DEPARTMENT OF PESTICIDE REGULATION

AMBIENT MONITORING REPORT

Date: August 25, 2015

1. Study highlights:

- Study Number: 271 & 278
- Title: Surface Water Monitoring for Pesticides in Agricultural Areas of California, 2011-2012
- Author Xin Deng
- Study area:
  - County: Imperial, Merced, Monterey, Napa, San Luis Obispo, Santa Cruz, Santa Barbara, Riverside, Ventura
  - Waterbody/ Watershed: Salinas River, Old Salinas River, Pajaro River, Santa Maria River, Napa River, Russian River, San Joaquin Watershed, New River, Alamo River, Colorado River, Salton Sea
- Land Use Type: ☒ Ag ☐ Urban ☐ Forested ☒ Mixed ☐ Other
- Water body type: ☐ Storm drain outfall ☒ Creek ☒ River ☐ Pond ☒ Lake ☒ Drainage ditch ☐ Other: Click here to enter describe other
- Objectives: 1. Determine pesticide presence and their concentrations in surface water runoff from agricultural areas of high pesticide uses; 2. Compare pesticide concentrations to the lowest US EPA aquatic life benchmarks.
- Sampling period: March - October, 2011; March - October, 2012
- Pesticides monitored:

  Aldicarb and degradates, Carbaryl, Carbofuran, 3-hydroxycarbofuran, Methomyl, Methiocarb, Oxamyl, Chlorpyrifos, Diazinon, Dichlorvos, Dimethoate, Disulfoton, Ethoprop, Fenamiphos, Malathion, Methidathion, Methyl parathion, Phorate, Methoxyfenozide, Tebufenozide, Imidacloprid and degradates, Bifenthrin, λ-cyhalothrin, Cyfluthrin, Cypermethrin, Fenvalerate/Esfenvalerate, Permethrin, Benfluralin, Bensulide, Ethalfluralin, Oryzalin, Pendimethalin, Prodiamine, Trifluralin, Oxyfluorfen, Azoxystrobin, Kresoxim-methyl, Pyraclostrobin, Trifloxystrobin.
- Major findings:

  INSECTICIDES. Imidacloprid, chlorpyrifos, methomyl and methoxyfenozide were the four insecticides with high detection frequencies (DF) (43-69%). Three organophosphates including diazinon, dimethoate and malathion were detected at 22-33% DF. DFs for pyrethroids varied from 6-26%. Bifenthrin and permethrin were the most frequently detected pyrethroid (26%), followed by λ-cyhalothrin (19%), fenvalerate/esfenvalerate (10% DF), cyfluthrin (6%) and cypermethrin (6%). Carbaryl and oxamyl had relatively low DFs (3-8%). No detections were reported for the rest of insecticides. As for the aquatic life benchmark (BM) exceedances, permethrin had the highest frequency (26%) exceeding the lowest BMs, followed by chlorpyrifos (25%), malathion (21%), λ-cyhalothrin (19%), methomyl (15%), imidacloprid

(13%) and bifenthrin (9%). Low exceedance frequencies (3-6%) were reported for diazinon, methoxyfenozide, cyfluthrin and fenvalerate/esfenvalerate. No BM exceedances were found for other insecticides.

HERBICIDES AND FUNGICIDES. Bensulide (64% DF) was the most frequently detected chemical, followed by azoxystrobin (42%), oxyfluorfen (39%), pendimethalin (37%), trifluralin (25%) and pyraclostrobin (18%). There was only one sample with a measurable concentration of benfluralin. No detections were reported for the rest of the herbicides and fungicides. Detected concentrations of herbicides and fungicides seldom exceed their lowest BMs. There were only 3 samples that had oxyfluorfen and trifluralin concentrations exceeding their BMs.

2. Pesticide detection frequency

Table 1. Pesticides detected in water. Complete data set in Appendix.

