Measurements of Pesticides in the Turia River Basin

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MEASUREMENTS OF PESTICIDES IN THE TURIA BASIN

- Introduction
- Methodology and experimental
- Main results
- Conclusions

INTRODUCTION

Development and maintenance of production in agriculture

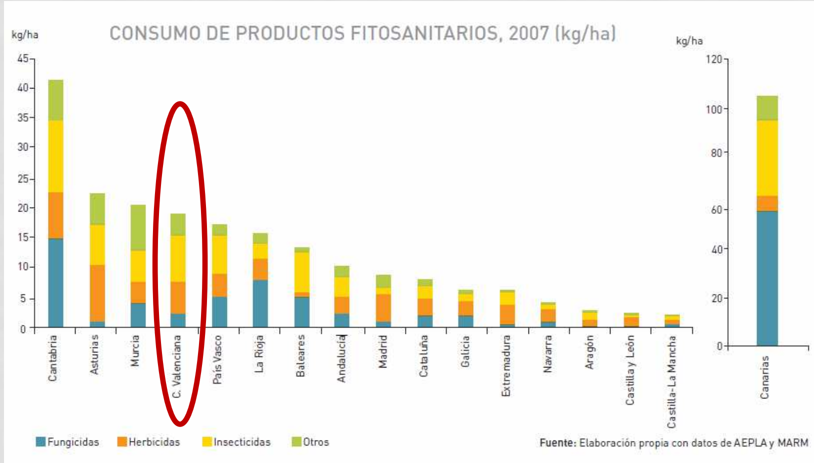
Prevention of diseases

Widespread use of pesticides

INTRODUCTION

Valencia Region (~23255 km^2)

One of the most important regions in Spain regarding use of pest



~30% of surface dedicated to agricultural activities

Olives (16%)

Vineyards (14%)

Cereals (7%)

Vegetables (4%)

Citric trees (31%)

INTRODUCTION

Aim of the field campaing

Provide information about the presence of selected pesticides in Turia river basin, and –if possible- their seasonal behaviour

Figure 1: Air sampling locations along Turia basin

Valencia (39°28'47''N, 0°20'15''W)
Paterna (39°33'05''N, 0°27'39''W)
Villar del Arzobispo (39°42'29''N, 0°49'55''W)

METHODOLOGY AND EXPERIMENTAL

Gas-phase → Automatic sampler developed at CEAM with XAD-2 cartridges (Supelco)

Aerosol phase → High volume capturer, with glass fiber filters (Whatman) at ~30 $m^3\ h^{-1}$

METHODOLOGY AND EXPERIMENTAL

Function	Compound	CAS	Analysis
Insecticide - Acaricide	Abamectin	71751-41-2	LCMS
Fungicide	Azoxystrobin	131860-33-8	LCMS
Herbicide	Benfluralin	1861-40-1	GCMS
Fungicide	Bitertanol	55179-31-2	LCMS
Insecticide	Buprofezin	69327-76-0	LCMS
Fungicide	Carbendazim	10605-21-7	LCMS
Insecticide - Acaricide	Chlorfenvinphos	470-90-6	GCMS
Insecticide - Acaricide	Chlorpyrifos	2921-88-2	GCMS
Insecticide - Acaricide	Chlorpyrifos-methyl*	5598-13-0	GCMS
Herbicide	Dichlobenil	1194-65-6	GCMS
Herbicide	Ethalfluralin	55283-68-6	GCMS
Insecticide - Avicide	Fenthion	55-38-9	GCMS
Acaricide	Hexythiazox	78587-05-0	LCMS
Fungicide	Imazalil	73790-28-0	LCMS
Insecticide	Imidacloprid	105827-78-9	LCMS
Insecticide - Acaricide	Lindane	58-89-9	GCMS
Insecticide - Acaricide	Malathion	121-75-5	GCMS
Fungicide	Metalaxyl	57837-19-1	LCMS
Insecticide - Acaricide	Methidathion	950-37-8	GCMS
Insecticide	Omethoate	1113-02-6	LCMS
Herbicide	Propachlor	1918-16-7	GCMS
Herbicide	Propanil	709-98-8	LCMS
Acaricide	Pyriproxyfen	95737-68-1	LCMS
Fungicide	Tebuconazole	107534-96-3	LCMS
Fungicide	Thiabendazole	148-79-8	LCMS
Herbicide	Trifluralin*	1582-09-8	GCMS

Compound	EU Legal situation
Hexythiazox	Yes (g)
Carbendazim	Yes (h)
Pyriproxyfen	Yes
Imidacloprid	Yes
Buprofezin	No (f)
Bitertanol	Yes (b)
Chlorpyrifos-methyl	Yes
Propachlor	No (a)
Abamectin	Yes
Imazalil	Yes
Thiabendazole	Yes
Omethoate	No**
Malathion	Yes (d)
Propanil	No (a)
Chlorpyrifos	Yes
Fenthion	No (e)
Metalaxyl	Yes
Azoxystrobin	Yes
Benfluralin	Yes
Tebuconazol	Yes
Chlorfenvinphos	No (e)
Trifluralin	No (c)
Dichlobenil	No (f)
Ethalfluralin	Yes (b)
Lindane	No
Methidathion	No (e)

Analytical methodology previously described.

