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OFFICE OF CEMICAL SAFETY AND
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MEMORANDUM

SUBJECT: Ecological Risk Assessment for Proposed Section 3 New Use for Saflufenacil (Rice, Post-Emergent Application and Rice Paddy Fish/Crayfish Aquaculture)

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This memo contains the findings of an ecological risk assessment for the proposed new use of saflufenacil for rice (Post-Emergent Application and Rice Paddy Fish/Crayfish Aquaculture). Saflufenacil is an herbicide that is currently used on rice fields for preplant burndown of emerged weeds in dry or drained fields. The product's name is Sharpen™ Herbicide, containing 29.74% a.i. or 2.85 lb a.i./gallon of product. The EPA Reg. No. is 7969-278 and the herbicide belongs to group 14 (protoporphyrinogen oxidase, PPO or protox inhibitor). This group of herbicides is known to show enhanced toxicity to fish in the presence of UV light.

I. Previous Use Patterns And Ecological Risk Assessments

Two ecological risk assessments were previously conducted:

(1) An environmental Fate and Ecological Risk Assessment for the Registration of the New Chemical Saflufenacil covering uses on fallow, sorghum, cotton, legume vegetables, soybeans, small grains, sunflower, citrus, pome & stone fruits, tree nuts, grape vines, X-mass

trees, Conifer & hardwood plantations and non-agricultural areas (DP Barcode: 349855 dated June 16, 2009). A maximum single application rate of 0.356 lb a.i. /A was assigned to the last four use sites. Exposure for this referenced assessment EECs were obtained by PRZM/EXAMS modeling for parent alone as a stressor, using a maximum application rate of 0.356 lb a.i. /A (rate for non-agricultural use pattern) and the California rights-of-way scenario. This scenario was used as it produced the highest estimated aquatic exposure.

(2) An Ecological Risk Assessment for Proposed Section 3 New Use for Saflufenacil on Rice, Pre-plant Burn-down (DP Barcode: 387336 dated March 9, 2011). In this referenced assessment, the maximum application rate for saflufenacil was 0.045 lb a.i./A with the following restrictions: (1) **DO NOT** apply after rice planting (2) **DO NOT** apply more than a maximum cumulative amount of 2.0 fl ozs/A of **Sharpen** per cropping Season; (3) **DO NOT** irrigate (flush) between **Sharpen** application and rice seeding; (4) **DO NOT** initiate permanent flood to rice fields until 30 days or more after planting; (5) **DO NOT** apply within 45 days of permanent flooding in water-seeded rice paddies; and (6) **DO NOT** use released tail-water for irrigation of adjacent crops.

EFED used a provisional modification of the Tier 1 Rice Model v 2.0 (USEPA 2007a, 2007b and 2011) for calculation of the estimated environmental concentrations (EECs). The Tier 1 Rice Model is a screening-level model, based on the Interim Rice Model, which was used in EFED for four years to estimate pesticide concentrations in rice paddies. It yields a single concentration, which is used for both acute and chronic exposures, and may be used to obtain EECs. In order to address this specific use, which involves a 45-d pre-flooding burn down, chemical degradation in the soil that occurs during this time period was included. In addition, the aerobic aquatic metabolism of the chemical occurring during flooding was also considered. It is noted that despite the modifications, EECs are likely to be conservative (the results are still considered part of a Tier 1 concept). The following assumptions still apply to the provisionally modified model:

- Movement of pesticide on suspended sediment is not considered.
- Volatilization and other dissipation processes are not considered.
- Partitioning to sediment is instantaneous.
- Water is available for human or wildlife exposure instantaneously.

The modeled application rate was 0.0445 lb a.i /A and modeling was done in two stages:

(1) **Stage 1 field before flooding:** to estimate the amount of pesticide left in the soil after the 45 days in which the rice paddy <u>is not</u> flooded as per label requirements. The estimate was based on the aerobic soil degradation half-life of saflufenacil which was previously determined to be 31 days[1].

(2) **Stage 2 field after flooding (rice paddy):** to estimate daily concentrations using the <u>provisionally modified</u> Tier I v.1.0 rice model. The concept takes into account degradation in the rice paddy. The input parameter was determined previously to be 212 days[3].

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[1] Environmental Fate and Ecological Risk Assessment for the Registration of the New Chemical Saflufenacil (DP Barcode: 349855 dated June 16, 2009).

