
Supplementary Materials: Passive Sampling as a Tool to Assess Atmospheric Pesticide Contamination Related to Vineyard Land Use

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SUPPORTING INFORMATION

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Table S1: Sampling campaign details

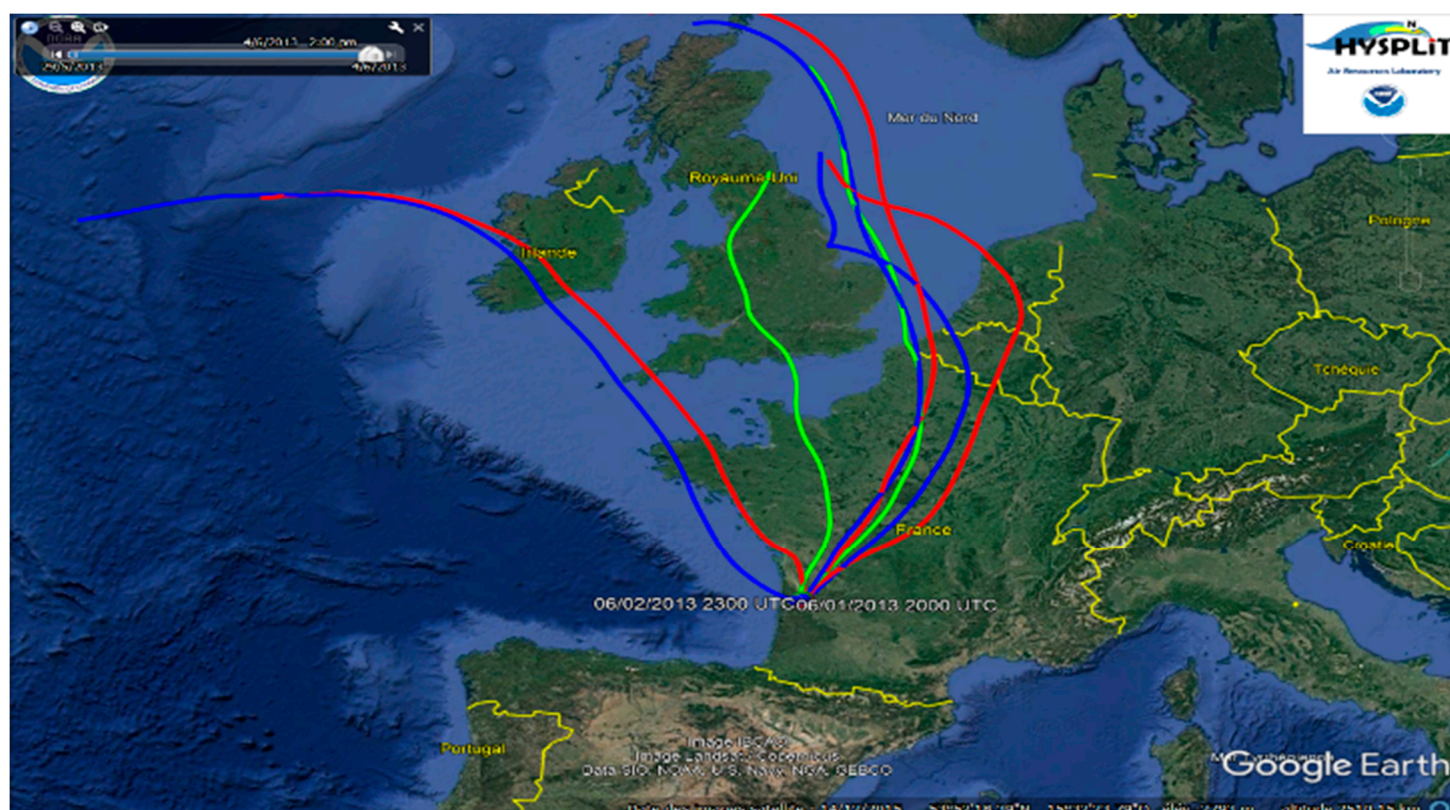
Treated and non treated zones					
1 month PUF-PAS			2 months PUF-PAS		
Passive sampling period	Passive sampling date	Passive sampling duration (days)	Passive sampling period	Passive Sampling date	Passive sampling duration (days)
1	20 February-21 March	29	1	20 February-23 April	62
2	21 March-23 April	33	2	21 March-29 May	68
3	23 April-29 May	35	3	23 April-26 June	63
4	29 May-26 June	28	4	29 May-24 July	56
5	26 June-24 July	28	5	26 June-11 September	77
6	24 July-11 September	49	6	24 July-17 October	85
7	11 September-17 October	36	7	11 September-13 December	93

