BASF
The Chemical Company

December 15, 2014

U.S. Environmental Protection Agency
Office of Pesticide Programs (7505P)
Document Processing Desk 7504P
Room S-4900
One Potomac Yard (South Building)
2777 South Crystal Drive
Arlington, VA 22202 U.S.A.
Attention: Mr. Stephen Schaible, Registration Division

RE: APPLICATION FOR EXTENSION OF EXCLUSIVE USE
KIXOR® Herbicide Technical
EPA Reg.No. 7969-275

Dear Mr. Schaible:

BASF Corporation submits an application for the extension of exclusive use for the herbicide active ingredient Saflufenacil, registered as **KIXOR® Herbicide Technical,** with EPA Reg.No. 7969-275.

This **Request to extend Exclusive Use of data as provided by FIFRA section 3(c)(1)(F)(ii)** corresponds to **PRIA code M007**, 12 month review and $5,250 fee.

Under cover of this letter, BASF is submitting the document entitled "***Application for the Extension of the Exclusive Use Period for Saflufenacil as Provided by FIFRA Section 3c(1)(F)(ii)***" as the rationale for the extension of exclusive of data period. Saflufenacil is registered for weed control for numerous minor crop uses and has been proven to be an effective herbicide for the control of herbicide resistant weeds, especially those species that have developed resistance to glyphosate. The use of Saflufenacil plays a significant role in managing glyphosate-resistance in many crops, and in particular, minor uses. For other minor crop uses, Saflufenacil provides an efficacious alternative to other registered pesticides. Saflufenacil was also granted reduced risk status for use as a harvest aid in sunflower.

Please find enclosed the following documentation to support this submission:

1. Application Form 8570-1
2. **Application for the Extension of the Exclusive Use Period for Saflufenacil as Provided by FIFRA Section 3c(1)(F)(ii)**

Thank you for your continued assistance with **KIXOR® Herbicide Technical**.
If you have any questions or concerns, please feel free to contact me.

Regards,

Craig D. Kleppe, Ph.D.
Product Registration Manager
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Title

Application for the Extension of the Exclusive Use Period for Saflufenacil as Provided by FIFRA Section 3c(1)(F)(ii)

EPA Guideline(s)

Not Applicable

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Study Completion Date

December 15, 2014

Test Facility / Performing Laboratory

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Study Identification Number

n/a

This document consists of 16 pages plus an APPENDIX

Application for the Extension of the Exclusive Use Period for Saflufenacil as Provided by FIFRA Section 3c(1)(F)(ii)

December 15, 2014

BASF Corporation, the sole registrant of the proprietary herbicide active ingredient, Saflufenacil, is hereby petitioning the Environmental Protection Agency (EPA) for a three-year extension of exclusive use of data supporting the registration of Saflufenacil on minors crops, as provided under FIFRA Section 3(c)(1)(F)(ii).

Saflufenacil was first registered by EPA on September 3, 2009 under the tradename **KIXOR® Herbicide Technical**, with EPA Registration Number 7969-275. The initial 10-year period for exclusive use of data currently extends to September 3, 2019.

As described in this petition, sixteen minor uses have been registered for Saflufenacil during the initial commencement of the exclusive use period. BASF is hereby submitting a rationale and supporting information for these sixteen minor crops in an effort to establish that at least nine of these minor crops meet the criteria and therefore qualify for extending the exclusive use period for Saflufenacil by 3 years.

The Saflufenacil-based end-use products used to develop the minor use data supporting the extension as described in this rationale, and on which these uses are registered, include:

- **Treevix® Powered by KIXOR® Herbicide** (EPA Reg.No. 7969-276) and
- **Sharpen® Powered by KIXOR® Herbicide** (EPA Reg.No. 7969-278).

The justification presented in this document is based on fulfillment of at least one of the four criteria identified in FIFRA 3c(1)(F)(ii) which states that:

"The period of exclusive data use provided under clause (i) shall be extended 1 additional year for each 3 minor uses registered after August 3, 1996, and within 7 years of the commencement of the exclusive use period, up to a total of 3 additional years for all minor uses registered by the Administrator if the Administrator, in consultation with the Secretary of Agriculture, determines that, based on information provided by an applicant for registration or a registrant, that ....

1. There are insufficient efficacious alternative registered pesticides available for the use;
2. The alternatives to the minor use pesticide pose greater risks to the environment or human health;
3. The minor use pesticide plays or will play a significant part in managing pest resistance;
4. The minor use pesticide plays or will play a significant part in an integrated pest management program."

A summary of the minor uses cited to satisfy the Criterion for extending exclusive use period is presented in **Table 1.** on the following page.