Modeling results for this pre-plant burn-down use pattern gave a peak value of 12.11 ppb, a 21-day average of 11.72 ppb and a 60-day average value of 11.01 ppb.

Since then, aquatic field dissipation and a freezer stability studies were requested and submitted (MRID 48945801 and 48945802). Additionally, labels were modified for some crops including the new use pattern for rice. The following are an assessment that deals with the new use pattern for rice in which the use rate is much higher (3X) noting that the registrant reduced that rates for some of the crops, other than rice, from 0.356 lb a.i. /A to 0.134 lb a.i. /A as a mitigation measure for the initial registration. Due to the fact that risk is expected to be reduced, the latter item will be dealt with shortly in combination with two submittals for new uses on barley, wheat, grass pastures/fields used for forage, hay, silage and grass grown for seed.

II. Proposed New Use Pattern for Rice

For this current assessment, the new label for rice use included the following crop-specific use restrictions/limitations:

- The pesticide can be applied to drilled, dry and water-seeded rice;
- The 1st application: A maximum of 0.089 lb a.i/A (0.1 kg/ha or 4.0 fl. oz/A) is applied pre-plant through pre-emergence "within 3 days of rice planting";
- The 2nd application: A maximum of 0.045 lb a.i/A (0.05 kg/ha or 2.0 fl. oz/A) is applied as a post-emergence weed control that may be applied either before or after flooding only when rice has reached the 2-leaf stage;
- The 1st and 2nd application may be applied sequentially but the two applications should be separated by at least 14 days;
- The maximum seasonal rate should not exceed 0.134 lb a.i/A (0.150 kg/ha or 6.0 fl. oz/A;
- Water may be released from treated fields after 7-days following the "last" pesticide application;
- DO NOT apply to rice fields that will be used for mollusk production during the treatment year; and
- SHARPEN may be applied to rice fields used for crustacean (including crayfish) production and commercial fish production.

In rice, the length for the recognized growth stages is highly dependent on variety, type of rice culture (i.e., dry or water seeded), temperature and other environmental conditions[2]. For example, germination occurs within two days when temperatures are between 70° to 97°F; below or above this temperature, germination requires more time. Therefore, the following variable time periods were reported for rice growth stages in the same reference:

- From planting, through germination/seedling emergence, to the 2nd leaf stage: 8-30 days;
- From planting, through the 2nd leaf stage to the start of internode elongation (the green ring stage): 44 to 112 days; and

[2] Rice Growth and Development by Karen Moldenhauer and Nathan Slaton: URL http://baegrisk.ddns.uark.edu/test/Books/PDF/chapter1sl3.pdf

- Life cycle of rice cultivars in Arkansas ranges from 110 to 150 days from germination to maturity.

In the rice label, the 2nd application (post-emergence weed control) may be applied before or after flooding when rice has reached the second leaf stage up to internode elongation. This means that the window for the second application is from 45 to 112 days after planting. However, the label states that the minimum time intervals between the 1st and second application is 14 days and that was the interval used in modeling.

Based on rice culture, growth stages and label specific use restrictions/limitations, the following may be stated:

(1) In dry seeded rice: the 1st application within 3 days of planting and the 2nd application within 14 days of the 1st application with flooding occurring within 30 to 45 days of planting (normal agronomic practice in dry seeded rice).
(2) In water seeded rice: the 1st application within 3 days of planting and the 2nd application within 14 days of the 1st application with flooding occurring at planting (water-seeded).

III. Surface Water Exposure EECs

For this ecological risk assessment, parent saflufenacil is considered to be the stressor of concern and surface water exposure EECs will be determent for parent only. Saflufenacil parent is expected to be moderately persistent in soils before flooding the (t ½= 31 days) but it is expected to be more persistent in the rice paddy after flooding (aerobic aquatic t ½= 70.7 days, anaerobic aquatic t ½= 29 days).

Surface water exposure EECs are obtained using EFED used a provisional modification of the Tier 1 Rice Model v 2.0 as described above for the Ecological Risk Assessment for Proposed Section 3 New Use for Saflufenacil on Rice, Pre-plant Burn-down (DP Barcode: 387336 dated March 9, 2011; refer to section I (2) above). Only the new application parameters are used with two scenarios which are based on the two aquatic field dissipation studies conducted by the registrant. It is also noted that an aerobic aquatic half life of 212 days is used in modeling (3 X 71.7 days, only one aquatic system was used in the study). The two exposure scenarios are:

(1) For dry seeded rice: the scenario is similar to the registrant submitted study in which the 1st application 3 days after planting, flooding 40 days after planting, the second application 44 days after planting and flood release 134 days after planting; and

(2) For water seeded rice: the 1st application 2 days before planting, flooding 1 day before planting, the second application 33 days after planting and flood release 123 days after planting.