Yes: IN USE; No: FORBIDDEN

(a) Excluded from 31/10 2009

(b) Allowed until 30/06/2011

(c) Excluded from 31/12/ 2008

(d) Excluded from 06/08/08 until 01/01/2010. Now allowed

(e) Excluded from 31/12/2007

(f) Excluded from 30/09 2009

(g) Voluntary exclusión from 30/06/2011

(h) Allow until 31/12/2011

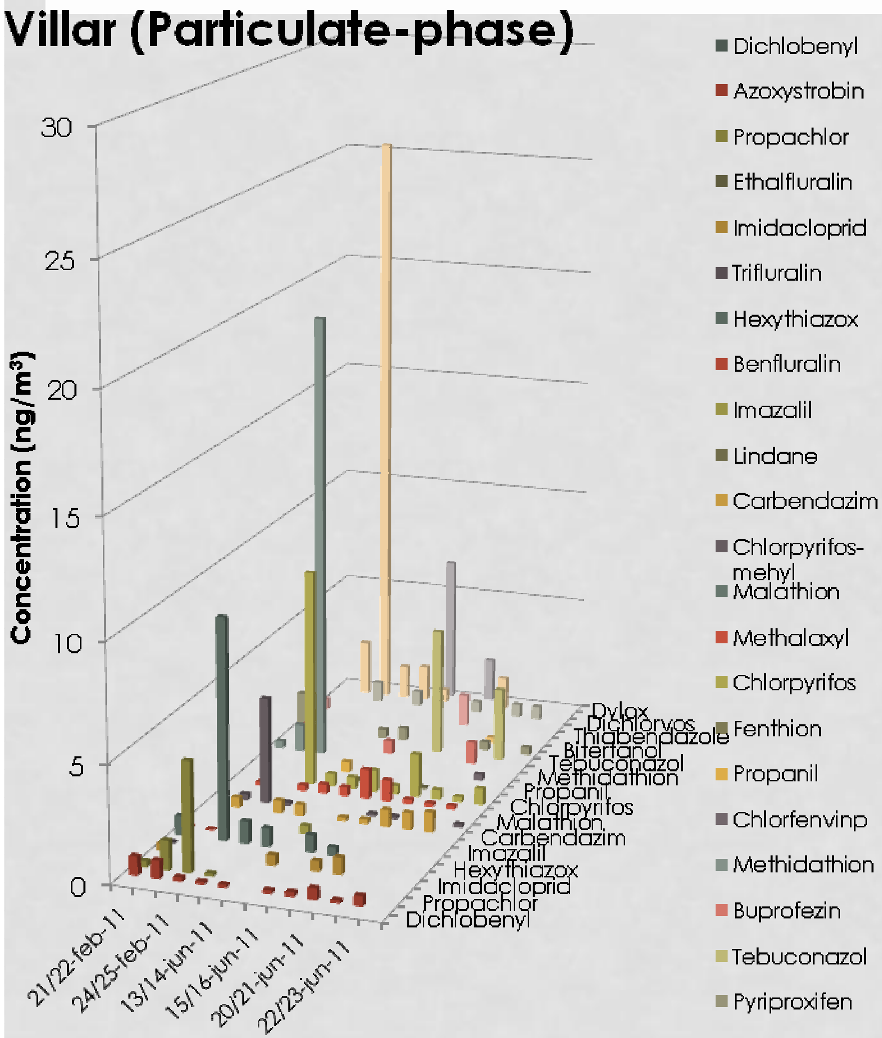
MAIN RESULTS

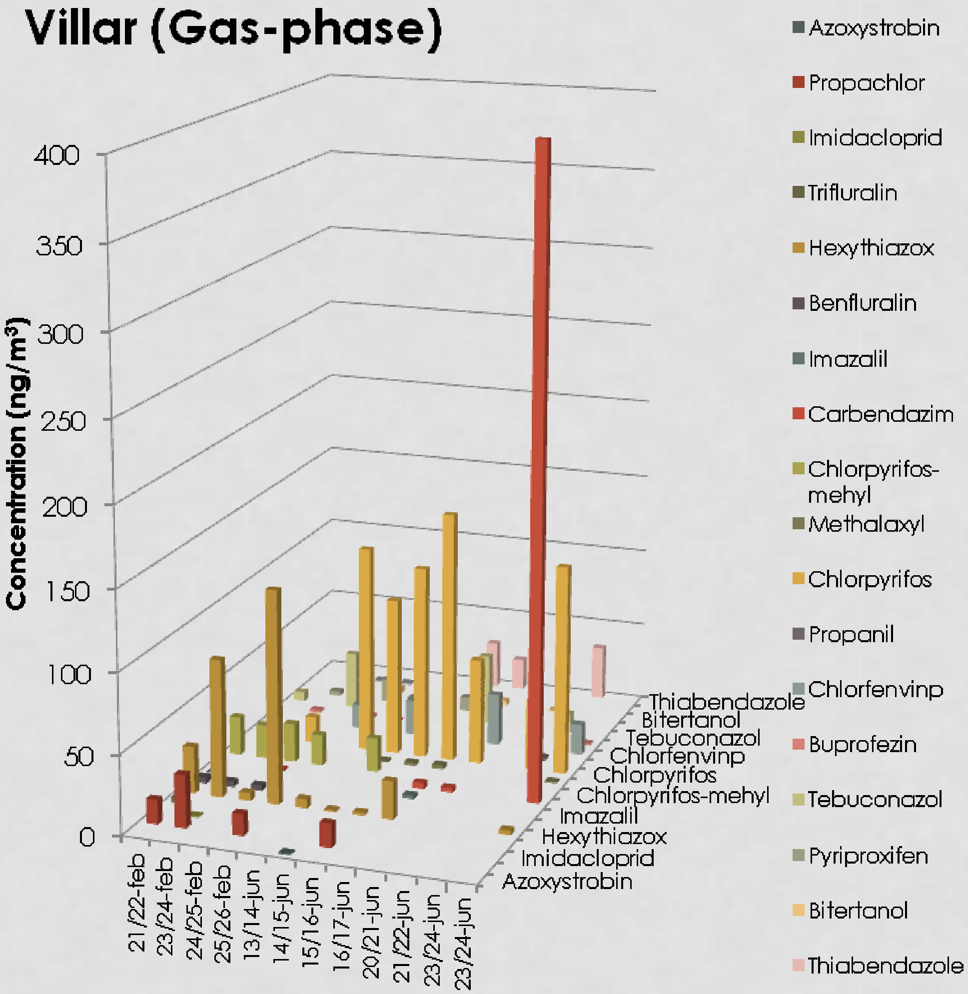
Overall concentrations of selected pesticides in the 3 sampling sites

	GAS PHASE					PARTICULATE PHASE				
	Min (ng m^{-3})	Max (ng m^{-3})	Mean value (ng m^{-3})	Conf. Inter *	Detections (N=36)	Min (ng m^{-3})	Max (ng m^{-3})	Mean value (ng m^{-3})	Conf. Inter.*	Detections (N=39)
Dichlobenyl	12.89	12.89	12.89		3%	0.63	0.96	0.79	± 0.05	10%
Azoxystrobin	0.93	0.98	0.957	± 0.010	6%	0.12	0.87	0.43	± 0.09	44%
Propachlor	13.35	32.98	18.3	± 1.8	36%	0.11	4.70	0.9	± 0.4	41%
Ethalfluralin	20.69	20.69	20.69		3%	0.11	2.08	0.8	± 0.4	8%
Imidacloprid	0.52	0.85	0.71	± 0.05	8%	0.33	0.85	0.59	± 0.05	28%
Trifluralin	2.84	5.98	3.7	± 0.3	31%	0.02	0.03	0.03		5%
Hexythiazox	0.97	133.65	22	± 11	61%	0.12	9.49	1.2	± 0.7	49%