Table 1. Summary of Rationale to Extend Exclusive Use for Saflufenacil

Count	Minor Use Crop	Saflufenacil Use Pattern	Criteria used by EPA to determine if minor crop is counted for data exclusivity extension			
			1. *There are insufficient efficacious alternative registered pesticides available for the use*	2. *The alternatives to the pesticide use pose greater risks to the environment or human health*	3. *The minor use pesticide plays or will play a significant part in managing pest resistance*	4. *The minor use pesticide plays or will play a significant part in an integrated pest management program.*
1	Grapefruit	Postemergence control of glyphosate-resistant weeds under tree canopy and between rows			✓	
2	Clementine				✓	
3	Lemon				✓	
4	Lime				✓	
5	Mandarin (tangerine)				✓	
6	Pummelo				✓	
7	Satsuma mandarin				✓	
8	Tangelo				✓	
9	Olive				✓	
10	Juncea	Harvest aid, desiccation	✓		✓	
11	Camelina (Gold of Pleasure)		✓		✓	
12	Crambe		✓		✓	
13	Mustard seed		✓		✓	
14	Canola (rapeseed)				✓	
15	Sunflower		✓	✓		
16	Safflower		✓			

Minor Crop Uses used to Satisfy the FIFRA 3c(1)(F)(ii) Criteria for Extending the Exclusive Use Period for Saflufenacil

Each of the crops or group of crops listed in sections I., II., and III. of this document, are minor crops within EPA crop groupings for which residue studies were conducted to establish permanent tolerances for Saflufenacil. These crops and the supporting rationale are not listed in rank order relative to satisfaction of the criteria for extension of exclusive use.

I. Citrus and Olive Trees

FIFRA 3c(1)(F)(ii) Criterion satisfied → 3
"The minor use pesticide plays or will play a significant part in managing pest resistance"

Minor Use Crop	Minor Use Acreage[1]	Description of Specific Labeled Use Pattern	Reason why Saflufenacil satisfies Criterion 3...
Grapefruit	73,300	Apply **Treevix Powered by KIXOR® Herbicide** at 0.5 – 1.0 oz/A (0.022 – 0.044 lb ai/A) as a postemergence-directed burndown spray to existing weeds; applied broadcast, banded or spot to the base of tree trunks but under the tree canopy.	**Treevix Powered by KIXOR® Herbicide** is the most efficacious registered herbicide for control of glyphosate-resistant horseweed/marestail and hairy fleabane in California citrus and olive and of glyphosate-resistant ragweed parthenium in Florida grapefruit.
Clementine	10,668		
Lemon	55,000		
Lime	465		
Mandarin (tangerine)	52,100		
Pummelo	1,536		
Satsuma mandarin	2,086		
Tangelo	3,900		
Olive	40,000		

[1] http://usda01.library.cornell.edu/usda/current/CitrFrui/CitrFrui-09-19-2013.pdf , http://www.nass.usda.gov/Statistics_by_State/California/Publications/Fruits_and_Nuts/201208citac.pdf , http://usda.mannlib.cornell.edu/usda/current/NoncFruiNu/NoncFruiNu-07-17-2014_revision.pdf .

The first eight crops are all minor crops within the Citrus Fruit Crop Group 10 while the ninth crop is olive trees. This rationale is based on the satisfaction of Criterion 3 because researchers have shown Saflufenacil is the most efficacious herbicide for the control of glyphosate-resistant populations of horseweed/marestail (*Conyza Canadensis*) and hairy fleabane (*Conyza bonariensis*) (1, 2, 3, 4, 5, 6). Glyphosate-resistant horseweed (7) and glyphosate-resistant hairy fleabane (8, 9) have been documented in the Central Valley of California. Most of the grapefruit, lemons, mandarins, limes, and pummelos grown in California are located in the Central Valley (10). A majority of the olive trees are also located in the Central Valley (10). Most of the Central Valley would be represented by Regions 2 and 6 of the California Commercial Crop Database (10).

In Florida, ragweed parthenium (*Parthenium hysterophorous*) is an invasive weed that has become a significant problem to agricultural production and is also a concern to human health (11, 12). Ragweed parthenium is a difficult weed to control and glyphosate-resistant populations have been observed in Florida citrus (13). Saflufenacil has been shown to be effective on glyphosate-resistant ragweed parthenium (14). In 2012-2013, there were 44,900 acres of grapefruit, 3,900 acres of tangelos and 11,600 acres of tangerines and mandarins in Florida (15).

These citations demonstrate that growers can effectively manage and control glyphosate-resistant populations of horseweed/marestail, hairy fleabane and ragweed parthenium with **Treevix Powered by KIXOR® Herbicide**. In doing so, Saflufenacil plays a significant role in managing pest resistance (in this case, glyphosate weed resistance) in minor crops including citrus and olive.