It is noted that the chosen scenarios may be considered in line with the new label and the agronomic practices in dry and water seeded rice cultures.
The results are summarized in Table 1 for dry seeded rice and Table 2 for water seeded rice.

Table 1 Dry seeded rice ECO EECs in µg a.i./L or ppb (as per label reflecting the most conservative application parameters)

Holding Time	*Peak*	*21- day Mean*	*60- day Mean*
Paddy Water	**87.2**	**84.3**	**79.2**
Tail Water*	**64.2**	Can't be calculated without knowing the type of water body receiving this release	

* This means that the concentration in the water upon release from the rice paddy (134 days after planting)= **68.2 ppb of Saflufenacil parent**

Table 2 Water seeded rice ECO EECs in µg a.i./L or ppb (as per label reflecting the most conservative application parameters)

Holding Time	*Peak*	*21- day Mean*	*60- day Mean*
Paddy Water	**125.0**	**120.9**	**113.6**
Tail Water*	**93.3**	Can't be calculated without knowing the type of water body receiving this release	

* This means that the concentration in the water upon release from the rice paddy (123 days after planting)= **93.3 ppb of Saflufenacil parent**

The above stated Exposure EECs are basically EECs obtained for the rice paddy water and the water released from the rice paddy and the released tail water at the end of the flooding period. Concentrations that might be found in water bodies beyond the rice field are expected to be lower depending on the types/distance of surface water bodies as a result of dilution and degradation.

IV. Aquatic Field dissipation studies

Dissipation of saflufenacil under US field conditions was examined in plots planted to rice at one site in Porterville, California (Site 1) and one site in Washington, Louisiana (Site 2). Sites were selected to represent water-seeded and dry-seeded rice production areas, respectively. Two applications were made at each test site. The first application was made to the soil surface at a nominal rate of 100 g a.i./ha (0.090 lb a.i./A), and the second application was made to the flooded rice at a nominal rate of 50 g a.i./ha (0.045 lb a.i./A), the maximum proposed label use rates for rice. Measured application rates at site 1 were 76.6 g a.i./ha for the first application and 51.53 g a.i./ha for the second application. Measured application rates at site 2 were 109 g a.i./ha for the first application and 43.55 g a.i./ha for the second application. The first application at Site 1 was made pre-plant and occurred 1 day prior to flooding and 2 days prior to planting. The first application at Site 2 was made pre-emergence and occurred 3 days following planting; the treated test plot at Site 2 was flooded 40 days following planting (5-leaf rice growth stage). The second application at both sites was post-emergence (5- to 6-leaf rice stage) and occurred 34 days after flooding at Site 1 and 4 days after flooding at Site 2. Paddy water was maintained at a level of *ca.* 5-15 cm through 90 days following the second application (15 to 28 days before harvest). The experiments at Site 1 and Site 2 were conducted for 392 days and 401 days, respectively.

Under aquatic field conditions at site 1 (California water seeded rice), observed dissipation half-lives (DT_{50}) were **1.0-1.3 days** in soil (both applications) and water (second application) using the SFO model. Modeled DT_{90} values for saflufenacil were 4.1-4.2 days in soil and 3.2 days in water (SFO model). Total carryover of residues of saflufenacil was 0-1% of the nominal applied amount from 7 to 267 days following the second application. Under aquatic field conditions at site 2 (Louisiana, dry seeded rice), observed dissipation half-lives (DT_{50}) were **11.7 days** (after maximum detection following the 2nd application, SFO model) and **21.2 days** (following the 1st application, SFO model). Saflufenacil had a DT_{50} in water of **2.2 days** following the second application using the SFO model. Modeled DT_{90} values for saflufenacil were **70.3 days** (first application) and **39 days** (second application) in soil and **7.3 days** in water (SFO model). Total carryover of residues of saflufenacil was 0-2% of the nominal applied amount from 30 to 272 days following the second application.

