UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

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MEMORANDUM

SUBJECT: Reduced Risk Request for Spirotetramat

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Conclusions:

The Environmental Fate and Effects Division (EFED) has reviewed the reduced risk request from Bayer CropScience for the use of spirotetramat (PC Code 392201) on citrus, grapes, hops, pome fruit, tree nuts and vegetables (cucurbits, fruiting, leafy, and tuberous and corm). Based on the registrant's review, a comparison of the toxicity endpoints and the predicted terrestrial and aquatic EECs from the maximum usage scenarios for spirotetramat demonstrates that no risk quotient (RQ) exceeded the regulatory level of concern (LOC) for acute or chronic risk to any organism, except for chronic risk to avifauna; chronic RQs for birds ranged from 0.08 to 2.43 for the worst-case scenario. Although there were exceedances of the chronic risk LOC, the NOAEC used to estimate chronic risk to birds was based on treatment-related foot lesions and effects upon feed consumption and hatchling bodyweight, and the significance of these endpoints in relationship to the survival, reproduction and growth of avian populations in the wild is uncertain. In addition, the registrant reported that it performed a wildlife foliar residue

study which demonstrates that the half-life of potential residues in wildlife food items is substantially shorter than the 35-day default used to estimate risk to terrestrial wildlife and that risk is likely overestimated; however, these data were not in the submitted reduced risk rationale and cannot be used for refinements until a formal review of these data is conducted by EFED. In conclusion, based on the limited RQs exceeding the LOCs, the potentially conservative nature of the RQs exceeding the LOCs, and the comparative risk assessment of alternative compounds (presented below), the registrant suggests that spirotetramat poses minimal risk to all non-target plants and animals (endangered or non-endangered) and that it has the safest overall ecological profile in almost all crops among competing compounds.

However, there was some uncertainty associated with the risk assessment provided by the registrant for spirotetramat that should be noted. First, although the registrant reported that spirotetramat demonstrates remarkable safety to adult honey bees and honey bee hives based on acute toxicity and field data, there is uncertainty regarding the potential chronic effects of spirotetramat on pollinators because no long-term data were available.

Second, there were no data on the acute oral toxicity or reproductive toxicity of spirotetramat enol to any terrestrial organism. In addition, registrant used a Single First Order Reversible Binding Model (SFORB) in calculating degradation half-lives of BY108330-enol. Since EFED does not use this model, there is uncertainty regarding the reported half-lives. Therefore, given the uncertainties surrounding its fate/transport and ecotoxicity profile, there is uncertainty regarding the risk to terrestrial organisms from exposure to this major degradate. However, the limited available data on this degradate do show that it is less toxic than the parent to aquatic animals, and equally or slightly less toxic to aquatic plants.

Lastly, spirotetramat is the third ketoenols systemic insecticide from Bayer CropScience and there are very little data outside of what registrant has submitted on the fate and ecological effects/toxicity of this relatively new class of pesticides. The environmental fate and ecological risk assessments of other ketoenols chemicals (spiromesifen, PC Code 024875 and spirodiclafen, PC code 124871) suggest that the low solubility of these chemicals make estimation and characterization of toxicity to aquatic organisms uncertain. In addition, those assessments also indicate that the potential toxic effects of these compounds to monocotyledonous plants could be better understood if studies with non-agricultural monocotyledonous plants were available. At this time, no such data were presented for spirotetramat.

Background:

Spirotetramat is a systemic insecticide of a new class of pesticides, *i.e.*, the ketoenols that act through inhibiting lipid biosynthesis. Spirotetramat is tectronic acid derivatives and is representative of a relatively new class of pesticides, specifically spirocyclic tetronic acids. As a relatively new chemistry, there are very little data outside of what registrant has submitted on the fate and ecological effects/toxicity of this class of pesticides. Registration is being proposed for citrus, grapes, hops, pome fruit, tree nuts and vegetables (cucurbits, fruiting, leafy, and tuberous and corm). Maximum proposed single application rates range from 0.08 to 0.16 lbs/A while maximum proposed seasonal application rates range from 0.16 to 0.40 lbs/A.

EFED has not had an opportunity to review any of the environmental fate and ecological effects/toxicity data beyond this reduced risk screening assessment. This reduced risk screen must therefore rely on the accuracy of the registrant's (Bayer CropScience) interpretation of these data. EFED's assessment of similar ketoenols class of chemicals such as spiromesifen and spirodiclafen indicate that this new class of pesticide with a purportedly novel mode of action, has considerable uncertainties associated with risk estimates.