Citations for Citrus and Olive Trees:

1. Evaluation of Saflufenacil on Glyphosate and Paraquat-resistant Hairy Fleabane (*Conyza bonariensis*) http://www.cwss.org/uploaded/media_pdf/3738-18_B6_Dennis_2014Abstract_Student.pdf

2. Evaluation of Saflufenacil on Glyphosate and Paraquat-resistant Hairy Fleabane (*Conyza bonariensis*) http://www.cwss.org/uploaded/media_pdf/8574-CWSSproceedings2013.pdf

3. Effect of saflufenacil on glyphosate-resistant and -susceptible horseweed (*Conyza canadensis*) biotypes. WSSA 2011 Meeting Abstracts (#104). http://wssaabstracts.com/public/4/abstract-104.html

4. Saflufenacil efficacy on horseweed (*Conyza* canadensis) and effects on the absorption and translocation of glyphosate. WSSA 2011 Meeting Abstracts (#274). http://wssaabstracts.com/public/4/Presentations-sorted-by-number.html http://wssaabstracts.com/public/4/abstract-274.html

5. Effect of saflufenacil application timing on soybean and its role in managing glyphosate-resistant horseweed (*Conyza* canadensis). WSSA 2012 Meeting Abstracts (#194). http://wssaabstracts.com/public/9/abstract-194.html

6. Effect of growth stage, light, and temperature on hairy fleabane (*Conyza bonariensis*) control with postemergence herbicides. WSSA 2014 Meeting Abstracts (#392). http://wssaabstracts.com/public/22/abstract-392.html

7. Distribution of Glyphosate-Resistant Horseweed (*Conyza canadensis*) and Relationship to Cropping Systems in The Central Valley of California. Weed Science: January 2009, Vol. 57, No. 1, pp. 48-53. http://wssajournals.org/doi/abs/10.1614/WS-08-103.1

8. Distribution of glyphosate-resistant and glyphosate-susceptible hairy fleabane (*Conyza bonariensis*) in central California and their phenological development. Journal of Pest Science, March 2014, Vol. 87, pp. 201-209. http://link.springer.com/article/10.1007/s10340-013-0524-8

9. http://californiaagriculture.ucanr.org/landingpage.cfm?article=ca.v062n03p116&fulltext=yes

10. http://www.wrpmc.ucdavis.edu/Ca/CaCrops/prodstat.html

11. http://hillsborough.ifas.ufl.edu/documents/pdf/ornamental_production/A-Z_pubs/Parthenium%20Ragweed.pdf

12. http://edis.ifas.ufl.edu/ep448

13. http://swfrec.ifas.ufl.edu/docs/pdf/squeezer/2013/june/SinghWeedControlCitrus062413.pdf

14. Response of Ragweed Parthenium (*Parthenium hysterophorus*) to Saflufenacil and Glyphosate. Weed Technology 2012 26:443-448. http://www.bioone.org/doi/abs/10.1614/WT-D-11-00116.1

15. http://usda01.library.cornell.edu/usda/current/CitrFrui/CitrFrui-09-19-2013.pdf

II. Oilseeds of Crop Subgroup 20A

FIFRA 3c(1)(F)(ii) Criterion satisfied → 1 and 3
"There are insufficient efficacious alternative registered pesticides available for the use". **and**
"The minor use pesticide plays or will play a significant part in managing pest resistance."

Minor Use Crop	Minor Use Acreage	Description of Specific Labeled Use Pattern	Reason why Saflufenacil satisfies Criterion 1 and 3…
Juncea	<300,000[1]	Apply **Sharpen Powered by KIXOR® Herbicide** at 1.0 – 2.0 fl oz/A (0.022 – 0.044 lb ai/A) for desiccation of plants after physiological maturity to aid in harvest.	**Sharpen Powered by KIXOR® Herbicide** is the only registered herbicide for effective crop desiccation with harvest aid applications in Juncea and Camelina. **Sharpen Powered by KIXOR® Herbicide** adds a new herbicide site of action for harvest aid use in the listed minor crops. It is the most effective product available for crop desiccation / harvest aid application in these minor crops.
Camelina (Gold of Pleasure)	2,200[2]		
Crambe	22,000[2]		
Mustard seed	45,000[2]		
Canola (rapeseed)	79,900[3]		

[1] Oplinger, E. et al. 2014. Mustard. In Alternative Field Crop Manual. http://www.hort.purdue.edu/newcrop/AFCM/mustard.html and Kandel H. and J. Knodel. 2011. North Dakota canola production field guide. p6., http://www.ag.ndsu.edu/pubs/plantsci/crops/a1280.pdf

[2] USDA National Agriculture Statistics Service: http://quickstats.nass.usda.gov/

[3] 79,900 = Total planted acres x percent of acres requiring desiccation (1,737,000 x 4.6%). Percent of desiccation acres are based on Zollinger, R. et al. 2014. Pesticide Use and Pest Management Practices in North Dakota, 2012. p6 or 9. http://www.ag.ndsu.edu/pubs/plantsci/pests/w1711.pdf and total planted acres are based on USDA National Agriculture Statistics Service: http://quickstats.nass.usda.gov/ or USDA. Crop Production 2013 Summary. p41., http://usda01.library.cornell.edu/usda/current/CropProdSu/CropProdSu-01-10-2014.pdf. For details, see text about canola.

The Benefits of Herbicides used for Harvest Aid Desiccation.