Table S2a. Meteorological data during the calibration week

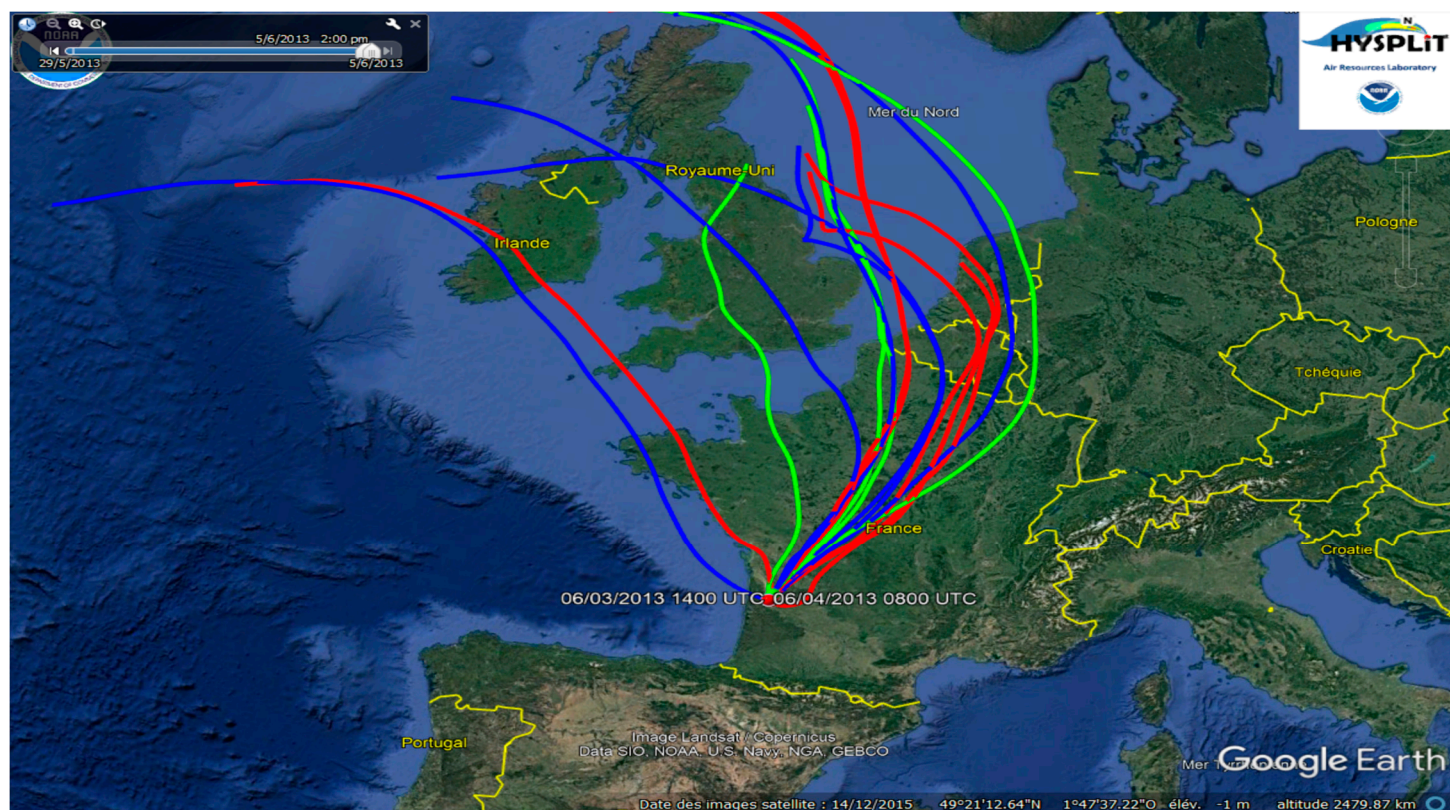
	Day 1 4 June	Day 2 5 June	Day 3 6 June	Day 4 7 June	Day 5 8 June
Average temperature (°C)	18.1	19.3	21.1	20.9	15.2
Maximum temperature (°C)	22.5	25.8	28.4	27.6	18.8
Rainfall (mm)	0	0	0	0.5	71
Mean wind speed (km h ⁻¹)	2.2	1.4	2.1	2.8	1.8