Environmental Fate Assessment

Spirotetramat has a moderate solubility (29.9 mg/L) and is characterized as non-persistent and moderately mobile but it's degradate (spirotetramat enol) is persistent in aquatic environment. Under neutral and alkaline conditions the compound hydrolyzed with half-life of 8.6 days at pH 7.0 and 7.6 hours at pH 9 at 25.0°C to form the primary degradate BY108330-enol(>91%). The primary degradate BY108330-enol is hydrolytically stable under acidic, neutral, and alkaline conditions. The parent undergoes aerobic soil metabolism with a half-lives ranging from 0.08 to 0.33 days. The overall degradation of spirotetramat in soil is characterized by rapid degradation to BY108330-enol, which subsequently degrades to BY108330-ketohydroxy and other minor metabolites. BY108330-enol dissipated following a biphasic kinetics with extremely quick first phase followed by second slower degradation phase. The reported mean DT_{50}s were 0.2 days and 6.9 days for BY108330-enol and BY108330-hydroxy respectively. Registrant used a Single First Order Reversible Binding Model (SFORB) in calculating degradation half-lives. Since EFED does not use this model, there is uncertainty regarding the reported half-lives.

Spirotetramat had moderate sorption to soils/sediments (K_{oc}= 201 to 435 mL/g) and would be categorized as moderately mobile. However, the primary degradate BY108330-enol does sorb appreciably to soil (K_{oc} = 828-1711) and is less mobile. In aerobic and anaerobic aquatic metabolism studies, spirotetramat reported to have rapidly underwent hydrolysis to form BY108330-enol maximum of (97%) and was stable under anaerobic aquatic condition. Terrestrial field dissipation studies with spirotetramat indicate that the compound dissipated with half-lives ranging from 1.1 to 3.5 days. Based on registrant's review of terrestrial field dissipation, the major transformation products were BY108330-enol and BY108330-ketohydroxy and BY108330-MA-amide, which were not detected below the surface layer (0-15 cm) at the study sites except Florida.

Ecological Risk Assessment

The registrant's summary of the potential ecological effects and risks associated with the registration of spirotetramat against scales, psyllids, mealy bugs, aphids and whiteflies on citrus, pome fruit, stone fruit, grapes, nut trees, Christmas trees, fruiting vegetables, leafy vegetables, cucurbit vegetables, cole crops and potatoes is summarized below. USEPA standard risk assessment procedures were utilized to assess potential risk to birds, mammals, aquatic and marine/estuarine organisms and non-target terrestrial plants resulting from the proposed uses of spirotetramat. The table below summarizes the agricultural use patterns for spirotetramat that were evaluated in the assessment.

Crop	Maximum Application Rate for Worst-case Exposure Scenario	Maximum Number of Applications per Season	Minimum Interval Between Applications	Types of Application
Tree, Nut & Vine (includes pome fruit, stone fruit, citrus and grape)	0.16 lbs. a.i./acre[a]	3	14-days	Aerial and ground application plus chemigation
Vegetables and Potato	0.08 lbs. a.i./acre	2	7-days	Aerial and ground application plus chemigation

[a] Maximum application to pome fruit is 0.16 lbs ai/acre followed by two applications of 0.14 lbs ai/acre with a 14 day application interval. This use pattern was modeled using 3 equal applications of 0.137 lbs ai/acre as not to exceed the seasonal maximum of 0.39 lbs ai/acre.

Terrestrial Assessment

Avian Toxicity

Based on the registrant's review of the available data, spirotetramat is practically non-toxic to birds on an acute basis. An acute LD_{50} of >2,000 mg a.i./kg body weight was determined for northern bobwhite quail. In the subacute dietary tests, no treatment-related mortality was observed at the highest concentration tested (5,000 ppm (nominal)) in either the bobwhite quail or mallard duck studies. In the northern bobwhite quail reproduction study, no effects on survival or reproduction were observed. Based on a reduction in female weight gain at the highest dose tested, the NOEC for adult northern bobwhites exposed to technical spirotetramat in the diet was 264 mg ai/kg feed (23 mg ai/kg bw/day). For the reproductive parameters, the NOEC was 802 mg ai/kg feed (74 mg ai/kg bw/day), based on a slight effect on hatchling body weight at 802 mg ai/kg feed. However, this reduction was only about 5% and was not significantly different by day 14 post-hatch. Therefore, the registrant did not consider this effect to be biologically relevant.