Benfluralin	3.19	5.63	3.7	± 0.3	19%	0.02	0.03	0.03		10%
Imazalil	0.84	2.00	1.40	± 0.16	14%	0.20	0.35	0.27	± 0.03	5%
Lindane	nd	nd	nd			nd	nd	nd		
Carbendazim	0.88	1723.77	248	± 213	19%	0.16	0.93	0.58	± 0.07	56%
Chlorpyrifos-mehyl	17.02	24.34	19.9	± 0.7	69%	0.11	4.57	0.5	± 0.3	51%
Malathion	nd	nd	nd			nd	nd	nd		
Metalaxyl	0.53	9.82	2.3	± 1.0	25%	0.12	1.28	0.48	± 0.09	82%
Chlorpyrifos	16.58	3809.64	381	± 300	75%	0.15	18539.63	716	± 1141	67%
Propanil	1.92	4.86	3.4	± 0.7	6%	0.09	49.98	8	± 5	28%
Chlorfenvinp	14.15	32.59	21	± 2	14%	0.46	0.76	0.60	± 0.05	8%
Fenthion	24.78	27.48	25.7	± 0.5	8%	0.25	1.73	0.70	± 0.18	23%
Methidathion	27.34	27.34	27.34		3%	0.21	19.32	2	± 2	31%
Buprofezin	0.89	2.41	1.56	± 0.15	33%	0.23	0.95	0.52	± 0.07	36%
Tebuconazol	5.82	44.47	20	± 4	22%	0.87	24.48	8	± 3	28%
Pyriproxifen	0.46	14.70	4	± 1	28%	0.27	1.61	0.50	± 0.10	49%
Bitertanol	0.59	3.87	1.9	± 0.4	42%	0.25	0.86	0.47	± 0.07	21%
Thiabendazole	19.88	34.12	28	± 2	8%	0.45	1.98	1.24	± 0.16	26%
Ometoate	nd	nd	nd			nd	nd	nd		
Difenilamine	nd	nd	nd			0.53	25.36	7	± 3	28%
Dylox	nd	nd	nd			1.85	6.27	4.1	± 1.0	5%

