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Pest Control Notes

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Reference on pesticide properties for surface water quality protection

With surface water quality issues becoming a major concern for our farming community, I thought I'd focus this newsletter on how pesticides get in our surface waters, so we can all look for ways to reduce non-point source pollution problems. In particular, take a look at the table on page 3, where Prof. J Gan, Consultant M. Nett, and I have evaluated and ranked insecticides by their potential to move in water run-off. The risk ranking assignments for run-off potential were determined from the water solubility and soil adsorption values for each insecticide (USDA-ARS database). In the table, we have also included risk rankings for indicator fish and aquatic invertebrates (waterfleas) for each pesticide based on US EPA's acute toxicity and mortality data. If your irrigation tail-water flows in to a natural waterway that leads to the Sac Delta, select a pesticide that has a minimal likelihood of moving off-site and/or that has low toxicity to aquatic life.

How pesticides get into surface water:
Following are the main determinants for the likelihood of a pesticide to contaminate surface water:

1) Pesticide chemical properties:

The more a pesticide's active ingredient adsorbs to soil surfaces (as indicated by its Koc value), and the lower its water solubility; the lower its potential will be to dissolve and move in run-off from the treatment site. Pesticides adsorbed to soil particles may move with the soil sediment in run-off, but will not readily be available as toxic agents in the aquatic ecosystem. It is almost exclusively the free chemical dissolved in the water phase that is responsible for aquatic toxicity. Pesticides that remain in the field for many weeks after treatment (half-life>40 days) may also remain available to move in run-off, because they last the longest in the environment. Half-life refers to the time required for one-half the original quantity of a chemical to break down.

2) Soil properties:

Soils high in clay and organic matter adsorb pesticides better than sandy soils. Soils with a slow infiltration rate may be more prone to pesticide run-off as they allow water to collect and pond on the soil surface. Soils with a fast infiltration rate more readily move pesticides into the soil profile.

3) *Application and handling*:

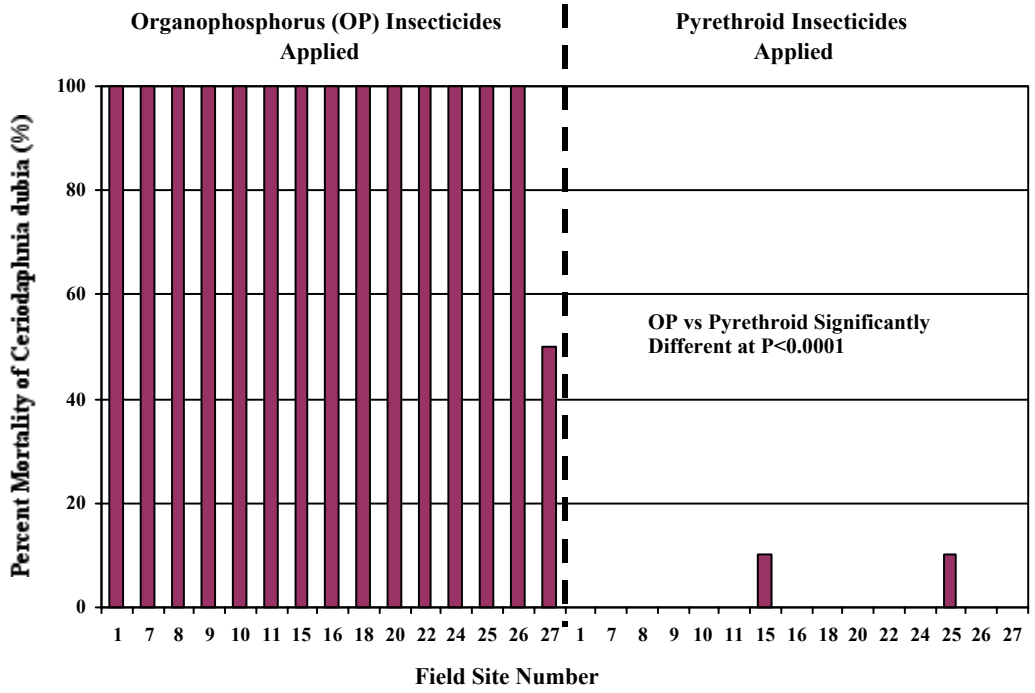
Low pesticide application rates, proper timing, careful handling of pesticides, minimizing drift (to neighboring crops and bare soil), and the presence of buffer zones will minimize run-off problems associated with pesticide use. Proper cleanup and disposal of pesticides is also important.

4) Water:

Rainfall, irrigation practices, evapotranspiration, acidity, temperature, clarity (microorganisms and sediment), and flow rate also affect pesticide movement and fate. Although one cannot control all these factors, some such as irrigation practices may be modified to help reduce water runoff.