The mallard was more sensitive than the quail in the reproduction studies. Two reproduction studies were performed with similar results. Levels above 90 ppm demonstrated adult and reproductive toxicity. At 80 ppm there was a transient effect on hatchling body weight which was less than 10% in both studies and was no longer significant in the weights of the 14 day post-hatch ducklings. In these studies, peeling and cracking of the skin was observed on the bottoms of the duck feet at doses above 30 ppm. The registrant concluded that a NOAEC for all parameters was achieved at 30 ppm based on treatment-related foot lesions and effects upon feed consumption and hatchling bodyweight.

Mammalian Toxicity

Based on the registrant's review of the available data, spirotetramat has low acute toxicity to mammals based upon the acute oral rat LD_{50} of >2,000 mg active ingredient/kg body weight, with no effects observed at the highest dose tested. In terms of chronic toxicity, the 2-generation

rat study produced a no observed adverse effect concentration (NOAEC) of 1000 mg active ingredient/kg feed (70.7 mg/kg bw/day), based body weight and kidney findings in the parental group.

Honey Bee Toxicity

Spirotetramat is practically non-toxic to the honey bee (LD_{50} >100 µg ai/bee), based on a preliminary review of both the acute contact and acute oral tests with the TGAI and formulations (MOVENTO® 240 SC Insecticide and MOVENTO® 150 OD Insecticide). Since spirotetramat may show larvicidal activity in insects, additional tests were performed with formulated material. A semi-field brood test was conducted with MOVENTO® 100 OD Insecticide, and a field test with MOVENTO® 150 OD Insecticide was also conducted. The registrant concluded that neither study demonstrated treatment-related effects to bee brood and colony development up to the highest rate tested (76 g ai/ha, 4 applications pre and during foraging or 92 g ai/ha, 2 applications during foraging). Likewise, no effects to other endpoints, as adult mortality, foraging activity, or bee behavior were detected. However, although the acute toxicity of spirotetramat to bees is categorized as practically non-toxic, there is uncertainty regarding the potential chronic effects of spirotetramat on pollinators because no long-term data were available.

Non-Target Terrestrial Plant Toxicity

Potential effects of spirotetramat on non-target terrestrial plants were examined for the MOVENTO® 150 OD Insecticide formulation. The seedling emergence test was performed as a limit test at the maximum single application rate (in the U.S.) of 0.157 lb ai/acre. Based on the registrant's review of the available data, no significant adverse effect for any measured parameter at or above 25% was determined as compared to the control. The resulting EC_{25} and NOEC were > 0.157 lb ai/acre.

The vegetative vigor test was conducted with MOVENTO® 150 OD Insecticide. In this study performed as a Tier I study for dicots, the dicot species were treated at a rate of 0.157 lb ai/acre. None of the dicot species demonstrated effects >25% at this concentration. For the monocot species, a Tier 2 study was conducted with the dose range of 0.01-0.157 lb ai/acre. Based on the registrant's review of the available data, only corn and ryegrass demonstrated effects >25% at any dose level. Corn was the most sensitive species tested and the plant dry weight was the most sensitive endpoint; the EC_{25} was 0.068 lb ai/acre and the NOEC was 0.039 lb ai/acre. EFED suspects that the toxicity of spirotetramat to monocotyledonous plants may be reflective of the chemical's structural similarity to a group of predecessor chemicals, *i.e.*, the bicyclic tetramic acids, that were developed as herbicides. In addition, EFED points out that the extent to which spirotetramat may affect nonagricultural plants is uncertain.

Risk Conclusions

Based on the registrant's review, a comparison of the toxicity endpoints and the predicted terrestrial EECs from the maximum usage scenarios for spirotetramat demonstrates that no RQ exceeded the regulatory level of concern (LOC) for acute risk to birds or acute or chronic risk to wild mammals. On the other hand, chronic RQs for avifauna ranged from 0.08 to 2.43 for the worst-case scenario. Estimated environmental concentrations (EECs) used to calculate these RQs for terrestrial vertebrates were determined using USEPA Environmental Fate and Effects

Division's T-REX program (Version 1.2.3, August 8, 2005; USEPA, 2005). As a first tier estimate, the peak daily residues were estimated using the EPA default 35 day foliar half-life, and assuming first order kinetics with a daily time step. The upper-bound residues on various forage items were then compared to the most sensitive endpoints for terrestrial receptors to derive RQs.

