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OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

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MEMORANDUM

SUBJECT: Review – Protocol for Experiments to Understand the Movement of Fipronil from Treated Onion Seeds

TO: Ann Sibold
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FROM: Stephen Wente, Biologist
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The registrant (BASF) has submitted a report, entitled "Protocol for Experiments to Understand the Movement of Fipronil from Treated Onion Seeds", for EFED's review in order to generate supplemental data to address ecological concerns associated with the use of fipronil on onion seeds. Previous EFED modeling of this use resulted in acute and chronic risk quotients that exceed levels of concern for aquatic invertebrates for fipronil and two of its degradates (MB 46136 and MB 45950).

Characteristics of both fipronil and onion seed treatment contribute to risk. Both fipronil and its degradates of concern are persistent and accumulate over time in aquatic and terrestrial environments. The onion seed treatment use contributes to risk because onion seeds are planted very close to the soil surface. Therefore, fipronil on the seeds is placed where it is most susceptible to runoff and erosion if dissolved or bound to soil particles or organic material entrained in runoff water.

Previous EFED modeling assumed that 100% of the fipronil on treated onion seeds is available for degradation, runoff, and erosion. It is this assumption that this proposed study appears to address. As stated in the report, the proposed study serves two purposes:

1. Determine the amount of fipronil and relevant metabolites available to wash off treated onion seeds and potentially affect surface water.
2. Contrast the amount of fipronil and relevant metabolites that is available via extraction from treated onion seeds under different conditions.

Protocol Study Design

The proposed study uses four experiments to measure how much fipronil and degradates wash off the seed coat. Experiment #1 uses sonication followed by mechanical shaking to break-up the seed coat and, finally, an organic solvent extraction. This experiment is characterized in the protocol as measuring the "maximum potential amount of fipronil that may be extracted from treated seed". Preliminary results included in the protocol indicate approximately 39% wash-off under these conditions.

Experiment #2 uses the same sonication and mechanical shaking procedure with a water extraction. This experiment is characterized in the protocol as measuring the "potential for fipronil to washoff the seed in water". Preliminary results included in the protocol indicate approximately 13% wash-off under these conditions. Further, the protocol characterizes the results of experiments 1# and #2 as measuring the maximum wash-off under laboratory conditions, whereas experiments #3 and #4 are designed to better simulate field conditions.

Experiment #3 uses an apparatus analogous to a soil column to soak the seeds for 24 hours before sucking the water through a thin layer of soil to "simulate a worst case washoff scenario in the field". The experiment is performed in a laboratory but uses a complex apparatus to "include the environmental factors of soil adsorption and translocation". Fipronil and its degradates would be measured in both water that leaches (under pressure) from the apparatus and the soil that the water leaches through. Preliminary results included in the protocol indicate approximately 0.015% (average of replicates) wash-off under these conditions (measured from water only; no soil measurements in preliminary data).

Experiment #4 is the same as experiment #3 with the exception that the soil and seeds combination is soaked for 120 hours (5 days). Preliminary results included in the protocol indicate approximately 0.055% wash-off under these conditions (average of replicates; water only).

Risk based on Preliminary Data

If the preliminary data generated for the protocol is used to modify EFED's assumption that 100% of the fipronil and its degradates are available from onion seed treatment, the freshwater invertebrate risk quotients can be modified by multiplying the original risk quotients (RQs) by the percentages measured in each of the four experiments (Table 1).

Table 1. Estimated freshwater Invertebrate risk quotients at maximum and typical application rates for fipronil and two of its toxic degradates.

Chemical/Estimate Source	Acute RQ	Chronic RQ	Acute LOC Exceeded?	Chronic LOC Exceeded?
Maximum Application Rate				
Fipronil				
Original EFED Analysis (100%)[1]	5.89	82.75	**A, RU, LS**	**Yes**
Experiment #1 (39%)	2.30	32.3	**A, RU, LS**	**Yes**
Experiment #2 (13%)	0.77	10.76	**A, RU, LS**	**Yes**
MB 46136				
Original EFED Analysis (100%)[1]	.67	11.71	**A, RU, LS**	**Yes**
Experiment #1 (39%)	.26	4.6	**RU, LS**	**Yes**
Experiment #2 (13%)	.0871	1.5	**LS**	**Yes**
MB 45950				
Original EFED Analysis (100%)[1]	.06	.46	**LS**	No
Experiment #1 (39%)	.023	.18	No	No
Experiment #2 (13%)	.0078	.060	No	No
Typical Application Rate				
Fipronil				
Original EFED Analysis (100%)[1]	2.84	39.9	**A, RU, LS**	**Yes**
Experiment #1 (39%)	1.11	15. 6	**A, RU, LS**	**Yes**
Experiment #2 (13%)	.37	5.2	**RU, LS**	**Yes**
MB 46136				
Original EFED Analysis (100%)[1]	.34	5.86	**A, RU, LS**	**Yes**
Experiment #1 (39%)	.13	2.29	**LS**	**Yes**
Experiment #2 (13%)	.044	.76	No	No
MB 45950				
Original EFED Analysis (100%)[1]	0.03	0.22	**LS**	No
Experiment #1 (39%)	0.0117	0.0858	No	No
Experiment #2 (13%)	0.0039	0.0286	No	No

[1] Original EFED analysis numbers from Table 27 of *Ecological Risk Assessment for Current and Proposed Residential and Crop Uses of Fipronil.*

Making similar assumptions for the estuarine/marine invertebrates, RQs would be as in Table 2.