Pesticide Choice in Alfalfa:

The following graph illustrates the effect of insecticide choice in alfalfa on mortality of water fleas in a 24-hour test (15 paired field comparisons, Sac. Valley). Water samples were taken from alfalfa tail-water flowing from fields during irrigation 25 to 53 days after insecticide application. In all OP tail water samples, when Piperonyl Butoxide (PBO) was added, mortality was zero, indicating OP toxicity.



Alfalfa weevil control:

Steward is now registered for use in alfalfa for weevil and worm control. The residual control for weevils is not as long as for pyrethroids (my data shows 95% control after one week, 80% after 2 weeks, and 60% after 3 weeks), but Steward is soft on beneficial insects and will not likely move with irrigation water. Steward does not control aphids, but residual beneficial insects after treatment should help control them. Try putting out small test plots of Steward for weevil control so we can get more information on where this pesticide best fits in our pest management program.

Now is the time to control voles and gophers in alfalfa:

Zinc phosphide has a section 18 use permit for vole control in alfalfa through May (with all indications that it will be extended). A 10% vole infestation must be shown via trapping until zinc phosphide gets a full use permit for alfalfa (being pursued). Diphacinone and chlorophacinone control gophers, but are slow acting because gophers need to get multiple doses over time to kill them. Hand baiting is the only option (anticoagulants cannot be used in a burrow builder). Try putting up barn owl boxes for help with gophers; every one owls eat is one less to worry about.

The following table shows California-registered insecticides ranked by potential to transport in run-off from treated areas (based on the soil adsorption and water solubility values for each pesticide).

Active Ingredient	Trade Names®	Potential to Move Offsite	Toxicity Aquatic	
			Water flea	Fish
Acephate	ORTHENE	Extremely High	Moderate	Very Low
Aldicarb	TEMIK	Extremely High	Moderate	Moderate
Dimethoate	CYGON	Extremely High	High	Moderate
Methamidaphos	MONITOR	Extremely High	High	Low
Methomyl	LANNATE	Extremely High	High	High
Oxamyl	VYDATE	Extremely High	Moderate	Moderate
Oxydemeton methyl	METASYSTOX-R	Extremely High	Moderate	Moderate
Carbaryl	SEVIN	Very High	Moderate	Moderate
Carbofuran	FURADAN	Very High	High	Moderate
Methidathion	SUPRACIDE	Very High	High	Very High
Azinphosmethyl	GUTHION	High	High	Very High
Diazinon	DIAZINON	High	High	Moderate
Imidacloprid	PROVADO	High	Very Low	Very Low
Malathion	MALATHION	High	High	Extremely High
Naled	DIBROM	High	Very High	High
Phosmet	IMIDAN	High	Very High	Very High
Thiodicarb	LARVIN	High	High	Moderate
Abamectin	AGRI-MEC, ZEPHYR	Moderate	High	High
Amitraz	OVASYN	Moderate	High	Moderate
Chlorpyrifos	LORSBAN, LOCK-0N	Moderate	Extremely High	High
Disulfoton	DI-SYSTON	Moderate	High	High
Fipronil	REGENT	Moderate	NA	Very High
Methyl parathion	PARATHION	Moderate	Very High	Moderate
Phorate	THIMET	Moderate	Very High	Very High
Profenofos	CURACRON	Moderate	Moderate	Low
Spinosad	SUCCESS, TRACER	Moderate	NA	Very Low
Tebufenozide	CONFIRM	Moderate	NA	Very Low
Diflubenzuron	DIMILIN	Low	Very Low	Very Low
Esfenvalerate	ASANA	Low	Very High	Very High
Fenpropathrin	DANITOL	Low	High	Moderate
Permethrin	POUNCE	Low	Very High	Very High
Rotenone	ROTEN	Low	Very High	High
Tralomethrin	SCOUT	Low	NA	Low
Cyfluthrin	BAYTHROID	Very Low	Extremely High	Very High
Cypermethrin	AMMO	Very Low	Very High	High
Endosulfan	THIODAN	Very Low	Very High	Very High
Bifenthrin	CAPTURE	Extremely Low	High	Very High
Lambda-cyhalothrin	WARRIOR, KARATE	Extremely Low	Very High	Very High

Resources available in our office:

1) Postemergence weed control in seedling alfalfa and phytotoxicity symptoms
Publication #21615, University of California ANR, 2002, $12.00.

2) 2002 Sample Costs to Produce Cotton in the Sacramento Valley, http://coststudies.ucdavis.edu/

3) Sacramento Valley cotton production guide, University of California ANR, 2001.

4) Hedgerow video, 2002 "Establishing a Hedgerow" video, 13 min.

Important Website:

http://alfalfa.ucdavis.edu Alfalfa production website/soil-moisture monitoring, variety trial results, and forage quality.

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