During harvest, green crop tissues can clog a combine and make harvest more difficult, cause delays, or even prevent harvest. Herbicide application to desiccate green crop tissue is an important practice for growers to facilitate the harvest. The urgency to desiccate the crop is even more apparent when there is a potential of yield loss caused by bird damage or adverse weather, such prolonged rainy periods, ice and snow. Other benefits of timely crop desiccation include: reduced shattering and lodging, reduced disease problems, aeration for crop drying, and reduced dockage. Therefore, the speed of crop desiccation and dry down is critical for a successful harvest aid application. A secondary benefit of herbicides applied as harvest aids is late season weed control. Green weed foliage can also hamper or delay harvest, therefore herbicide applications are needed to desiccate weeds as well as the crop. As with crop desiccation, speed of herbicide activity to burn down green weeds is critical for a successful harvest. Late season weed control will also reduce or prevent weed seed production and/or reduce viability of weed seeds. This slows the replenishment of the soil weed seed bank for future seasons.

- **Juncea and Camelina**

Alternative products: None

Reasons why Saflufenacil meets the Criteria 1 and 3:
Sharpen Powered by KIXOR® Herbicide is the only registered pesticide for harvest aid applications in Juncea and Camelina (1); therefore, there are insufficient efficacious alternative registered pesticides available for the use. Saflufenacil also represents a new herbicide site of action in these crops which will be useful for the harvest aid desiccation of herbicide-resistant weeds present at Juncea and Camelina harvest, thus playing a significant role in managing weed resistance.

- **Crambe and Mustard seed**

Alternative product: Glyphosate
Reasons why Saflufenacil satisfies Criteria 1 and 3:
Criterion 1: Glyphosate is registered for harvest aid applications in crambe and mustard seed, but it is only a partial alternative to **Sharpen Powered by KIXOR® Herbicide**. Glyphosate is a systemic herbicide and its mode of action acts slowly on plants, therefore it isn't an effective crop desiccant and is only recommended for late-season, pre-harvest weed control from harvest aid applications (2). Soltani et al (3) desiccated dry beans in 11 field trials over a 3-year period and found that Saflufenacil desiccates all evaluated broadleaf weeds (redroot pigweed, common ragweed, and common lambsquarters) better than glyphosate for all evaluation dates. Since glyphosate was shown to be less effective for pre-harvest weed control and is not recommended for crop desiccation, it is an inferior product when compared to **Sharpen Powered by KIXOR® Herbicide** for the harvest aid application in crambe and mustard seed. Without an effective glyphosate, there are insufficient efficacious alternative registered pesticides available for crop desiccation in crambe and mustard seed.

Sharpen Powered by KIXOR® Herbicide is a suitable product for both crambe and mustard seed desiccation and pre-harvest weed control. It is primarily a contact herbicide and its mode of action acts quickly on plants, especially broadleaves, and a foliar response is visible within hours of application. This property allows Saflufenacil to be both an effective crop desiccant and broadleaf weed burndown herbicide in the days just prior to crambe and mustard seed harvest. **Sharpen Powered by KIXOR® Herbicide** clearly fills the need for effective harvest aid applications in crambe and mustard seed.

Criterion 3: Glyphosate's mode of herbicide action is inhibition of EPSPS, therefore making it Group 9 (WSSA) / Group G (HRAC) herbicide. Glyphosate-resistant biotypes of *Amaranthus*, *Conyza*, *Ambrosia*, and *Kochia* have been reported throughout the U.S., and these are common weed species in crambe and mustard seed production areas (4).

Saflufenacil is a potent inhibitor of protoporphyrinogen-oxidase (PPO) belonging to herbicide mode of action Group 14 (WSSA) / Group E (HRAC). Saflufenacil is rapidly absorbed by roots and foliage. Following inhibition of protoporphyrinogen-oxidase, plant death is the result of membrane damage. Under active growing conditions, susceptible emerged weeds usually develop chlorotic and necrotic injury symptoms within hours and die within a few days. Saflufenacil has a distinctly different mode of herbicide action from glyphosate, and has been shown to be an extremely effective herbicide for control of glyphosate-resistant weeds such as *Amaranthus*, *Conyza*, *Ambrosia*, and *Kochia* (5, 6, 7, 8).

Glyphosate applied in crambe and mustard seed for preharvest weed control will be ineffective on the various glyphosate-resistant weeds, and its use will thereby contribute to the spread of resistant weeds and further populate the soil seed bank. Instead, **Sharpen Powered by KIXOR® Herbicide** applied as a harvest aid or in combination with glyphosate will not only be effective on glyphosate-resistant weed species, thereby playing a significant role in managing weed resistance, but also adds a new, effective herbicide mode of action for crambe and mustard seed production.