The major route of dissipation of saflufenacil under field conditions at Site **1** was transformation to the major transformation product M800H07 and to the minor transformation products M800H01 and M800H15. At site 2, the major transformation product was M800H08 and to the minor transformation products M800H01, M800H02, M800H07 and M800H15.

At site 1 (water seeded rice), the first application, was applied to dry soil only one day before flooding and maximum parent concentration observed in the rice paddy one days after planting (or 2 days after flooding) was **6.9 ppb** decreasing to below detection limit just before the second application (34 days after flooding). Upon application of the second application, the concentration of the parent increased to **56 ppb** (compared to a modeled concentration of **125 ppb**) and reached non-detection after 45 days of flooding and up the time for water release (i.e. the concentration of the parent in the tail water was below the detection limit (compared to a modeled concentration of **93 ppb**).

At site 2 (dry seeded rice), the first application, was applied to dry soil 40 days before flooding and maximum parent concentration observed in the rice paddy upon the second application (few days after flooding) was **48.6 ppb** (compared to a modeled concentration of **87.2 ppb**) decreasing to below detection limit within three weeks after before the second application and up the time for water release (i.e. the concentration of the parent in the tail water was below the detection limit (compared to a modeled concentration of **64.2 ppb**).

It is noted that the water limit of quantification (LOQ) was 0.001 mg/L (1 ppb) and the limit of detection (LOD) was 0.0002 mg/L (0.2 ppb).

Modeled EECs are much higher than those observed in these two studies reflecting uncertainties stated below in modeling and in the results of the studies.

Modeling Uncertainties and Fate Data Gaps

(1) The aerobic aquatic half life for modeling was multiplied by 3 as per guidance because only one study was submitted. Submittal of another study will probably reduce modeled values substantially and possibly explain some of the differences between observed and modeled values. It is noted that using the PFAM model (an aquatic model currently under development by EFED) gave lower exposure EECs. Additionally, a submittal of another anaerobic aquatic study will help in reducing the uncertainty in modeling by PFAM. In the review of previously submitted aerobic/anaerobic aquatic studies, the following was stated:

a. For the aerobic aquatic study (MRID 47127827): Results of the study are highly uncertain because anaerobic conditions in the water layer, where the majority of the applied partitioned, were marginal; redox potential was not measured in the water layer (it was reducing to strongly reducing in the sediment layer) and dissolved oxygen in the water layer was up to 1.7 mg/L. Additional uncertainty was due to a declining material balance for the uracil-labeled system and significant dissipation (35-50% of the applied) of saflufenacil in both systems between the 30 and 62 day sampling intervals, when dissolved oxygen appeared to be most elevated. Due to the detection of major and minor degradation products in this study that were not detected in the aerobic aquatic metabolism or hydrolysis studies, it appears that conditions were partially anaerobic.

b. For the anaerobic aquatic study (MRID 47127828): Results of the study are uncertain because dissolved oxygen concentrations (2.7-5.5 mg/L, corresponding to ~33-65% saturation at 25°C) were less than the typical range (7-10 mg/L) and recoveries of the uracil-labeled systems were highly variable (76% to 114%). Regardless, redox potentials in the water layer (ranging +150 to +410 mV) indicate that the test system was aerobic. It is not understood why saflufenacil appears to degrade with shorter half-lives in aerobic terrestrial and anaerobic aquatic systems (9.3 to 32 days) than in anaerobic terrestrial and aerobic aquatic systems (half-lives of 71 to 217 days).

These above stated deficiencies support the need for new aerobic/anaerobic aquatic studies.

(2) Although soil and aquatic system degradation were considered in modeling, this is still a tier 1 modeling exercise and results are conservative as it assumes that partitioning to sediment is instantaneous, sediment depth is only 1 cm with an organic carb and no movement of pesticide on suspended sediment.

(3) The submitted aquatic field dissipation study is considered by EFED to be an acceptable study but observed EECs may have been affected by the following deficiencies.

a. The aquatic field dissipation is to answer the question as to where the pesticide dissipates. A review of the mass balance accounting suggests that a significant amount of the pesticide dissipated very quickly in the rice paddy. The authors of the study suggest that it was due to hydrolysis and photolysis. This may not be substantiated knowing that the chemical is hardly affected by hydrolysis and/or photolysis (Hydrolysis $t_{1/2}$= 248 days in pH 7, MRID 47127823 and photolysis $t_{1/2}$= 56 days, MRID 47699901). On the other hand it should be stated that analytical determination errors are expected to be high because the chemical degrades into more than 14 transformation products and unknowns and only seven were tracked (one with stability problem in freezer storage).
b. It is noted that more degradation appear to be occurring in the field probably because the conditions in the field are more anaerobic than aerobic (aerobic aquatic half life

for the chemical is much longer than anaerobic aquatic half life). It would be helpful to have data on aerobiciy if it was measured as this may explain the high degradation rate observed in the rice paddy.

V. Effects Summary

Table 2 shows the acute and chronic effects data that were used for estimating risk to aquatic animals and plants.

Table 2. Summary of Most Toxic Acute and Chronic Toxicity Data for Aquatic Organisms Exposed to Saflufenacil Technical and Formulated Products.

Aquatic Animals					
Species (Test Substance)	**Acute Toxicity**			**Chronic Toxicity**	
	96-hr LC_{50}/EC_{50} (mg a.i./L)	**48-hr EC_{50} (mg a.i./L)**	**Toxicity Classification (MRID)**	**NOAEC/ LOAEC (mg a.i./L)**	**Endpoints (MRID)**
Bluegill sunfish *Oncorhynchus mykiss* (TGAI: BAS 800 H)	>108	--	Practically non-toxic (47127905)	--	--
Fathead minnow *Pimephales promelas* (TGAI: BAS 800 H)	--	--	--	0.997 / 3.32	Embryo survival (47127908)
Sheepshead Minnow *Cyprinodon variegates* (TGAI: BAS 800 H)	>98	--	Practically non-toxic (47127906)	--	--
Waterflea *Daphnia magna* (TAGI: BAS 800 H)	--	>98	Practically non-toxic (47127901)	1.33 / 2.64	Parental mortality and parental length (47127907)
Mysid *Americamysis bahia* (TGAI: BAS 800 H)	8.5	--	Slightly toxic (47127903)	--	--

Aquatic Plants		
Species	**Endpoint (mg a.i./L)**	**Effect (MRID)**
Freshwater Algae *Pseudokirchneriella subcapita* (TGAI: BAS 800 H)	96 hr $EC_{50} = 0.042$ $EC_{05} = 0.015$	Cell yield (47127923)
Duckweed *Lemna gibba* (TGAI: BAS 800 H)	7-day $EC_{50} = 0.087$ NOAEC = 0.01	Frond count (47127922)

Ecological effects data for birds, mammals and beneficial terrestrial invertebrates (honeybee) are not summarized here because the previous Section 3 assessment (DP 349855 and 349860) did not identify risks to these taxa with an application rate of 0.354 lb a.i./A. This application rate is nearly 3X greater than the proposed maximum <u>seasonal</u> application rate (0.134 lb a.i./A) for rice pre- and post emergent use.

Effects data for listed and non-listed terrestrial plants are not summarized here because risks were assumed to be similar to those identified for the previous Section 3 assessment for BAS 800 01H, which included assessment of the same maximum single application rate (0.089 lb a.i./A) as the proposed rate for the proposed rice pre- and post emergent use.

Risk Summary for Aquatic Animals

Risks to aquatic animals from the proposed use of saflufenacil on rice are summarized in **Table 3.** For aquatic animals, no acute or chronic risks were identified either for listed or non-listed species. However, no chronic toxicity data are available for estuarine/marine invertebrates, which appear to be the most acutely sensitive of all of the aquatic animals tested. Estuarine/marine invertebrates (EC_{50} = 8.5 mg a.i./L) are more than 11 times (98/8.5) more sensitive to saflufenacil on an acute exposure basis than freshwater invertebrates (EC_{50} >98 mg a.i./L). In order to characterize the uncertainty associated with the lack of chronic toxicity data for estuarine/marine invertebrates, an acute-to-chronic ratio determined for freshwater invertebrates of > 73.6 was applied to the acute EC_{50} of 8.5 mg a.i./L for mysid shrimp to estimate a chronic NOAEC of < 0.115 mg a.i./L (i.e., >98/1.33 = >73.6; 8.5/>73.6 = <0.115]. The chronic aquatic EECs for estuarine/marine invertebrates (84.3 ppb for dry seeded rice and 120.9 ppb for wet seeded rice) are similar to the estimated NOAEC of < 115 ppb (<0.115 mg ai/L) for saflufenacil, suggesting that chronic risks to estuarine/marine invertebrates may be near levels of concern. However, it is emphasized that: 1) the putative NOAEC of < 115 ppb is highly uncertain because the acute-to-chronic ratio is based on non-definitive acute toxicity value, and 2) the EEC represents concentrations in the paddy itself (not the estuarine/marine environment). It is reasonable to expect that discharge of the paddy water into the estuarine/marine environment would yield lower EECs due to dilution of the paddy water.

