

TIER-2 RISK ASSESSMENTS WITH THE SHVAL TOOLS DEVELOPED FOR THE EFSA BEE GUIDANCE DOCUMENT

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INTRODUCTION

The new EFSA guidance document on bees suggests the implementation of a tiered risk assessment scheme. It was criticised for being too complex at lower tiers and difficult to apply at higher tiers. To ease the required calculations, a user friendly calculator based on MS-Excel, named ‘Bee-Tool’, has been developed for Tier 1 calculations. Additionally, EFSA has developed the SHVAL tools to enable Tier 2 calculations for exposure refinements. SHVAL tools are small applications developed for ‘R’ statistical software that can calculate (by Monte Carlo simulations) refined shortcut values (SVs) considering measured residue levels of the pesticide molecule from pollen and nectar or crop-specific sugar content of nectar.

This poster gives an overview of these tools with illustrative calculations for the oral route of exposure of a new systemic insecticide, flupyradifurone. The simulated agricultural use was a single foliar spray of 112.5 g/ha on flowering watermelon in the South EU region.

The outputs of Tier-1 calculations (Bee-Tool) are illustrated in figure 1. As can be seen, the majority of the necessary risk assessments passed Tier-1 for honey bees; however some scenarios failed.

Choose these categories												HONEY BEE				
Crop Category	Application	BBCH	Category	Scenario	Ef	SV HB	SV BB	SV SB	TWA HB	TWA BB	TWA SB	ETR HB	Trigger	Risk indicator	Ratio	
Fruiting vegetables	spray DW	50 - 69	acute	treated crop	1	7.6	11.2	5.7	1	1	1	A	0.71	0.2	!	3.6
Fruiting vegetables	spray DW	50 - 69	acute	weeds	0.3	3.7	6.5	2.3	1	1	1	A	0.10	0.2	OK	
Fruiting vegetables	spray DW	50 - 69	acute	field margin	0.0092	3.7	6.5	2.3	1	1	1	A	0.00	0.2	OK	
Fruiting vegetables	spray DW	50 - 69	acute	adjacent crop	0.0033	7.6	11.2	5.7	1	1	1	A	0.00	0.2	OK	8.6
Fruiting vegetables	spray DW	50 - 69	acute	next crop	1	0.7	0.9	0.49	1	1	1	A	0.07	0.2	OK	
Fruiting vegetables	spray DW	50 - 69	chronic	treated crop	1	5.8	9.9	5.7	0.72	0.72	0.72	Ch	0.257	0.03	!	
Fruiting vegetables	spray DW	50 - 69	chronic	weeds	0.3	2.9	5.9	2.3	0.72	0.72	0.72	Ch	0.039	0.03	!	1.3
Fruiting vegetables	spray DW	50 - 69	chronic	field margin	0.0092	2.9	5.9	2.3	0.72	0.72	0.72	Ch	0.001	0.03	OK	
Fruiting vegetables	spray DW	50 - 69	chronic	adjacent crop	0.0033	5.8	9.9	5.7	0.72	0.72	0.72	Ch	0.001	0.03	OK	
Fruiting vegetables	spray DW	50 - 69	chronic	next crop	1	0.54	0.78	0.49	0.72	0.72	0.72	Ch	0.024	0.03	OK	1.6
Fruiting vegetables	spray DW	50 - 69	larva	treated crop	1	4.4	4.5	33.6	0.85	1	1	L	0.32	0.2	!	
Fruiting vegetables	spray DW	50 - 69	larva	weeds	0.3	2.2	2.6	30.8	0.85	1	1	L	0.05	0.2	OK	
Fruiting vegetables	spray DW	50 - 69	larva	field margin	0.0092	2.2	2.6	30.8	0.85	1	1	L	0.00	0.2	OK	1.6
Fruiting vegetables	spray DW	50 - 69	larva	adjacent crop	0.0033	4.4	4.5	33.6	0.85	1	1	L	0.00	0.2	OK	
Fruiting vegetables	spray DW	50 - 69	larva	next crop	1	0.4	0.2	0.93	0.85	1	1	L	0.03	0.2	OK	

Figure 1 The results of the Tier-1 calculations for the oral assessments

EXPOSURE REFINEMENT WITH THE SHVAL TOOL

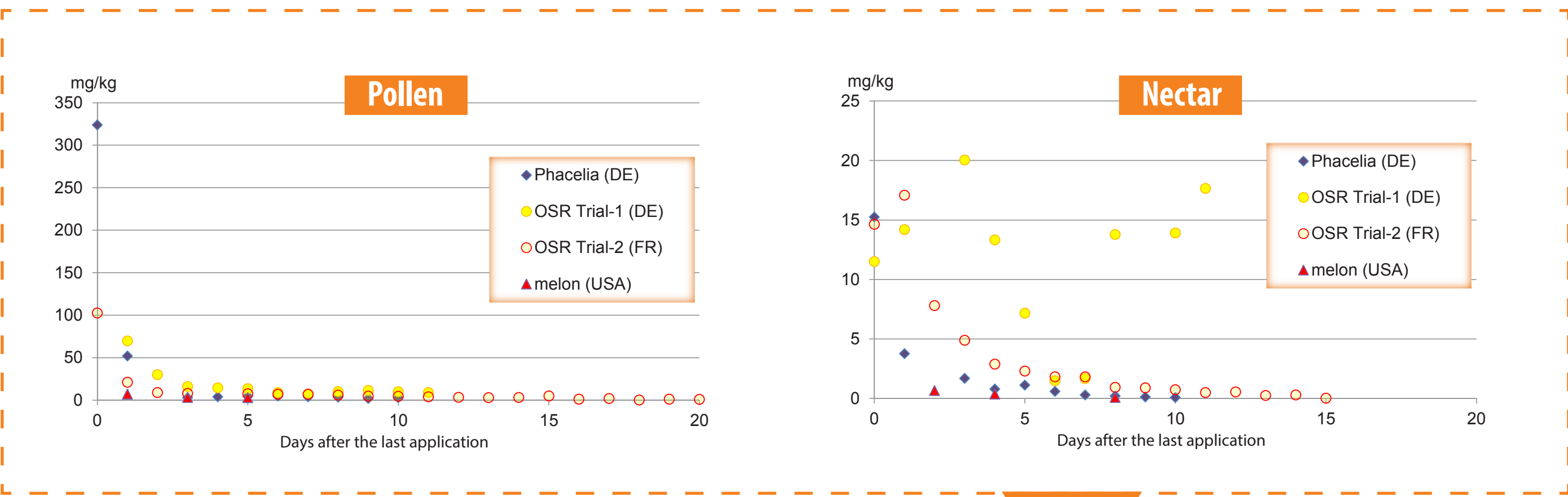


Figure 2 Residue unit doses in pollen and nectar from the available trials

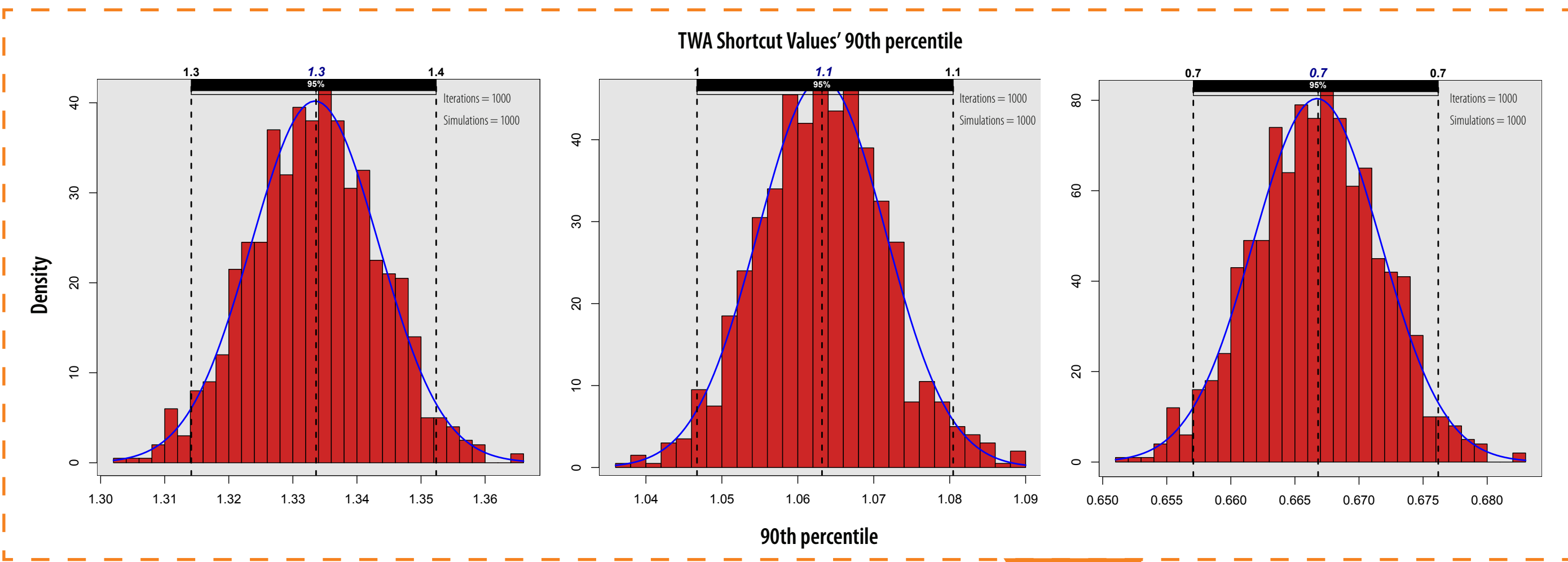


Figure 3 Outputs of the Monte Carlo simulations with SHVAL

												HONEY BEE				
Crop	Treatment	BBCH	Category	Scenario	Ef	SV HB	SV BB	SV SB	TWA HB	TWA BB	TWA SB	ETR HB	trigger	Risk indicator	Ratio	
Fruiting vegetables	spray DW	50 - 69	acute	treated crop	1	7.6	11.2	5.7	1	1	1	A	0.713	0.2	!	3.6
Fruiting vegetables	spray DW	50 - 69	acute	weeds	0.3	3.7	6.5	2.3	1	1	1	A	0.104	0.2	OK	
Fruiting vegetables	spray DW	50 - 69	acute	field margin	0.0092	3.7	6.5	2.3	1	1	1	A	0.003	0.2	OK	
Fruiting vegetables	spray DW	50 - 69	acute	adjacent crop	0.0033	7.6	11.2	5.7	1	1	1	A	0.002	0.2	OK	2.7
Fruiting vegetables	spray DW	50 - 69	acute	next crop	1	0.7	0.9	0.49	1	1	1	A	0.066	0.2	OK	
Fruiting vegetables	spray DW	50 - 69	chronic	treated crop	1	1.3	9.9	5.7	1	0.72	0.72	Ch	0.080	0.03	!	
Fruiting vegetables	spray DW	50 - 69	chronic	weeds	0.3	1.1	5.9	2.3	1	0.72	0.72	Ch	0.020	0.03	OK	2.7
Fruiting vegetables	spray DW	50 - 69	chronic	field margin	0.0092	2.9	5.9	2.3	0.72	0.72	0.72	Ch	0.001	0.03	OK	