- **Canola**

Harvest aid desiccation as a minor use. Although canola planted acreage exceeds 300,000 acres, the harvest aid desiccation use can be considered as a minor use defined under FIFRA § 2(ll) provisions "where the use does not provide sufficient economic incentive to support the initial registration or continuing registration of a pesticide for such use." According to Zollinger (10), North Dakota grows about 80% of canola in the U.S. (11), but there are only about 4.6% of canola acres needing harvest aid desiccant application. The number of acres receiving a harvest aid desiccation application is 79,900, calculated from total canola acres planted in U.S. multiplied by percentage of acres treated with harvest aid (1,737,000 x 4.6%). Even though canola in the U.S. is a major crop (acreage wise), the harvest aid desiccation can be considered a minor use.

Alternative products: Glyphosate, Diquat (Reglone)

Reasons why Saflufenacil meets the Criteria 3:
Criterion 3: Glyphosate is registered for harvest aid in canola, but it is only a partial alternative to **Sharpen Powered by KIXOR® Herbicide**. Because glyphosate is a systemic herbicide and its mode of action acts slowly on plants, it isn't effective as a crop desiccant and is therefore only recommended for late-season, pre-harvest weed control (2). Glyphosate's mode of herbicide action is inhibition of EPSPS, therefore making it Group 9 (WSSA) / Group G (HRAC) herbicide. Glyphosate resistant biotypes of *Amaranthus*, *Conyza*, *Ambrosia*, and *Kochia* have been reported throughout the U.S., and these are common weed species in Canola (4).

Diquat's mode of herbicide action is diverting photosystem I electron transport (PS I electron diverter), therefore making it a Group 22 (WSSA) / Group D (HRAC) herbicide. Thirty one weed species have been confirmed resistant to PS I electron diverters including *Conyza* and *Solanum* species in the U.S. (9). A hairy fleabane (*Conyza bonariensis*) biotype resistant to both glyphosate and paraquat (a PS I electron diverter) has also been reported (8).

Saflufenacil is a potent inhibitor of protoporphyrinogen-oxidase (PPO) belonging to herbicide mode of action Group 14 (WSSA) / Group E (HRAC). Saflufenacil is rapidly absorbed by roots and foliage. Following inhibition of protoporphyrinogen-oxidase, plant death is the result of membrane damage. Under active growing conditions, susceptible emerged weeds usually develop chlorotic and necrotic injury symptoms within hours and die within a few days. Saflufenacil has a distinctly different mode of action from glyphosate or diquat, and has been shown to be an extremely effective herbicide for control of glyphosate-resistant weeds such as *Amaranthus*, *Conyza*, *Ambrosia*, and *Kochia* (5, 6, 7, 8). Dennis et al (8) reported that Saflufenacil effectively controlled a hairy fleabane (*Conyza bonariensis*) biotype that is resistant to only glyphosate and a biotype that is resistant to both glyphosate and PSI electron diverter herbicides.

Glyphosate and diquat applied in canola for preharvest weed control will be ineffective on the glyphosate- and diquat-resistant weeds, respectively, and their use will thereby contribute to the spread of resistant weeds and further populate the soil seed bank. Instead, **Sharpen Powered by KIXOR® Herbicide** applied as a harvest aid instead of glyphosate or diquat will not only be effective on the resistant weed species, thereby playing a significant role in managing weed resistance, but also adds a new, effective herbicide mode of action option for canola production.

Citations for Oilseeds of Crop Subgroup 20A:

1. Hulting, A, 2014a, Oilseed Crops H-1, Pacific Northwest Weed Management Handbook; http://pnwhandbooks.org/weed/sites/default/files/chapters/pdf/h-oilseeds_0.pdf or http://pnwhandbooks.org/weed/agronomic/oilseed-crops/camelina-gold-pleasure

2. North Dakota Weed Control Guide, 2014. Sunflower, safflower, flax, canola/mustard. p42. http://www.ag.ndsu.edu/weeds/weed-control-guides/nd-weed-control-guide-1 or http://www.ag.ndsu.edu/weeds/weed-control-guides/nd-weed-control-guide-1/wcg-files/6-Snfl.pdf

3. Soltani N. et al. 2013. Desiccation in dry edible beans with various herbicides. Can. J. Plant Sci. 93: 871-877 (hardcopy). http://pubs.aic.ca/doi/abs/10.4141/cjps2013-061

4. Heap, I. 2014a. Weeds Resistant to EPSP synthase inhibitors (G/9). http://www.weedscience.org/summary/MOA.aspx?MOAID=12

5. Shrestha, A and I. Moretti. 2011. Effect of saflufenacil on glyphosate-resistant and -susceptible horseweed (*Conyza canadensis*) biotypes. WSSA 2011 Meeting Abstracts (#104). http://wssaabstracts.com/public/4/abstract-104.html

6. Eubank T. et al. 2011. Saflufenacil efficacy on horseweed (*Conyza canadensis*) and effects on the absorption and translocation of glyphosate. WSSA 2011 Meeting Abstracts (#274). http://wssaabstracts.com/public/4/abstract-274.html

7. Ikley J. and R. Ritter. 2012. Effect of saflufenacil application timing on soybean and its role in managing glyphosate-resistant horseweed (*Conyza canadensis*). WSSA 2012 Meeting Abstracts (#194). http://wssaabstracts.com/public/9/abstract-194.html