Pesticide	Number of samples	Number of detections	Reporting Limit (µg/L)	Detection frequency (%)	Lowest USEPA benchmark (BM) (µg/L)*		Number of BM exceed-ances	BM exceedance frequency (%)
Aldicarb	66	0	0.05	0	0.46	FC	0	0
Aldicarb sulfone	65	0	0.05	0	140	IA	0	0
Aldicarb sulfoxide	65	0	0.05	0	21.5	IA	0	0
Carbaryl	66	2	0.05	3	0.5	IC	0	0
Carbofuran	66	0	0.05	0	0.75	IC	0	0
3-hydroxycarbofuran	65	0	0.05	0	NB		-	-
Methomyl	65	28	0.05	43	0.7	IC	10	15
Methiocarb	66	0	0.05	0	0.1	IC	0	0
Oxamyl	66	5	0.05	8	27	IC	0	0
Chlorpyrifos	170	89	0.01	52	0.04	IC	43	25
Diazinon	144	48	0.01	33	0.105	IA	9	6
Dichlorvos	85	0	0.05	0	0.0058	IC	0	0
Dimethoate	170	38	0.04	22	0.5	IC	10	6
Disulfoton	9	0	0.04	0	0.01	IC	0	0
Ethoprop	85	0	0.05	0	0.8	IC	0	0
Fenamiphos	9	0	0.05	0	0.12	IC	0	0
Malathion	170	36	0.02	21	0.035	IC	35	21
Methidathion	170	0	0.05	0	0.66	IC	0	0
Methyl parathion	85	0	0.03	0	0.25	IC	0	0
Phorate	9	0	0.05	0	0.21	IC	0	0
Methoxyfenozide	37	16	0.05	43	6.3	IC	1	3
Tebufenozide	37	0	0.05	0	4.3	IC	0	0
Imidacloprid	163	112	0.05	69	1.05	IC	22	13
Imidacloprid guanidine	64	30	0.05	47	NB		-	-
Imidacloprid guanidine olefin	64	0	0.05	0	NB		-	-
Imidacloprid olefin	64	0	0.05	0	NB		-	-
Imidacloprid urea	64	2	0.05	3	NB		-	-
Bifenthrin	31	8	0.005	26	0.0013	IC	6	9
λ-cyhalothrin	31	6	0.015	19	0.002	IC	6	19
Cyfluthrin	31	2	0.015	6	0.0074	IC	2	6
Cypermethrin	31	2	0.015	6	0.069	IC	0	0
Fenvalerate/ Esfenvalerate	31	3	0.015	10	0.017	IC	1	3

Permethrin	31	8	0.015	26	0.0014	IC	8	26
Benfluralin	59	1	0.05	2	1.9	FC	0	0
Bensulide	94	60	0.04	64	290	IA	0	0
Ethalfluralin	59	0	0.05	0	0.4	FC	0	0
Oryzalin	59	0	0.05	0	15.4	VA	0	0
Pendimethalin	59	22	0.05	37	5.2	NA	0	0
Prodiamine	59	0	0.05	0	1.5	IC	0	0
Trifluralin	59	15	0.05	25	1.14	FC	2	3
Oxyfluorfen	59	23	0.05	39	0.29	NA	1	2
Azoxystrobin	43	18	0.05	42	44	IC	0	0
Kresoxim-methyl	44	0	0.05	0	55	IC	0	0
Pyraclostrobin	44	8	0.05	18	1.5	NA	0	0
Trifloxystrobin	44	0	0.05	0	2.76	IC	0	0

*FA, fish acute; FC, fish chronic; IA, invertebrate acute; IC, invertebrate chronic; NA, non-vascular acute; VA, vascular acute; NB, no benchmark available.

3. Laboratory QC summary

QC Type		Water Samples		Sediment Samples	
		Total Number	Number of QC out of contro1	Total Number	Number of QC out of control
	Lab Blanks	312	0	NA	NA
	Matrix Spikes/Duplicates	312	0	NA	NA
	Laboratory Control Spikes/Duplicates	0	0	NA	NA
	Blind Spikes	52	4	NA	NA
	Surrogate Spikes	0	0	NA	NA
Other QC:	Describe	NA	NA	NA	NA
Other QC:	Describe	NA	NA	NA	NA
Explain out of control QC and interpretation of data:	All lab QCs were within control limits except for four blind spikes. The recoveries of four blind spikes were below the lower control limits (LCL) for methiocarb (2.7% < LCL), chlorpyrifos (6.8 < LCL, 2 spikes) and diazinon (11% < LCL). The methiocarb spike was associated with 13 samples collected in June, 2011. Methiocarb was not detected in those smaples and any other samples in 2011. The spike that was below the LCL is unlikely to affect the results. The two chlorpyrifos spikes and one diazinon spike were associated with 20 samples collected in May and October, 2012 and 10 samples collected in April, 2011, respectively. The lower recovery percentages suggest that the actual concentrations might be higher than detected in those samples. The relative differences of recoveries between the blind spikes and LCLs would not affect the benchmark exceedance frequencies when the detected concentrations were compared with the lowest aquatic life benchmarks. All the matrix spikes for those samples were within control limits.The data were deemed acceptable.				

4. Supporting Information

Index of Supporting Information: