Department of Pesticide Regulation
Environmental Monitoring Branch
1001 I Street
Sacramento, CA 95812

Study 308: Interim Report on SeaMist Farms Woodchip Bioreactor

Scott D. Wagner
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In July 2016, we collected water samples from the SeaMist bioreactor inlet and outlet on SeaMist Farms in Castroville, Calif. (Fig. 1). Samples were analyzed for pyrethroids (bifenthrin, fenpropathrin, permethrin, cypermethrin, cyfluthrin, esfenvalerate, and lambda-cyhalothrin), dinitroaniline herbicides and oxyfluorfen, organophosphates (dimethoate, methidathion, diazinon, and chlorpyrifos), and imidacloprid. At the bioreactor inlet, we detected oxyfluorfen, bifenthrin, and permethrin. At the outlet, samples contained only bifenthrin, and at a lower concentration than was detected at the inlet (Table 1). While this is a promising start, more data is needed to determine how effectively this woodchip bioreactor removes pesticides from water and which pesticides are removed.

Sampling was scheduled to take place in May, July, and September of 2017, according to the protocol (link: http://www.cdpr.ca.gov/docs/emon/pubs/protocol/study308_sea_mist_farms.pdf). However, the bioreactor was taken off line over the winter of 2017 due to flooding and maintenance issues. The bioreactor was turned on again in August 2017. Given the time it takes for the resident bacteria to grow and establish in the bioreactor, we decided to forego sampling for 2017. Thus, sampling will resume in May 2018 when the hydraulic residence time (HRT) is known and the bacteria in the bioreactor are established. Furthermore, according to pesticide use reports, the peak pesticide use for this region is from May through early September. Thus, when sampling resumes in May, we will begin sampling at a time to maximize our chances of detecting pesticides in the inlet water.

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Fig. 1: SeaMist woodchip bioreactor, Castroville, Calif., July 2016.

Table 1: Analytical results of pesticides in surface water samples taken from SeaMist bioreactor, July 2016.

Analyte	Site				
	Bioreactor Inlet (ppb)	**Bioreactor Outlet (ppb)**	**Reporting Limit (ppb)**	**Lowest Chronic Aquatic Life Benchmark (ppb)**	**Lowest Acute Aquatic Life Benchmark (ppb)**
Dinitroanilines					
Oryzalin	ND	ND	0.05	220 *F**	13 *VP*
Ethalfluralin	ND	ND	0.05	0.4 *F*	7.3 *VP*
Trifluralin	ND	ND	0.05	1.9 *F*	9.25 F
Benfluralin	ND	ND	0.05	1.9 *F*	34.85 *F*
Prodiamine	ND	ND	0.05	1.5 *I*	>6.5 *I*
Pendimethalin	ND	ND	0.05	6.3 *F*	5.2 *NVP*
Oxyfluorfen	0.071	ND	0.05	1.3 *F*	0.29 *NVP*
Pyrethroids					
Bifenthrin	0.0133	0.00434	0.001	0.0013 *I*	0.075 *F*
Fenpropathrin	ND	ND	0.005	0.06 *F*	0.265 *I*
Lambda Cyhalothrin	ND	ND	0.002	0.002 *I*	0.0035 *I*
Cyfluthrin	ND	ND	0.002	0.0074 *I*	0.0125 *I*
Esfenvalerate/Fenvalerate	ND	ND	0.005	0.017 *I*	0.025 *I*
Permethrin	0.00336	ND	0.002	0.0014 *I*	0.0195 *I*
Imidacloprid	ND	ND	0.05	1.05 *I*	34.5 *I*
Organophosphates					
Chlorpyrifos	ND	ND	0.01	0.04 *I*	0.05 *I*
Diazinon	ND	ND	0.02	0.17 *I*	0.105 *I*
Methidathion	ND	ND	0.05	0.66 *I*	1.1 *F*
Dimethoate	ND	ND	0.04	0.5 *I*	21.5 *I*

*Organism used in toxicity test to determine benchmark: *I*= invertebrate, *F*= fish, *VP*= vascular plant, *NVP*= nonvascular plant