Table S2b. Air mass trajectories computed using NOAA HYSPLIT model

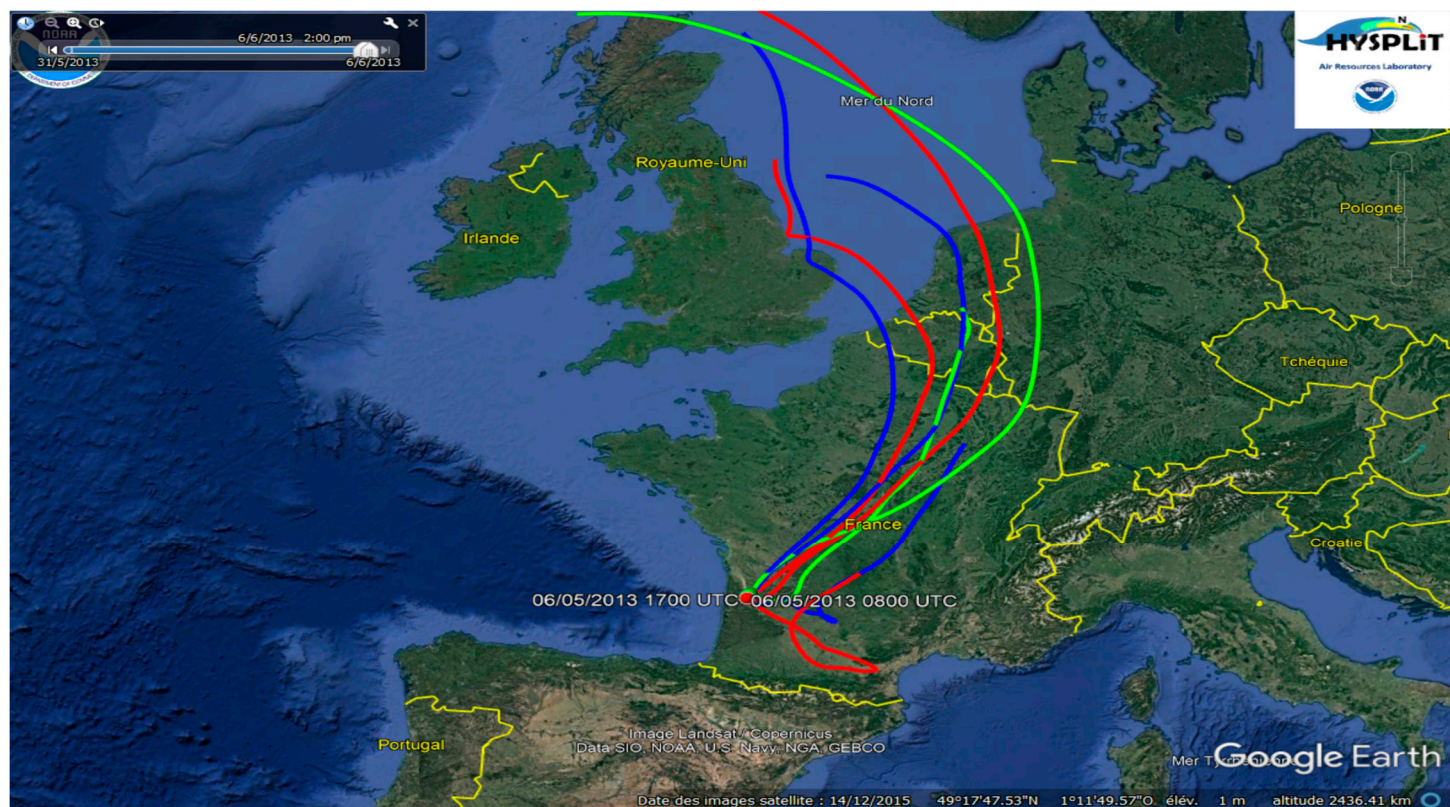
June 4 at noon; 72h (every 9h)



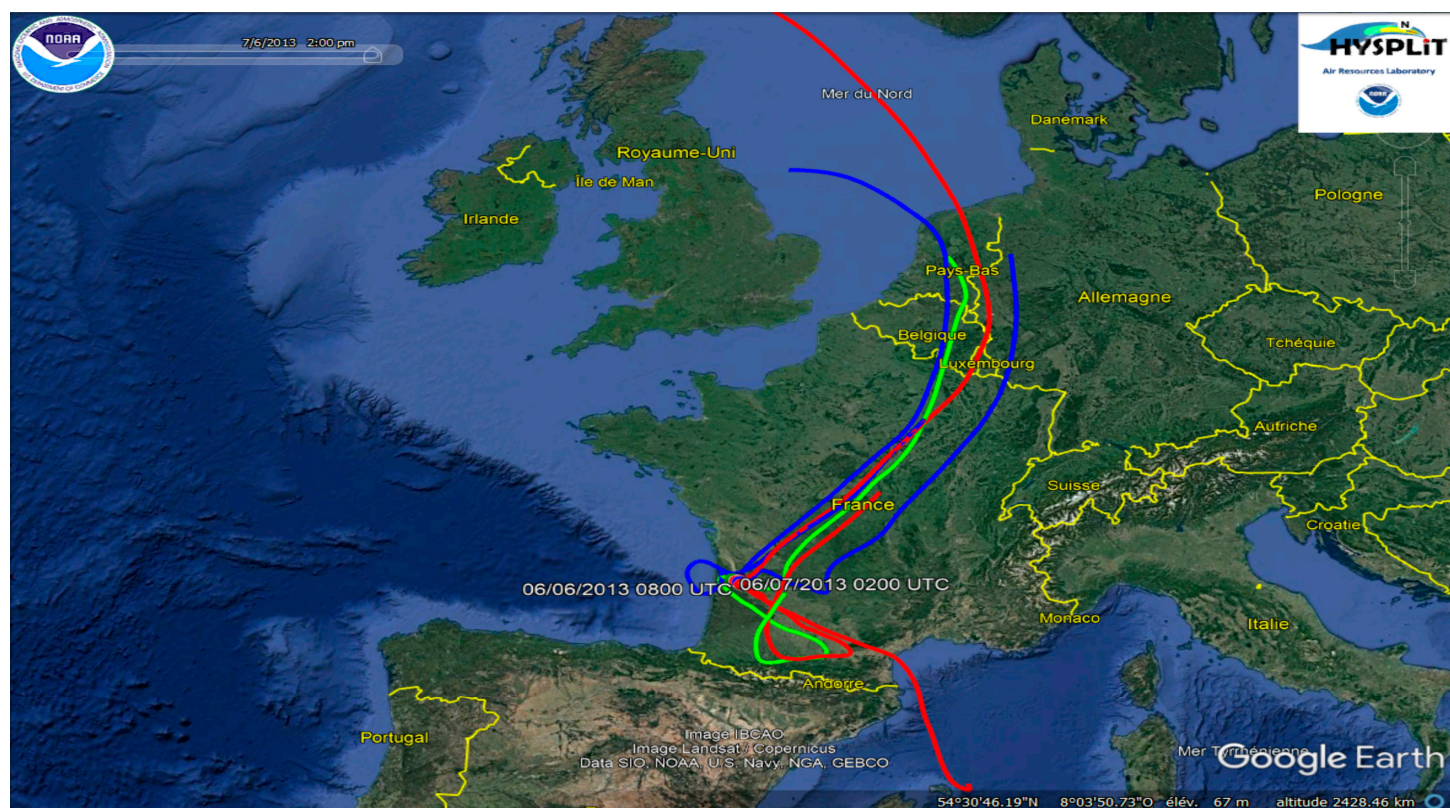
June 5 at noon; 72h (every 9h)



June 6 at noon; 72h (every 9h)



June 7 at noon; 72h (every 9h)



June 8 at noon; 72h (every 9h)

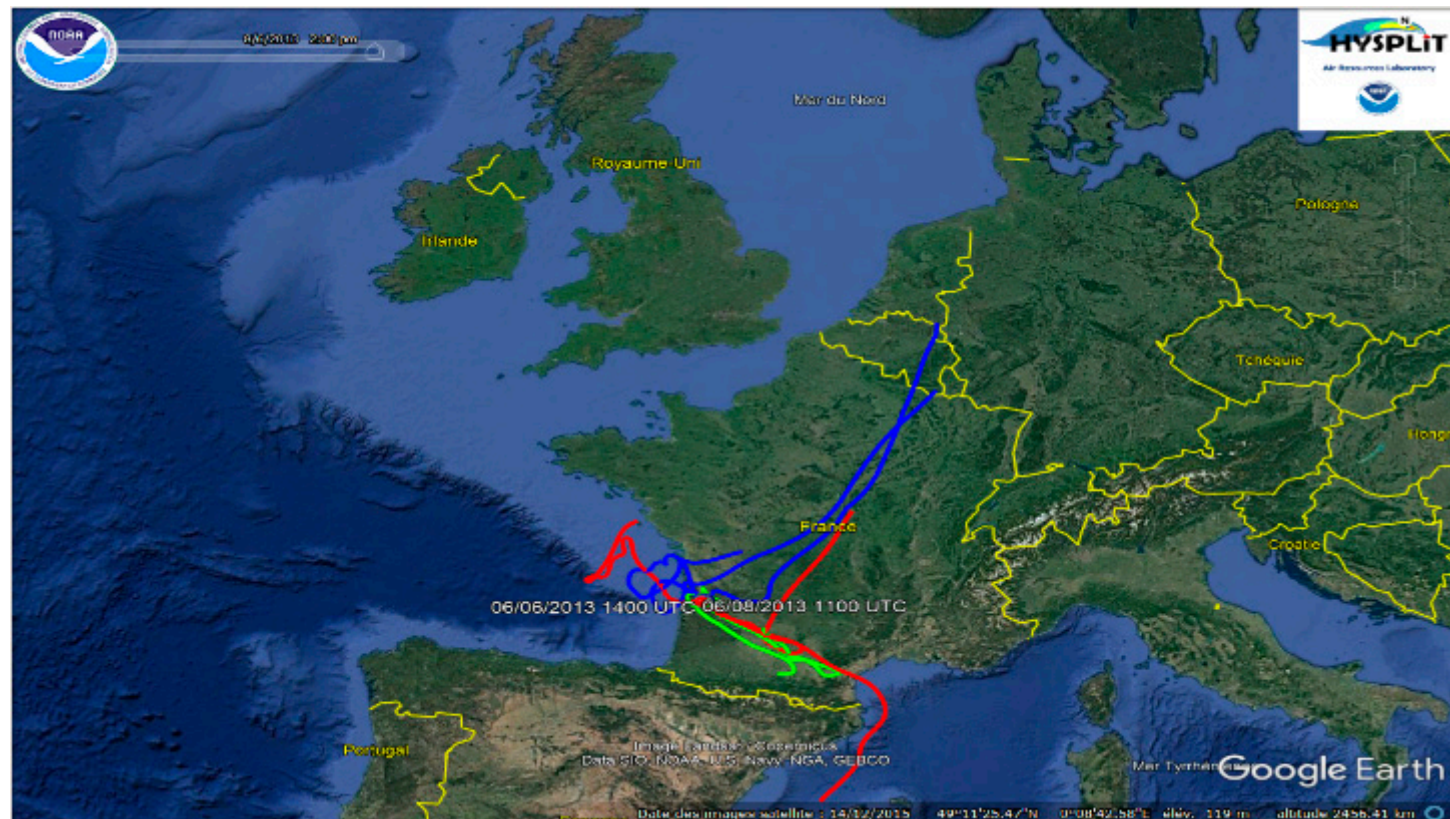


Table S3. LC-MS/MS method conditions and parameters

Analytical column:	100 mm x 2.1 mm ; 1.7 μ m ; Phenomenex, Torrance, CA, USA
Column temperature:	35°C
Volume injected:	5 μ L
Mobile phase:	(A) Water + 0.1% acetic acid, 5 mM ammonium acetate ; (B) Methanol
Flow rate:	0.5 mL min ⁻¹
Linear gradient:	100% A (0 min), 0% A (14 min), 100% A (17 min, 2 min equilibration)
Ionization characteristics and source:	ESI + Agilent Jet Stream
Gas temperature:	300°C
Gas flow:	8 L min ⁻¹
Nebulizer:	400°C, 11 L min ⁻¹
Capillary voltage:	3000 V
Scan type:	Dynamic MRM

Name	Surrogate standard	Retention time (min)	Quantifier transition		Qualifier transition		Ratio (%)	Linearity			ILOQ (pg injected)
			Precursor ion	Product ion	Precursor ion	Product ion		Slope	Slope uncertainty	r ²	
Ametoctradin	Thiamethoxam d3	11.3	276.22	176.1	276.22	149.1	96	327	7	0.9923	0.08
Atrazine	Atrazine d5	8.1	216.1	174	216.1	68	49.6	632	5	0.9989	0.20
<i>Atrazine d5</i>		8.1	221.1	179				560	6	0.9983	0.15
Azoxystrobin	Metolachlor d6	9.4	404.1	372.1	404.1	344.1	27.5	3518	76	0.9921	0.05
Boscalid	Terbutylazine d5	9.5	343	306.9	343	139.9	29.6	198	2	0.9974	0.36
Carbendazim	Thiamethoxam d3	5	192.1	160	192.1	105	17.5	1579	39	0.9900	0.11
Carbetamide	Atrazine d5	6.6	237.1	192.1	237.1	118.1	79.6	1066	13	0.9973	0.05
Cyazofamid	Atrazine d5	10.2	325.1	108	325.1	44.1	23	561	14	0.9890	0.11

Cymoxanil	Atrazine d5	5.2	221.1	175.9	221.1	149.9	58.9	11	0	0.9889	10
Cyprodinil	Atrazine d5	10.6	226.1	93	226.1	77	83.7	459	6	0.9976	0.16