Table 2. Estimated estuarine/marine Invertebrate risk quotients at maximum and typical application rates for fipronil and two of its toxic degradates.

Chemical/Estimate Source	Acute RQ	Chronic RQ	Acute LOC Exceeded?	Chronic LOC Exceeded?
Maximum Application Rate				
Fipronil				
Original EFED Analysis (100%)[1]	9.25	182.06	**A, RU, LS**	**Yes**
Experiment #1 (39%)	3.6	71.0	**A, RU, LS**	**Yes**
Experiment #2 (13%)	1.2	23.7	**A, RU, LS**	**Yes**
MB 46136				
Original EFED Analysis (100%)[1]	.86	166.6	**A, RU, LS**	**Yes**
Experiment #1 (39%)	.34	64.98	**RU, LS**	**Yes**
Experiment #2 (13%)	.11	21.7	**LS**	**Yes**
MB 45950				
Original EFED Analysis (100%)[1]	1.54	23.74	**A, RU, LS**	**Yes**
Experiment #1 (39%)	0.6006	9.2586	**A, RU, LS**	**Yes**

Experiment #2 (13%)	0.2002	3.0862	**RU, LS**	**Yes**
Typical Application Rate				
Fipronil				
Original EFED Analysis (100%)[1]	4.46	87.78	**A, RU, LS**	**Yes**
Experiment #1 (39%)	1.74	34.23	**A, RU, LS**	**Yes**
Experiment #2 (13%)	.58	11.41	**A, RU, LS**	**Yes**
MB 46136				
Original EFED Analysis (100%)[1]	.43	83.35	**RU, LS**	**Yes**
Experiment #1 (39%)	.17	32.51	**RU, LS**	**Yes**
Experiment #2 (13%)	.0559	10.84	**LS**	**Yes**
MB 45950				
Original EFED Analysis (100%)[1]	.73	11.22	**A, RU, LS**	**Yes**
Experiment #1 (39%)	.28	4.38	**RU, LS**	**Yes**
Experiment #2 (13%)	.095	1.46	**LS**	**Yes**

[1] Original EFED analysis numbers from Table 28 of *Ecological Risk Assessment for Current and Proposed Residential and Crop Uses of Fipronil.*

EFED's Review of the Proposed Protocol

The relevant issue is how much of the fipronil and toxic degradates could be transported to surface waters over the entire time period of concern and via all potential routes of transport. EFED's risk concerns and, therefore, standard modeling scenarios span decades. Over this larger time-frame, the integrity of onion seed coats is likely to relatively rapidly decline as well as the seed coats' ability to retain fipronil and its degradates.

Experiments #3 and #4 of the proposed study seem only to addresses a short time-frame after the onion seeds are planted when the seed coat is intact and, presumably, during which fipronil would be least likely to be released from the seed coat and before degradates would be produced in appreciable quantities. The longest of these proposed experiment's durations is 120 hours.

In contrast, experiment #2 (even though short in duration) does at least examine how much fipronil leaches after the seed coat has been disrupted. Comparing experiments #2 with #3 and #4 indicates that disrupting the seed coat does result in a much greater amount of fipronil (and presumably its degradates) being released.

EFED would argue that the key variable that controls the availability of fipronil and its degradates is the degree to which the seed coat has degraded. EFED's assumption of 100% availability can be thought of as an assumption of what is available after the seed coat has completely degraded. If the seed coat quickly degrades, the assumption of 100% availability is likely an acceptable approximation; if the seed coat degrades slowly, the assumption of 100% availability will over-estimate fipronil and its degradates concentrations (at least in the near-term).

Potentially, a better way to design the study might be to measure the release of fipronil and its degradates from treated seeds as they degrade. Possibly, modified guideline fate studies (such as aerobic soil metabolism, etc.) could be designed that would measure the

half-life of fipronil release from a seed/soil mixture. In this way, the half-life values from these studies could be directly used in PRZM/EXAMS modeling.

After reviewing the proposed protocol, EFED concludes that the study *as proposed* would *be unlikely to* materially affect EFED's modeling assumptions and would *be unlikely to* affect EFED's conclusions concerning environmental risk. Please contact Steve Wente at (703) 305-0001 (wente.stephen@epa.gov) with any comments or concerns.