Although the registrant states that by using the mean Kenaga values in lieu of the upper-bound values, RQs are all reduced below the LOC (RQs range 0.04-0.91), EFED stresses that using the mean Kenaga residue values for calculating RQs would not protect birds and mammals that consume food items that have residues on the higher end of the residue distribution. An analysis of the residue distribution for the different food items using input values from Fletcher et al. (1994) and assuming a log-normal distribution of residues on food items shows that the mean Kenaga values range from about the 62-87 percentile indicating that up to 38% of the higher-end food item residue estimates are not captured by using the mean Kenaga values. In contrast, for the upper-end Kenaga residue estimates, about 3-13% of the upper-end residue estimates were not captured. This highlights the fact that the upper-end Kenaga values are not a maximum exposure level. Because pesticide regulatory decisions involve potentially widespread uses of pesticides, EFED believes that the use of upper limit values is necessary to account for the potential variability and uncertainty associated with application to a wide variety of use sites under a variety of environmental conditions.

The registrant also reported that it performed a wildlife foliar residue study which demonstrates that the half-life of potential residues in wildlife food items is substantially shorter than the 35 day default (90th percentile half-life was 4.36 days); however, this refinement was not in the submitted reduced risk rationale. A formal review of these data would need to be conducted by EFED scientists to determine if a refined half-life derived from these data would be an acceptable alternative to the default T-REX 35-day half-life.

All RQs terrestrial plants were below the endangered plant and non-endangered plant LOC. Therefore, the registrant concluded that spirotetramat poses minimal risk for non-target terrestrial plants (endangered or non-endangered). The Tier 1 exposure estimates used to assess the potential risk of spirotetramat to non-target plants were generated based on EPA EFED standard methods (Urban and Cook, 1986). Due to the low vapor pressure of spirotetramat, only runoff and drift routes of exposure were considered in calculating the spirotetramat Estimated Environmental Concentrations (EECs) for terrestrial and semi-aquatic plants. Three scenarios were used as Tier 1 models to obtain the EECs for non-target plants. The first model assumed sheet runoff from a one-acre application site adjacent to a one-acre field containing non-target terrestrial plants. The second scenario assumed channelized runoff from 10 acres to a low-lying one-acre site containing semi-aquatic non-target plants. The third scenario assumed a percent drift from the application area to a non-target area. At the first tier in the screening level risk assessment, the USEPA Environmental Fate and Effects Division assumes runoff at 1, 2 or 5% of the application rate, based on compound solubility. Due to the low water solubility of spirotetramat, the runoff exposure estimate was 2% of the application rate. No buffer zone and 1% drift estimate was assumed for ground applications or 5% drift for air blast or aerial applications. The seedling emergence toxicity endpoints were used for the exposure scenario

with a runoff component. The vegetative vigor toxicity endpoints were used for the drift exposure scenarios.

Although quantitative risk estimates were not generated for non-target terrestrial insects due to the lack of appropriate methodology, all acute oral, acute contact, semi-field and field toxicity tests demonstrated that spirotetramat was practically non-toxic to adult honeybees. Therefore, the registrant reported that spirotetramat demonstrates remarkable safety to adult honey bees and the hives. However, there is uncertainty regarding the potential chronic effects of spirotetramat on pollinators because no long-term data were available.

Aquatic Assessment

Fish Toxcicity

Based on the registrant's review of the available data, spirotetramat is moderately toxic, on an acute basis, to both freshwater and estuarine/marine fish (rainbow trout, bluegill sunfish, and sheepshead minnow LC_{50}s > 2540, >2200, >1960 ug/L). The freshwater fish chronic toxicity NOAEC was 0.534 mg/L based an early life stage testing (33-days) performed on fathead minnow. The effect was not reported. Chronic tests were not performed with any estuarine/marine fish species since spirotetramat does not meet the toxicity nor persistence triggers.