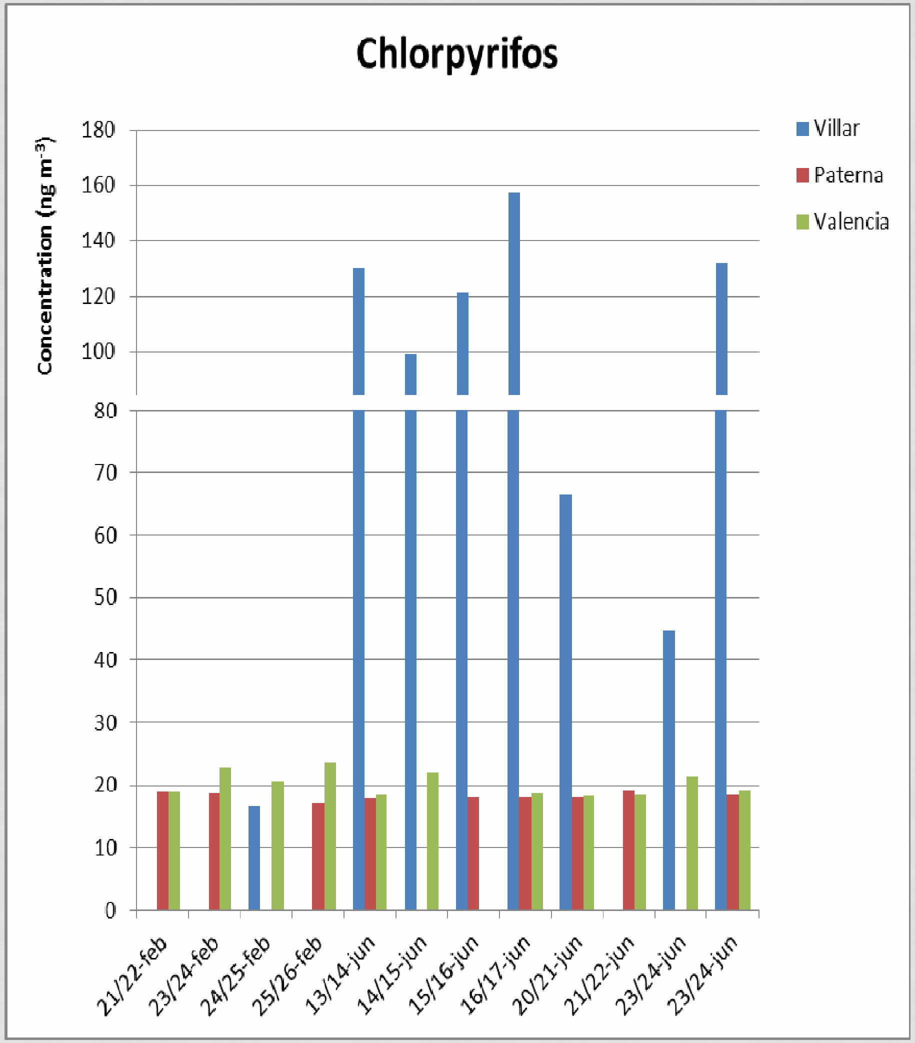
*: The average and 95% confidence intervals (Conf. Inter.) were calculated from the arithmetic mean and standard deviation (SD) of samples with concentration superior to LOD.