Fruiting vegetables	spray DW	50 - 69	chronic	adjacent crop	0.0033	5.8	9.9	5.7	0.72	0.72	0.72	Ch	0.001	0.03	OK	
Fruiting vegetables	spray DW	50 - 69	chronic	next crop	1	0.54	0.78	0.49	0.72	0.72	0.72	Ch	0.024	0.03	OK	Refined, but not solved
Fruiting vegetables	spray DW	50 - 69	larva	treated crop	1	0.7	4.5	33.6	1	1	1	L	0.060	0.2	OK	
Fruiting vegetables	spray DW	50 - 69	larva	weeds	0.3	2.2	2.6	30.8	0.85	1	1	L	0.048	0.2	OK	
Fruiting vegetables	spray DW	50 - 69	larva	field margin	0.0092	2.2	2.6	30.8	0.85	1	1	L	0.001	0.2	OK	Refined, but not solved
Fruiting vegetables	spray DW	50 - 69	larva	adjacent crop	0.0033	4.4	4.5	33.6	0.85	1	1	L	0.001	0.2	OK	
Fruiting vegetables	spray DW	50 - 69	larva	next crop	1	0.4	0.2	0.93	0.85	1	1	L	0.029	0.2	OK	

Figure 4 Refined risk assessments using the calculated SVs with SHVAL

CONCLUSION

EFSA's SHVAL tools are useful and effective calculator tools to be used in exposure refinements for the risk assessment of bees. They were developed to simulate case-specific shortcut values and they are able to consider 1) measured residue levels from pollen and nectar, 2) residue decline, 3) crop-specific sugar content of nectar.