Table 3. Aquatic Animal RQ Values for Exposure to Saflufenacil.

Taxa	Acute EEC (ug a.i./L)	Chronic EEC (ug a.i./L)	Acute EC/LC50 (ug a.i./L)	Chronic NOAEC (ug a.i./L)	Acute RQ	Chronic RQ
Dry Seeded Rice						
Freshwater Fish	87.2	79.2	> 108,000	997	<0.01	0.08
Freshwater Invertebrates	87.2	84.3	> 98,000	1,330	<0.01	0.06
Estuarine / Marine Fish	87.2	79.2	> 98,000	---	<0.01	---
Estuarine / Marine Invertebrates	87.2	84.3	8,500	---	0.01	---
Wet Seeded Rice						
Freshwater Fish	125	113.6	> 108,000	997	<0.01	0.11
Freshwater Invertebrates	125	120.9	> 98,000	1,330	<0.01	0.09
Estuarine / Marine Fish	125	113.6	> 98,000	---	<0.01	---
Estuarine / Marine Invertebrates	125	120.9	8,500	---	0.02	---

It is further noted that saflufenacil is a light dependent peroxidizing herbicide (LDPH) chemical and may be more toxic under conditions of natural sunlight than in standard laboratory lighting (Matringe, 1989). Although the Agency has requested testing this class of compounds under UV light conditions, such data are not available for saflufenacil. Based on an analysis of enhanced toxicity to fathead minnow from various early-life cycle toxicity tests submitted for other LDPH chemicals, EFED guidance recommends using a toxicity adjustment factor of 29X for fish NOAEC values from chronic toxicity studies (USEPA, 2010) for assessing risks of LDPH chemicals. **Table 4** shows the results of the chronic risk assessment to freshwater fish using this 29X adjustment factor. Specifically, the estimated chronic RQ values for dry seeded and wet seeded rice (**2.3 and 3.3**, respectively) exceed the chronic risk LOC of 1.0, indicating a potential for chronic risk to fish. However, it is noted that the EECs used for this comparison are based on concentrations in the rice paddy, and would likely be lower when tail water is discharged into other bodies of water containing fish.

Table 4. Chronic Risks of Saflufenacil to Freshwater Fish Under Conditions of UV Light Exposure

Taxa	Chronic EEC (ug a.i./L)	Chronic NOAEC (ug a.i./L)*	Chronic RQ
Freshwater Fish (dry seeded rice)	79.2	34.4	**2.3**
Freshwater Fish (wet seeded rice)	113.6	34.4	**3.3**

* calculated by dividing the NOAEC of 997 ug a.i./L by the toxicity adjustment factor of 29. Bold RQ values indicate exceedance of the chronic risk LOC of 1.0.

Risk Summary for Aquatic Plants

Risks to aquatic plants from the proposed use of saflufenacil on rice are summarized in **Table 4.** For aquatic nonvascular plants, risks were identified for both listed or non-listed species, with RQ values ranging from 2.1 to 5.8 for dry seeded rice and 3.0 to 8.3 for wet seeded rice. For vascular plants, risks were also identified for non-listed species (RQ = 1.0 to 1.4 for dry and wet seeded rice, respectively) and listed plant species (RQ = 8.7-12.5, respectively). RQ values would be somewhat lower based on peak tail water concentrations (64.2 and 93.3 ug a.i./L for dry and wet seeded rice, respectively) but would still result in RQ values that exceed the LOC of plant LOC of 1.0.

Table 4. Aquatic Plant RQ Values for Exposure to Saflufenacil.