Diuron	Diuron d6	8.4	233	72	233	46.1	36.6	422	11	0.9888	0.07
<i>Diuron d6</i>		8.3	239.1	78				449	10	0.991	0.17
Flazasulfuron	Diuron d6	8.4	408.1	182	408.1	83	31.1	259	2	0.999	0.07
Flusilazole	Hexazinone d6	10.4	316.1	165	316.1	247	104	368	2	0.9994	0.35
<i>Hexazinone d6</i>		7.1	259.2	177.1				2526	62	0.9897	0.07
Imidacloprid	Imidacloprid d4	4.6	256	209	256	175	100.8	148	2	0.9956	0.70
<i>Imidacloprid d4</i>		4.5	260.09	213.1				131	2	0.9951	0.07
Iprovalicarb	Metolachlor d6	10	321.2	119	321.2	203	29.8	2950	45	0.996	0.09
Kresoxim-methyl	Atrazine d5	10.5	314.1	267	314.1	222	70.7	507	7	0.9964	0.19
Mandipropamid	Terbuthylazine d5	9.7	412.13	328.1	412.13	356.1	36.9	913	17	0.9943	0.09
Metalaxyl-M	Hexazinone d6	8.5	280.16	220.1	280.16	192.1		1275	36	0.9864	0.10
Metolachlor (S)	Metolachlor d6	10.1	284.1	252	284.1	176.1	43.3	2072	32	0.996	0.12
<i>Metolachlor (S) d6</i>		10.1	290.2	258.1				2313	44	0.9939	0.11
Metrafenone	Terbuthylazine d5	11.1	409.07	209	409.07	226.9	42.3	982	16	0.9956	0.11
Myclobutanil	Metolachlor d6	9.7	289.1	70	289.1	125	29.2	530	5	0.9982	0.09
Propiconazole	Metolachlor d6	10.8	342.1	158.9	342.1	69	74.9	287	1	0.9997	0.38
Simazine	Simazine d10	7	202.1	68	202.1	103.9	75.5	172	2	0.9976	0.55
<i>Simazine d10</i>		6.9	212.1	104.9				227	2	0.9981	2.29
Spiroxamine	Simazine d10	9.5	298.3	144	298.3	100	54.3	5737	317	0.9506	0.04
Tebufenpyrad	Simazine d10	11.8	334.17	145	334.17	117	104.3	361	3	0.9984	0.15
Terbuthylazine	Terbuthylazine d5	9.5	230.1	68				225	4	0.994	0.42
<i>Terbuthylazine d5</i>		9.3	235	179				1021	20	0.9934	0.11
Thiamethoxam	Thiamethoxam d3	3.7	292	211	292	181	41.6	303	8	0.9878	0.20