Tests were conducted with two formulations, MOVENTO® 240 SC Insecticide and MOVENTO® 150 OD Insecticide. In formulation testing with fish, the formulations were slightly more toxic than parent alone when compared on an active ingredient basis, but the difference was insignificant. The L(E)C_{50}s based on active ingredient were still above 1 mg ai/L.

BYI08330-enol was determined to be both an animal and environmental metabolite of spirotetramat. A rainbow trout acute test was performed with this metabolite as a limit test at 100 mg pure metabolite (p.m.)/L. There were no mortalities or behavioral observations at this concentration. Therefore, the LC_{50} is >100 mg p.m./L and the BYI08330-enol falls in the "practically non-toxic to fish" category. Some limited testing was conducted with BYI08330-ketohydroxy. It also was substantially less toxic than parent.

Aquatic Invertebrate Toxicity

Testing with spirotetramat technical active ingredient at the limit of its water solubility resulted in a *Daphnia magna* EC_{50} of > 42.7 mg ai/L placing it in the "slightly toxic to aquatic invertebrates" category. Acute testing with mysid shrimp demonstrated that estuarine/marine organisms are slightly more sensitive with an LC_{50} of 5.5 mg ai/L. However, the eastern oyster was the most sensitive marine/estuarine (and freshwater) organism tested. The EC_{50} for shell deposition was 0.85 mg ai/L, classifying spirotetramat as "highly toxic to aquatic invertebrates." While chronic toxicity testing with daphnids (21-day life-cycle study) established a NOAEC of 2 mg ai/L, chronic tests were not performed with any estuarine/marine organism since spirotetramat does not meet the toxicity nor persistence triggers. The effect in the daphnid life-cycle study was not reported.

As with the fish, the enol metabolite was tested as a limit test in *Daphnia magna* at 100 mg ai/L. There were no immobilities or sublethal observations at this level, placing the metabolite in the "practically non-toxic to aquatic invertebrates" category.

Aquatic Non-Target Plant Toxicity

Spirotetramat was tested with the green algae (*Pseudokirchneriella subcapitata*). The EC_{50} for spirotetramat based on yield was 5.6 mg ai/L (EC_{50} based on growth rate was 8.15 mg ai/L). For duckweed (*Lemna gibba),* spirotetramat yielded an EC_{50} (frond number) of 4.62 mg ai/L based on yield. Other testing was performed with the freshwater diatom, *Navicula pelliculosa*, the blue-green algae, *Anabaena flos-aquae*, and the saltwater diatom, *Skeletonema costatum*. The blue-green algae was the least sensitive with an EC_{50} of 20.9 mg ai/L based on biomass. The freshwater diatom demonstrated the same approximate level of sensitivity as the green algae with an EC_{50} of 7.33 mg ai/L based on biomass. The saltwater diatom was the most sensitive aquatic plant with an EC_{50} of 0.59 mg ai/L based on biomass.

The green algae was also much less sensitive to the enol metabolite with an EC_{50} of >100 mg p.m./L based on growth rate. Testing with the enol demonstrated that the duckweed was equally or slightly less sensitive to the metabolite with an EC_{50} (frond area) of 5.4 mg p.m./L based on yield (as compared to 4.62 mg ai/L for parent).

Risk Conclusions

Based on the registrant's review, a comparison of the toxicity endpoints and the predicted aquatic EECs from the maximum usage scenarios for spirotetramat demonstrates that there is minimal concern that spirotetramat poses an adverse acute or chronic risk to aquatic fish or invertebrates (freshwater or saltwater) through direct toxicity. No LOCs were exceeded in the registrant's assessment, and in fact, all aquatic RQs were below 0.01. The registrant derived the Tier 2 exposure estimates for estimating risk of spirotetramat exposure to aquatic organisms with the Pesticide Root Zone Model (PRZM) and the Exposure Analysis Modeling System (EXAMS).

Bioaccumulation

A fish bioaccumulation test was not triggered because the log K_{OW} for spirotetramat was <3. It appears that spirotetramat is not likely to accumulate in aquatic organisms. However, bioaccumulation of major degradade BY108330-enol was not provided in the reduced risk assessment.