Taxa	Acute EEC (ug a.i./L)	EC/LC50 (ug a.i./L)	NOAEC or EC05 (ug a.i./L)	Non-Listed Species RQ	Listed Species RQ
Dry Seeded Rice					
Nonvascular plant	87.2	42	15	**2.1**	**5.8**
Vascular plant	87.2	87	10	**1.0**	**8.7**
Wet Seeded Rice					
Nonvascular plant	125	42	15	**3.0**	**8.3**
Vascular plant	125	87	10	**1.4**	**12.5**

Risk Summary for Terrestrial Plants

Risks to listed and non-listed terrestrial and semi-aquatic plants were identified at the previously assessed Section 3 new chemical assessment for Saflufenacil using a maximum single application rate of 0.09 lb a.i./A (ground and aerial application of BAS 800 01H, DP 349855 and 349860) and are reproduced here in **Table 5**. RQ values calculated using the TerrPlant model from the Section 3 new chemical assessment (DP 349855) exceed the terrestrial plant risk LOC of 1.0 for all application methods, exposure scenarios (dry, semi-aquatic, drift), and species types (monocots and dicots) except for non-listed monocots with spray drift only exposure.

Table 5. Comparison of RQ Values for Terrestrial and Semi-Aquatic Monocots Exposed to the BAS 800 01H and BAS 800 02H Formulations.

Taxa	Application Method	Dry Area RQ	Semi-aquatic Area RQ	Drift RQ
		BAS 800 01H[1]	BAS 800 01H[1]	BAS 800 01H[1]
Non-listed Monocots	Ground	**3.8**	**32**	0.6
	Aerial	**6.4**	**35**	**3.2**
Listed Monocots	Ground	**297**	**2,520**	**49**
	Aerial	**464**	**2,720**	**247**
Non-listed Dicots	Ground	**6.1**	**52**	**8.9**
	Aerial	**10**	**56**	**45**
Listed Dicots	Ground	**27**	**227**	**14**
	Aerial	**45**	**245**	**67**

[1] RQs based on BAS 800 01H maximum single application rate of 0.090 lbs a.i./A via ground and aerial applications.

Risk Summary for Post Application Aquaculture Uses of Rice Paddies

The proposed label for saflufenacil includes allowance of treated rice paddies for crustacean and fish aquaculture. Direct effects of saflufenacil on these taxa have already been described in Tables 3 and 4 previously. However, there is a potential for exposure of wildlife to saflufenacil based on consumption of aquatic prey.

To evaluate this potential exposure route, the registrant conducted a accumulation study of saflufenacil in crayfish (MRID 49004101). This study simulated rice production, saflufenacil treatment (pre-emergent application of 0.2 lb ai/A followed by post emergent application of 0.1 lb ai/A) and crayfish addition 1 day after post emergent application. Time weighted concentrations of saflufenacil during the 28-d crayfish exposure period ranged from 13 to 18.5 ppb. Over this same time period, residues of saflufenacil in crayfish were all below the method level of detection (4.8 ppb wet weight). The concentration of these residues at the level of detection (4.8 ppb) are three orders of magnitude below that estimated on foliar diets of birds and mammals from the Section 3 new chemical assessment using the maximum application rate of 0.356 lb ai/A. Since no risks were found to birds and mammals associated with foliar residues and this higher application rate, **risks are not expected** to piscivorous birds and mammals at the application rate proposed for pre- and post-emergent applications on rice.

References

Matringe, M., J.M. Camadro, P. Labbe, and R. Scalla. 1989. Protoporphyrinogen oxidase as a molecular target for diphenyl ether herbicides. Biochem. J. 260:231-235.

USEPA. 2010. Interim Guidance on Light-Dependent Peroxidizing Herbicides: Identification, DCI Justification, and Use of a Toxicity Adjustment Factor on Fish Chronic Endpoints. Memorandum from Don Brady, Director, Environmental Fate and Effects Division. August 20, 2010

<u>Citations</u>:

USEPA. 2007a. Bradbury, S. Guidance for Tier I Estimation of Aqueous Pesticide Concentrations in Rice Paddies. U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Environmental Fate and Effects Division. Internal EFED memorandum. May 8, 2007.

USEPA 2007b. Guidance for Tier I Estimation of Aqueous Pesticide Concentrations in Rice Paddies, May 8, 2007. U.S. Environmental Protection Agency, Pesticides: Science and Policy. Last updated on 03/09/11. Available online at: http://www.epa.gov/oppefed1/models/water/rice_tier_i.htm

USEPA. 2011. Water Models. U.S. Environmental Protection Agency, Pesticides: Science and Policy. Last updated on 02/16/11. Available online at: http://www.epa.gov/oppefed1/models/water/