Thiamethoxam d3		3.6	295.05	214.1				286	8	0.988	0.27
Trifloxystrobin	Atrazine d5	11.4	409.1	186	409.1	145	58.2	2155	34	0.9958	0.14
Zoxamide	Atrazine d5	10.7	336	186.9	336	158.9	54	531	9	0.995	0.49

Table S4. GC-MS/MS method conditions and parameters

Analytical column:	HP 5 MS UI (30 m x 0.25 mm x 0.25 µm film thickness; 5% phenylmethylsiloxane, Agilent J&M GC column)
Column temperature:	60°C (hold 2 min), 209°C (25°C min ⁻¹), 230°C (5°C min ⁻¹), 325°C (25°C min ⁻¹ hold 2 min)
Flow rate:	11 mL min ⁻¹
Carrier gas:	Helium (6.0)
Ionisation source:	EI (70 eV)
Transfer line temperature:	290°C
Ion source temperature:	230°C
Quadrupole temperature:	150°C

Name	Surrogate standard	Retention time (minutes)	Quantifier transition		Qualifier transition		Ratio (%)	Linearity			ILOQ (pg injected)
			Precursor ion	Product ion	Precursor ion	Product ion		Slope	Slope uncertainty	r ²	
Bifenthrin	Chlorpyrifos-ethyl d10	14.1	181.0	166.0	181.0	165.0	38	1213	58	0.9561	0.28
Chlorpyrifos-ethyl d10		10.3	324.0	260.0				323	6	0.993	0.06
Chlorpyrifos-methyl	Chlorpyrifos-ethyl d10	9.8	286.0	93.0	286	271	62	286	5	0.9937	0.09
Fipronil	Parathion-methyl d6	10.8	367.0	213.0	367.0	255.0	35	83	4	0.9466	0.32
Fipronil sulfide	Parathion-methyl d6	10.7	351.0	255.0	351.0	228.0	33	307	14	0.9592	0.23
Fipronil sulfone	Parathion-methyl d6	11.7	383.0	255.0	213.0	178.0	32	105	7	0.9194	0.57
Folpet	Folpet d4	11.0	259.7	129.9	261.7	130.0	79	143	6	0.9650	0.64

<i>Folpet d4</i>		11.0	263.7	134.0	265.7	134.0	67	125	6	0.9608	0.83
Fludioxonil	Chlorpyrifos-ethyl d10	11.6	247.8	153.9	247.8	126.9	97	159	11	0.9113	1.52
<i>Parathion-methyl d6</i>		9.8	269.0	115.0	269	131	6	187	10	0.9491	0.13
Quinoxifen	Chlorpyrifos-ethyl d10	13.1	272.0	237.0	237	208	167	504	21	0.9676	0.17
Tetraconazole	Chlorpyrifos-ethyl d10	10.4	336.0	204.0	171.0	136.0	75	142	5	0.9770	0.51

Table S5. Method extraction performance for spiked PUF-PAS ($n=5$)