Comparative Risk Assessment

EFED has not conducted an assessment of whether the alternative pesticides pose less ecological risk; however, based on the analysis of RQ values presented by the registrant in the table below entitled "*Summary of Ecological Risk for Spirotetramat and Major Competitors*", it appears that spirotetramat has RQ values below most of its competitors. The data for the competitor products were obtained from a number of sources including EPA Reregistration Eligibility Decisions, the USDA/ARS Pesticide Properties Database, The Pesticide Manual (12th edition), European Union and UK monographs, Canadian PMRA and the National Registration

Authority of Australia. The data were selected with priority given to available EPA and USDA data, with other sources used to supply missing elements.

The registrant reports that while the RQs are not necessarily those from an EPA assessment of an individual compound, they are standardized to permit a valid determination of comparative risk. The only LOC exceedance for spirotetramat is the avian chronic LOC (RQ=2.43). From this standpoint, the registrant claims that a strong case can therefore be made for spirotetramat having the safest overall ecological profile in almost all crops.

Summary of Ecological Risk for Spirotetramat and Major Competitors

Chemical	Avian Acute	Avian Chronic	Mammal Acute	Mammal Chronic	Fish Acute	Fish Chronic	Daphnia Acute	Daphnia Chronic	Marine Acute	Bees[1]
Spirotetramat	0.01	2.43	0.02	0.45	<0.01	<0.01	<0.01	<0.01	<0.01	>100
Acephate	0.35	89.79	0.22	77.90	<0.01	NA[2]	<0.01	0.09	<0.01	1.2
Acetamiprid	<0.02	0.47	0.24	7.9	<0.01	<0.01	<0.01	<0.01	0.09	8.09
Aldicarb	NP[3]	NP	NP	NP	<0.01	<0.01	<0.01	<0.01	<0.01	0.285
Azinphos-methyl	1.94	90.12	52.63	1641.90	5.21	50.43	13.38	46.40	71.90	0.053
Buprofezin	<0.12	1.25	0.12	34.39	0.54	3.65	0.47	2.37	0.36	>200
Chlorpyrifos	9.59	52.15	5.83	1131.11	26.76	18.90	481.67	609.60	1378.20	0.059[4]
Cyfluthrin	<0.01	0.16	0.17	3.45	1.67	1.86	2.62	2.33	167.93	0.037
Diazinon	19.04	202.31	1.44	1456.87	0.57	>32.31	64.25	104.55	12.24	0.22
Dimethoate	0.12	30.00	0.29	69.41	<0.01	<0.01	<0.01	0.05	<0.01	0.16
Endosulfan	0.81	>21.81	28.38	378.42	4.56	6.91	0.02	0.69	0.46	4.5
Esfenvalerate	0.02	0.69	0.42	18.73	230.94	160.49	17.32	55.55	519.61	0.06
Imidacloprid	0.07	2.32	0.11	2.63	<0.01	<0.01	<0.01	<0.01	0.17	0.04
Methamidophos	18.79	263.05	26.33	664.68	<0.01	NA	0.38	1.27	0.01	1.37
Oxamyl	4.10	139.29	241.69	24.17	0.01	0.02	0.06	0.01	<0.01	0.31
Oxydemeton-methyl	1.93	233.22	3.79	404.69	0.01	<0.01	0.03	0.13	<0.01	0.54
Phosmet	6.26	52.47	12.09	1365.77	0.55	0.89	6.85	3.79	23.99	1.06
Pyriproxyfen	<0.01	0.03	<0.01	0.23	<0.01	0.10	0.03	42.96	0.02	>100
Thiamethoxam	<0.01	<0.10	0.01	21.69	<0.01	<0.01	<0.01	<0.01	<0.01	0.024

Cells in color indicate the following:

= No Tier 1 LOC exceedances, or for honey bees, practically non-toxic

= Between the endangered species LOC and the high risk LOC for acute risk. Between 1 and 5 times the LOC for chronic risk or for honey bees, moderately toxic

= Greater than the high risk LOC for acute risk. Greater than 5 times the LOC for chronic risk, or for honey bees, highly toxic

[1] The "Bees" column gives the 48 h contact LD50 value since there is no EPA risk paradigm for bees with the color indicative of the hazard classification as noted above.

[2] NA = Not available

[3] NP – not performed. Aldicarb is a soil incorporated granular product. The T-REX program is designed to estimate potential residues on wildlife food items from a foliar spray. Therefore, it is not an appropriate model for the estimation of risk from potential aldicarb exposure.

[4] Toxicity after 24 hours