8. Dennis, M. et al. 2014. Effect of growth stage, light, and temperature on hairy fleabane (*Conyza bonariensis*) control with postemergence herbicides. WSSA 2014 Meeting Abstracts (#392). http://wssaabstracts.com/public/22/abstract-392.html

9. Heap, I. 2014b. Weeds resistant to PSI electron diverter (D/22). The International Survey of Herbicide Resistant Weeds. Online. Internet. http://www.weedscience.org/summary/MOA.aspx?MOAID=7

10. Zollinger, R. et al. 2014. Pesticide Use and Pest Management Practices in North Dakota, 2012. p6 or 9. http://www.ag.ndsu.edu/pubs/plantsci/pests/w1711.pdf

11. USDA. Crop Production 2013 Summary. p41. http://usda01.library.cornell.edu/usda/current/CropProdSu/CropProdSu-01-10-2014.pdf

III. Oilseeds of Crop Subgroup 20B

FIFRA 3c(1)(F)(ii) Criterion satisfied → 1 and 2.
"There are insufficient efficacious alternative registered pesticides available for the use." **and**
"The alternatives to the pesticide use pose greater risks to the environment or human health."

Minor Use Crop	Minor Use Acreage	Description of Specific Labeled Use Pattern	Reasons why Saflufenacil satisfies the Criteria 1 and 2
Sunflower	126,040[1]	Apply **Sharpen Powered by KIXOR® Herbicide** at 1.0 – 2.0 fl oz/A (0.022 – 0.044 lb ai/A) for desiccation of plants after physiological maturity to aid in harvest.	**Sharpen Powered by KIXOR® Herbicide** is the most effective registered pesticide for harvest aid applications in Sunflower and Safflower. On August 28 2008, EPA granted Saflufenacil Reduced Risk status for use as a harvest aid in sunflower. The reduced risk status was based on saflufenacil having less acute toxicity in regard to human health, exhibits lower acute toxicity in regard to birds and mammals, and has a lower use rate resulting in an overall reduction in the herbicide load in the environment than the registered alternative pesticide, paraquat.
Safflower	176,000[2]		

[1] 126,040 = Total planted acres x percent of potential desiccation acres = 1,575,500 x 8%. Percent of desiccation acres are based on Zollinger, R. et al. 2014. Pesticide Use and Pest Management Practices in North Dakota, 2012. p6 or 8. http://www.ag.ndsu.edu/pubs/plantsci/pests/w1711.pdf and total planted acres are based on USDA.

Crop Production 2013 Summary. p42. http://usda01.library.cornell.edu/usda/current/CropProdSu/CropProdSu-01-10-2014.pdf or USDA National Agriculture Statistics Service: http://quickstats.nass.usda.gov/. For details, see following text about sunflower.

[2] USDA. Crop Production 2013 Summary. p47.
http://usda01.library.cornell.edu/usda/current/CropProdSu/CropProdSu-01-10-2014.pdf

- **Sunflower**

Harvest aid desiccation as a minor use. Although total sunflower planted acreage exceeds 300,000 acres, the harvest aid desiccation use can be considered as a minor use defined under FIFRA § 2(ll) provisions "where the use does not provide sufficient economic incentive to support the initial registration or continuing registration of a pesticide for such use." According to Zollinger (2), North Dakota grows about 33% of sunflower in the U.S. (1), but there are only about 8% of sunflower acres needing harvest aid desiccant application. The North Dakota survey (1) also indicates the northern part of state had a higher percent of harvest aid desiccation acres than the southern region. Since North Dakota is the most northern state for sunflower production in the U.S., it's expected to have the highest sunflower desiccant treatment rate. The number of acres needing a harvest aid desiccation application is about 126,040, calculated from total sunflower acres planted in U.S.multplied by percentage of acres treated with harvest aid (1,575,500 x 8%). Even though sunflower in the U.S. is a major crop (acreage wise), the harvest aid desiccation can be considered a minor use.

Alternative products: Glyphosate, Paraquat, Sodium chlorate, and Flumioxazin,

Reasons why Saflufenacil meets the Criteria 1 and 2:
Criterion 1:
Saflufenacil vs. Glyphosate:

Stahlman et al (3) observed "Saflufenacil and paraquat treatments appeared to desiccate sunflower considerably faster than glyphosate." Because glyphosate is a systemic herbicide and its mode of action acts slowly on plants, it isn't effective as a crop desiccant and is therefore only recommended for late-season, pre-harvest weed control (2). Soltani et al (4) desiccated dry beans in 11 field trials over a 3-year period and found that Saflufenacil desiccated all evaluated broadleaf weeds (redroot pigweed, common ragweed, and common lambsquarters) better than glyphosate for all evaluation dates. These weeds are also important in sunflower production. Since glyphosate was shown to be less effective for pre-harvest weed control and is not recommended for crop desiccation, it is an insufficient efficacious alternative when compared to **Sharpen Powered by KIXOR® Herbicide** for the harvest aid application in sunflower.