Name	Analysis	Extraction accuracy		LOQ (ng PUF-PAS ⁻¹)	Extrapolated LOQ (pg m ⁻³)	
		Mean	SD	Mean	Mean	CV
Ametoctradin	LC-MS/MS	117%	47%	0.7	4.7	50%
Atrazine	LC-MS/MS	135%	21%	0.6	4.3	26%
Azoxystrobin	LC-MS/MS	75%	17%	0.2	1.5	43%
Bifenthrin	GC-MS/MS	126%	19%	27.8	185.5	35%
Boscalid	LC-MS/MS	83%	11%	2.2	14.7	33%
Carbendazim	LC-MS/MS	55%	21%	0.4	2.7	38%
Carbetamide	LC-MS/MS	160%	23%	0.1	0.4	24%
Chlorpyrifos-methyl	GC-MS/MS	98%	12%	1.6	10.3	32%
Cyazofamid	LC-MS/MS	135%	60%	0.3	2.2	45%
Cymoxanil	LC-MS/MS	104%	74%	34.7	231.1	61%
Cyprodinil	LC-MS/MS	135%	77%	2.7	18.0	57%
Diuron	LC-MS/MS	116%	16%	0.4	2.7	34%
Fipronil	GC-MS/MS	110%	14%	1.4	9.1	22%
Fipronil sulfide	GC-MS/MS	99%	29%	1.6	10.9	29%
Fipronil sulfone	GC-MS/MS	102%	21%	2.1	13.9	21%
Flazasulfuron	LC-MS/MS	36%	11%	0.6	4.2	32%
Fludioxonil	GC-MS/MS	105%	22%	5.6	37.3	41%
Flusilazole	LC-MS/MS	82%	31%	1.1	7.5	38%
Folpet	GC-MS/MS	97%	18%	8.6	57.1	39%
Imidacloprid	LC-MS/MS	101%	41%	0.7	4.5	41%
Iprovalicarb	LC-MS/MS	81%	14%	0.2	1.3	27%
Kresoxim-methyl	LC-MS/MS	120%	68%	0.6	3.7	57%
Mandipropamid	LC-MS/MS	86%	13%	0.4	2.7	35%
Metalaxyl-M	LC-MS/MS	107%	45%	0.1	1.0	42%
Metolachlor (S)	LC-MS/MS	90%	10%	11.1	74.0	51%
Metrafenone	LC-MS/MS	78%	37%	0.8	5.3	48%
Myclobutanil	LC-MS/MS	81%	18%	0.2	1.5	22%
Propiconazole	LC-MS/MS	149%	64%	12.4	82.5	43%
Quinoxifen	GC-MS/MS	107%	14%	2.1	14.2	23%
Simazine	LC-MS/MS	75%	22%	3.3	22.1	49%
Spiroxamine	LC-MS/MS	119%	39%	0.1	0.5	33%
Tebufenpyrad	LC-MS/MS	114%	54%	1.5	9.8	47%
Terbutylazine	LC-MS/MS	98%	13%	0.7	4.6	56%
Thiamethoxam	LC-MS/MS	94%	15%	1.1	7.4	46%
Trifloxystrobin	LC-MS/MS	109%	52%	0.1	0.7	48%
Zoxamide	LC-MS/MS	135%	52%	1.0	6.5	39%

Table S6. Concentrations of CUP (ng PUF-PAS⁻¹) in the 2 sampling sites for the 2 sampling frequencies

		Amounts accumulated on PUF-PAS (ng PUF-PAS ⁻¹) in the treated zone (TZ)													
		1 month PUF-PAS							2 months PUF-PAS						
		20/02- 21/03	21/03- 23/04	23/04- 29/05	29/05- 26/06	26/06- 24/07	24/07- 11/09	11/09- 17/10	20/02- 23/04	21/03- 29/05	23/04- 26/06	29/05- 24/07	26/06- 11/09	24/07- 17/10	11/09- 13/12
Sampling duration (days)		29	33	35	28	28	49	36	62	68	63	56	77	85	93
Ametoctradin	Appli. 17/05	<LQ	<LQ	1208	58	18	6	<LQ	<LQ	720	536	54	22	3	<LQ
Azoxystrobin		<LQ	<LQ	1	<LQ	21	<LQ	1	<LQ	<LQ	<LQ	16	<LQ	<LQ	<LQ
Boscalid	Appli. 08/07	<LQ	8	11	79	17,615	766	206	9	<LQ	135	27,089	16,435	813	529
Carbendazim		<LQ	<LQ	6	2	<LQ	<LQ	<LQ	<LQ	3	14	10	4	<LQ	<LQ
Chlorpyrifos-methyl	Appli. 01/07, 01/08	<LQ	<LQ	50	137	3931	2803	12	3	7	167	3638	6574	1567	9
Cyazofamid	Appli. 02/08	<LQ	<LQ	5	18	5	70	11	<LQ	3	14	10	218	64	6
Cyprodinil		<LQ	16	<LQ	<LQ	48	<LQ	<LQ	<LQ	<LQ	26	34	23	<LQ	<LQ
Fipronil		<LQ	3	<LQ	<LQ	3	2	<LQ	4	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ
Fipronil sulfide		<LQ	6	<LQ	<LQ	2	2	<LQ	6	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ
Fipronil sulfone		<LQ	6	<LQ	<LQ	<LQ	3	<LQ	8	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ
Fludioxonil		<LQ	<LQ	13	31	124	11	<LQ	<LQ	<LQ	35	163	<LQ	13	<LQ
Folpet	Appli. 07/05, 17/06, 17/07	61	143	1960	23,481	9504	3292	462	78	9434	27,140	15,137	4682	1220	152
Iprovalicarb	Appli. 17/06	<LQ	<LQ	2	414	71	8	2	<LQ	2	492	403	65	6	2
Kresoxim-methyl	Appli. 16/07	<LQ	<LQ	6	21	1189	164	8	<LQ	<LQ	21	922	996	132	4
Mandipropamid	Appli. 27/05	<LQ	<LQ	852	176	34	15	<LQ	<LQ	582	727	131	19	4	4
Metalaxyl-M	Appli. 07/05	<LQ	<LQ	3324	41	19	4	<LQ	<LQ	1992	3351	33	17	5	<LQ
Metolachlor (S)		<LQ	<LQ	1481	150	<LQ	<LQ	<LQ	<LQ	1246	1626	165	<LQ	<LQ	<LQ

