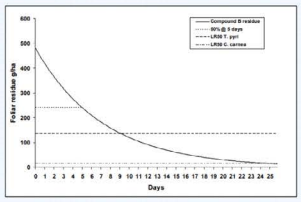


Compound B

PRC plots provided information on community responses from a long term cereals study. Data shown are for summer application. Clear effects following application are visible, consistent with the screening phase TER for indicator species. The strongest response in the PRC was from soil dwelling Collembola, however, Scelionidae and other Hymenopteran groups also responded similarly. Recovery occurred within season.

Field effects data, compound B: PRC





Foliar residue decline data & LR_{50} (ext. lab), Compound B

The plot of foliar residue decline against extended lab LR_{50} illustrates one possible mechanism facilitating recovery in-field – recolonising and hatching arthropods were not exposed to adverse foliar residues.

Results & Discussion

This method provides a useful additional tool for risk assessors when comparing laboratory toxicity data to field effects. In order to make the method applicable to those compounds for which field effects data are not available, validation of the field exposures is required (foliar residues, tracer studies etc). In particular, the distribution of exposure throughout the crop requires attention – either distribution may be averaged, or worst-case exposures may be considered. Also, additional species need to be included, as in line with current risk assessment schemes, to reduce interspecific uncertainty.

This method may reduce unnecessary higher tier laboratory, semi-field and field testing as exposure refinement is made possible.

Conclusions

Comparing toxicity derived from studies on leaf surfaces is more realistic than those from glass plate studies. Using exposure estimates likely to occur under field conditions adds further realism. This method therefore represents a potentially cost-effective refinement option for risk assessors. Validation of exposure estimates is now required.

Acknowledgements

The UK Pesticides Safety Directorate funded the original exposure work (DEFRA PS2307).