Saflufenacil vs. Paraquat:
Howatt and Zollinger (9) at North Dakota State University reported that Saflufenacil desiccated sunflower as well as or better than paraquat, especially on sunflower stems. Jenks et al (7, 8) in North Dakota Weed Control Research reported that Saflufenacil was as effective as or more effective with preharvest burndown of evaluated weed species (common lambsquarters, kochia, wild buckwheat, and redroot pigweed) than paraquat.

Saflufenacil vs. Sodium chlorate:
Sodium chlorate is registered for harvest aid in sunflower, but it is only a partial alternative to Saflufenacil because it only desiccates the crop but has limited efficacy on weeds. However, North Dakota and South Dakota weed control guides (2, 10) no longer recommend sodium chlorate as a sunflower desiccant. These two states represent two-thirds of the sunflower production acreage in the U.S.

Saflufenacil vs. Flumioxazin:
Howatt et al (5, 6) in North Dakota Weed Control Research showed that Saflufenacil desiccates sunflower consistently better than flumioxazin, and observed that "flumioxazin alone did not cause visible desiccation to sunflower compared with the untreated sunflower." In contrast, Saflufenacil demonstrated substantially hastened desiccation relative to the untreated sunflower. Jenks et al (7, 8) in North Dakota Weed Control Research reported that Saflufenacil was much more effective with preharvest burndown of evaluated weed species (common lambsquarters, kochia, wild buckwheat, and redroot pigweed) than flumioxazin. Soltani et al (4) in Canada also observed that Saflufenacil desiccates evaluated broadleaf weeds (redroot pigweed, common ragweed, and common lambsquarters) better than flumioxazin prior to harvest. In these side-by-side preharvest studies, flumioxazin was shown to be less efficacious than Saflufenacil for both sunflower desiccation and preharvest weed control.

In conclusion on **Criterion 1, Sharpen Powered by KIXOR® Herbicide** is the most suitable product for both sunflower desiccation and pre-harvest weed control. It is primarily a contact herbicide and its mode of action acts quickly on plants, especially broadleaves, and a foliar response is visible within hours of application. This property allows **Sharpen Powered by KIXOR® Herbicide** to be both an effective crop desiccant and broadleaf weed burndown herbicide in the days just prior to sunflower harvest. When compared to the aforementioned insufficient efficacious alternatives, **Sharpen Powered by KIXOR® Herbicide** clearly fills the need and is the most effective for harvest aid applications in sunflower.

Criterion 2:
On August 28, 2008, EPA granted Saflufenacil reduced risk status to the harvest aid use on sunflowers. The reduced risk status was based on Saflufenacil having less acute toxicity in regard to human health, exhibits lower acute toxicity in regard to birds and mammals, and has a lower use rate resulting in an

overall reduction in the herbicide load in the environment than the then registered alternative pesticide, paraquat (see EPA letter in **APPENDIX I**).

Sharpen Powered by KIXOR® Herbicide's labeled rate (0.022 – 0.045 lb ai/A) is only a fraction of sodium chlorate's label rate (6 lb ai/A), while acute toxicity (rat oral LD_{50} study) are >2,000 and 5,000 mg/kg, respectively. Although not classified federally as such, one or more uses of sodium chlorate or glyphosate are classified as "restricted-use" in one or more of the Pacific Northwest (PNW) states in 2014 PNW Weed Management Handbook (11). **Sharpen Powered by KIXOR® Herbicide** is not classified as a "restricted-use" in those PNW states.

Soltani et al (4) compared environmental impact among glyphosate, saflufenacil, flumioxazin, glufosinate ammonium, diquat, and carfentrazone-ethyl as dry bean harvest aids by calculating environmental impact quotient and reported "Among desiccant treatments that provided consistent desiccation of dry bean and weeds, saflufenacil has the lowest environmental impact, etc." Additionally, a fall application of flumioxazin for harvest aid desiccation may cause follow crop injury as indicated in the long rotation intervals in flumioxazin label.

In summary for **Criterion 2** when compared to the various characteristics of the registered alternative pesticides, Saflufenacil poses less risk to the environment or human health.