MAIN RESULTS





MAIN RESULTS



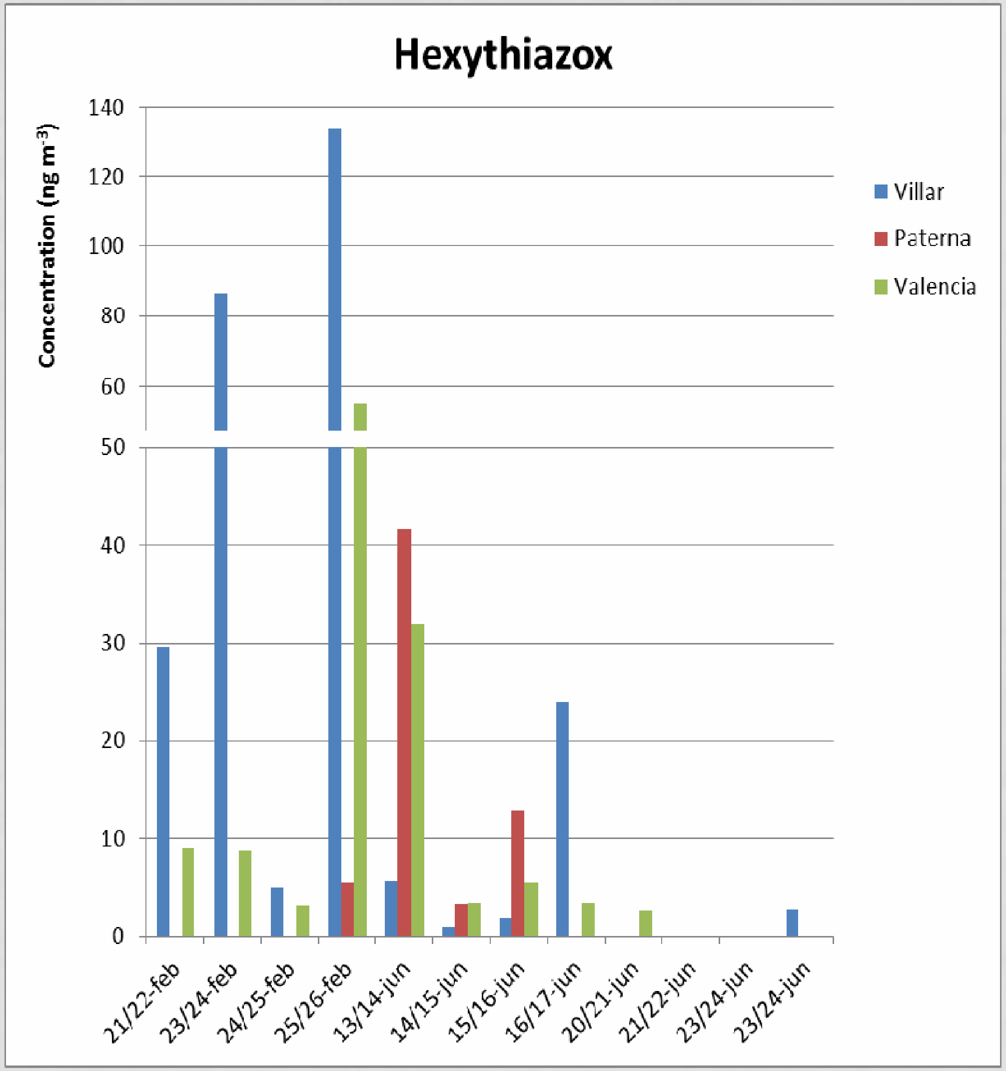
Gas-phase

Insecticide (one of the most important pest in the world in terms of consumption)

Recommended period of application: from January to September

Seasonal behaviour with more detections in summer

MAIN RESULTS



Gas-phase

Acaricide and fungicide

Recommended period of application: from March to June and in October

Detections in Feb likely due to an advance in the dates of treatment.

CONCLUSIONS

- Concentrations in gas-phase are higher than in particulate phase (only one exception), with less number of pest detected.
- Chlorpyrifos is one of the most detected pesticide in both, gas and particulate phases, with the highest concentrations measured. It is one of the most widely used insecticide in citric crops.
- Clear detection of pesticides related to local applications and usages.
- A seasonal behaviour can be infered ⇒ higher concentrations and number of pest detected in summer.
- Wide number of compounds detected in urban and semi-urban areas

⇓

Deeper studies recommended including agricultural areas

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