Metrafenone	Appli. 27/05	<LQ	<LQ	254	42	7	<LQ	<LQ	<LQ	148	212	35	7	<LQ	<LQ
Myclobutanil	Appli. 05/06	<LQ	<LQ	7	1774	747	14	4	<LQ	7	2052	3378	749	15	5
Quinoxifen	Appli. 17/05	<LQ	<LQ	13	51	58	7	<LQ	<LQ	368	381	68	11	7	<LQ
Spiroxamine	Appli. 17/06	<LQ	<LQ	73	2193	57	5	<LQ	<LQ	41	1831	858	35	4	<LQ
Trifloxystrobin		<LQ	<LQ	3	10	3	<LQ	<LQ	<LQ	1	8	7	2	<LQ	<LQ
Zoxamide	Appli. 01/07	<LQ	<LQ	37	6	428	22	7	<LQ	24	36	501	314	18	7

in bold: sampling period during which the pesticide was applied (when applied)

		Amounts accumulated on PUF-PAS (ng PUF-PAS ⁻¹) in the non-treated zone (NTZ)													
		1 month PUF-PAS							2 months PUF-PAS						
		20/02- 21/03	21/03- 23/04	23/04- 29/05	29/05- 26/06	26/06- 24/07	24/07- 11/09	11/09- 17/10	20/02- 23/04	21/03- 29/05	23/04- 26/06	29/05- 24/07	26/06- 11/09	24/07- 17/10	11/09- 13/12
Sampling duration (days)		29	33	35	28	28	49	36	62	68	63	56	77	85	93
Ametoctradin	Appli. 17/05	<LQ	<LQ	43	34	9	2	<LQ	<LQ	92	92	50	11	<LQ	<LQ
Azoxystrobin		<LQ	<LQ	<LQ	<LQ	17	<LQ	<LQ	<LQ	<LQ	<LQ	19	<LQ	<LQ	<LQ
Boscalid	Appli. 08/07	27	7	<LQ	56	640	118	40	5	<LQ	47	1215	752	88	12
Carbendazim		<LQ	<LQ	3	6	<LQ	1	<LQ	<LQ	<LQ	<LQ	<LQ	8	<LQ	<LQ
Chlorpyrifos-methyl	Appli. 01/07, 01/08	<LQ	<LQ	<LQ	na*	96	426	7	<LQ	4	57	119	928	283	4
Cyazofamid	Appli. 02/08	8	<LQ	2	11	<LQ	27	2	<LQ	<LQ	7	6	47	25	<LQ
Cyprodinil		<LQ	<LQ	<LQ	<LQ	30	<LQ	<LQ	<LQ	<LQ	<LQ	24	<LQ	<LQ	<LQ
Fipronil		<LQ	<LQ	<LQ	na	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ
Fipronil sulfide		<LQ	<LQ	<LQ	na	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ

Fipronil sulfone		<LQ	<LQ	<LQ	na	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ
Fludioxonil		<LQ	<LQ	<LQ	na	68	8	<LQ	<LQ	<LQ	<LQ	60	22	<LQ	<LQ
Folpet	Appli. 07/05, 17/06, 17/07	<LQ	24	1763	na	2962	908	154	20	3608	6015	7262	2649	622	76
Iprovalicarb	Appli. 17/06	4	<LQ	<LQ	54	7	<LQ	<LQ	<LQ	<LQ	45	63	12	<LQ	<LQ
Kresoxim-methyl	Appli. 16/07	3	<LQ	2	10	52	4	<LQ	<LQ	<LQ	8	67	34	4	<LQ
Mandipropamid	Appli. 27/05	9	<LQ	3	59	6	2	<LQ	<LQ	<LQ	56	56	11	<LQ	<LQ
Metalaxyl-M	Appli. 07/05	13	<LQ	331	20	3	3	<LQ	<LQ	682	481	23	<LQ	1	<LQ
Metolachlor (S)		<LQ	<LQ	<LQ	<LQ	18	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ	<LQ
Metrafenone	Appli. 27/05	6	<LQ	4	17	2	<LQ	<LQ	<LQ	5	19	22	3	<LQ	<LQ
Myclobutanil	Appli. 05/06	15	<LQ	1	371	9	<LQ	<LQ	<LQ	5	389	513	14	<LQ	<LQ
Quinoxifen	Appli. 17/05	<LQ	<LQ	27	na	41	6	<LQ	<LQ	40	46	69	29	4	<LQ
Spiroxamine	Appli. 17/06	34	<LQ	10	189	6	3	<LQ	<LQ	13	128	120	4	1	<LQ
Trifloxystrobin		1	<LQ	1	6	2	<LQ	<LQ	<LQ	2	7	7	1	<LQ	<LQ
Zoxamide	Appli. 01/07	11	<LQ	5	3	13	3	<LQ	<LQ	10	11	27	13	3	<LQ

* na: not analyzed