- **Safflower**

Alternative products: Glyphosate, Sodium chlorate, and Flumioxazin

Reasons why Saflufenacil meets the Criteria 1:
Criterion 1:
Saflufenacil vs. Glyphosate:
Glyphosate is registered for harvest aid applications in safflower, but it is only a partial alternative to **Sharpen Powered by KIXOR® Herbicide**. Glyphosate is a systemic herbicide and its mode of action acts slowly on plants, therefore it isn't an effective crop desiccant and is only recommended for late-season, pre-harvest weed control from harvest aid applications (2). Howatt et al (12) found Saflufenacil to desiccate safflower leaf and head much faster than glyphosate. Jenks (13) also reported that days required providing safflower leaf, stem, and head desiccation equivalent to comparison product are shorter for Saflufenacil than for glyphosate. In a desiccation study on several crops including lentil, dry pea, chickpea, dry beans, safflower, and flax; and desiccants including Saflufenacil, glyphosate, paraquat, diquat, and flumioxazin, Jenks et al (13) found "crop desiccation with glyphosate was generally slower compared to other treatments." Soltani et al (4) desiccated dry beans in 11 field trials over a 3-year period and found that Saflufenacil desiccates all evaluated broadleaf weeds (redroot pigweed, common ragweed, and common lambsquarters) better than glyphosate for all evaluation dates. Since glyphosate was shown to be less effective for pre-harvest weed control and is not recommended for crop desiccation, it is an insufficient efficacious alternative when compared to **Sharpen Powered by KIXOR® Herbicide** for the harvest aid application in safflower.

Saflufenacil vs. Sodium chlorate:
In a safflower desiccation study, Howatt et al (12) reported that the low labeled rate of Saflufenacil desiccated safflower leaf and head faster than sodium chlorate at label rate when evaluated 17 days after treatment. The high labeled rate of Saflufenacil desiccated safflower leaf and head as fast as or faster than sodium chlorate at label rate for all evaluated dates.

Saflufenacil vs. Flumioxazin:
There is no reported side-by-side study to compare Saflufenacil and flumioxazin for safflower desiccation. However, Jenks et al (7, 8) in North Dakota Weed Control Research reported that Saflufenacil was much more effective with preharvest burndown of evaluated weed species (common lambsquarters, kochia, wild buckwheat, and redroot pigweed) than flumioxazin. Soltani et al (4) in Canada also observed that Saflufenacil desiccates evaluated broadleaf weeds (redroot pigweed, common ragweed, and common lambsquarters) better than flumioxazin prior to harvest. In these side-by-side preharvest studies, flumioxazin was shown to be less efficacious than Saflufenacil for both sunflower desiccation and preharvest weed control.

In conclusion on **Criterion 1**, **Sharpen Powered by KIXOR® Herbicide** is the most suitable product for both safflower desiccation and pre-harvest weed control. It is primarily a contact herbicide and its mode of action acts quickly on plants, especially broadleaves, and a foliar response is visible within hours of application. This property allows **Sharpen Powered by KIXOR® Herbicide** to be both an effective crop desiccant and broadleaf weed burndown herbicide in the days just prior to safflower harvest. When compared to the aforementioned insufficient efficacious alternatives, **Sharpen Powered by KIXOR® Herbicide** clearly fills the need and is the most effective for harvest aid applications in safflower.

Citations for Oilseed of Crop Subgroup 20B:

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11. Hulting, A. 2014. Restricted-use Herbicides in Idaho, Oregon, and Washington. PNW 2014 Weed Management Handbook. Page C-25. http://pnwhandbooks.org/weed/other-items/agrichemicals-and-their-properties/restricted-use-herbicides-idaho-oregon-and-washington

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APPENDIX I

(copy of EPA acceptance letter, Saflufenacil Reduced Risk status, August 28 2008)

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

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

AUG 28 2008

Craig D. Kleppe
Product Registration Manager
BASF Corporation
26 Davis Drive
Research Triangle Park, NC 27709

Subject: Reduced Risk Decision for Harvest Aid Use on Sunflowers of Saflufenacil

Dear Mr. Kleppe,

Thank you for your submission requesting reduced risk status for the harvest aid use on sunflowers of the new active ingredient herbicide saflufenacil (BAS 800H). On June 24, 2008, the Reduced Risk Committee completed its review of the information in your reduced risk rationale and granted reduced risk status to the harvest aid use on sunflowers. When compared to the registered alternative, paraquat, saflufenacil appears to be less acutely toxic with regard to human health, and exhibits lower acute toxicity with regard to birds and mammals. Though it is possible that total sunflowers acres treated with a dessicant may rise with the introduction of saflufenacil and transition to stay-green varieties, it's lower use rate suggests that there will likely be an overall reduction in the herbicide load to the environment.

Please note that the reduced risk status of any chemical is an initial assessment. Should information warrant, the Agency may re-evaluate and possibly revoke your submission's reduced risk status. Also, should the Agency determine at any time that the data base for your product is unacceptable or incomplete, the Agency may stop the expedited process for the chemical until adequate data are submitted.

Under the Pesticide Registration Improvement Act (PRIA), uses designated as "reduced risk" receive an expedited time frame for review. Dan Kenny is the branch chief in EPA who will now handle all regulatory issues associated with this application. If you have any regulatory questions, you may contact Dan at (703) 305-7546.

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▸ 2

To CRAIG D. KLEPPE	From STEVE SCHAIBLE
Dept./Agency BASF	Phone # (703) 308-9362
Fax # (919) 547-2850	Fax #

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Thank you for your interest in reduced risk pesticides. If you have any questions regarding the reduced risk pesticide program please feel free to contact Steve Schaible at (703) 308-9362.

Sincerely yours,

Lois Rossi, Director
Registration Division

cc: Dan Kenny