US Environmental Protection Agency
Office of Pesticide Programs

Extension of the Protection Period for Mesotrione Exclusive Use Data (Part 1 of 4)

January 15, 2009

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Attention: **Ms. Joanne Miller, PM Leader Team 23, Herbicide Branch, Registration Division**

SUBJECT: EXTENSION OF PROTECTION PERIOD FOR MESOTRIONE EXCLUSIVE USE DATA

Dear Ms. Miller:

Enclosed with this letter is Syngenta Crop Protection, Inc.'s (Syngenta) submission in support of a 3-year extension of the protection period for mesotrione exclusive use data under FIFRA Section 3(c)(1)(F)(ii).

EPA granted the initial registration of mesotrione on June 4, 2001 for use in corn. Thus, the original 10-year period of exclusive use runs until June 4, 2011. Today's submission is to request that EPA extend the period of exclusive use for an additional 3 years, until June 4, 2014. There are at least 9 uses that are important tools for minor use growers and that EPA approved within the first 7 years of mesotrione's initial registration. Each of these uses meets one or more of the criteria of FIFRA Section 3(c)(1)(F)(ii).

We have included 12 crops in today's submission, to help ensure that EPA has ample basis to approve the maximum 3-year extension. EPA has granted Reduced Risk status to 11 of these 12 crops as part of its decisions on May 20, 2008 and July 15, 2008 to grant Reduced Risk status to 15 uses of mesotrione. EPA's recognition of the Reduced Risk attributes of these mesotrione uses is clear evidence that each of these uses meets the reduced risk criterion (criterion II) of FIFRA Section 3(c)(1)(F)(ii). We note that EPA denied reduced risk status to one use, sweet sorghum, only because there is no other herbicide currently registered for this specific type of sorghum and therefore, EPA concluded that the risk could not be reduced. This is clear evidence that sweet sorghum meets the "insufficient efficacious alternative registered pesticides" criterion (criterion I) of FIFRA Section 3(c)(1)(F)(ii).

The12 crop uses in today's submission are: asparagus, blueberry, cranberry, flax, grain sorghum, perennial ryegrass grown for seed, Kentucky bluegrass grown for seed, tall fescue grown for seed, oats, pearl millet, rhubarb and sweet sorghum. Our submission provides information demonstrating each fully satisfies at least 2 of the first 3 FIFRA Section 3(c)(1)(F)(ii) criteria. The 3 criteria are:

(I) *there are insufficient efficacious alternative registered pesticides available for the use;*

(II) *the alternatives to the minor use pesticide pose greater risks to the environment or human health;* and

(III) *the minor use pesticide plays or will play a significant part in managing pest resistance.*

Syngenta has elected not to submit information to justify criterion ((IV) *the minor use pesticide plays or will play a significant part in an integrated pest management program*), because only 1 criterion is needed by crop and each crop is justified 1 or multiple times for criterion I, II, or III.

We hope that the following brief summary will facilitate EPA's review of the enclosed submission. Our submission begins with an introduction summarizing how the submission meets the threshold requirements of FIFRA Section 3(c)(1)(F)(ii). We then describe the methodology used to analyze each of the 12 crops included in the submission, followed by a summary of the conclusions for all 12 crops. Finally, we provide the detailed back-up for these conclusions crop-by-crop, including summary tables to facilitate review of the detailed information.

We appreciate EPA's efforts to implement this provision of FIFRA, which is intended to provide an incentive to pesticide registrants to develop and maintain uses that are vital to small groups of growers producing minor crops or minor uses of other crops. We believe that with this documentation we have fully demonstrated that mesotrione qualifies for a 3-year extension of exclusive use protection under the minor use extension provisions of FIFRA Section 3(c)(1)(F)(ii) as intended by Congress. We hope that this information is helpful to EPA's and USDA's evaluation of the extension.

Please let me know if there is any further information we can provide.

Sincerely,

John D. Abbott, Ph.D., CPH
NAFTA Herbicide Team Leader

Enclosure

cc: M. Knorr (EPA Office of General Counsel)

EXTENSION OF PROTECTION PERIOD FOR
MESOTRIONE EXCLUSIVE USE DATA

Introduction

EPA granted the initial registration of mesotrione on June 4, 2001 for use in corn. Thus, the original 10-year period of exclusive use runs until June 4, 2011. Today's submission is to request that EPA extend the period of exclusive use for an additional 3 years, until June 4, 2014. There are at least 9 minor crops or minor uses of other crops that are important tools for minor use growers and that EPA approved within the first 7 years of mesotrione's initial registration. Each of these uses meets one or more of the criteria of FIFRA Section 3(c)(1)(F)(ii).

We have included 12 crops in today's submission to help ensure that EPA has an ample basis to approve the maximum 3-year extension. EPA has granted Reduced Risk status to 11 of these 12 crops as part of its decisions on May 20, 2008 and July 15, 2008 to grant Reduced Risk status to 15 uses of mesotrione. EPA's recognition of the Reduced Risk attributes of these mesotrione uses is strong evidence that each of these uses meets the reduced risk criterion (criterion II) of FIFRA Section 3(c)(1)(F)(ii). We note that EPA did not similarly grant reduced risk status to one use, sweet sorghum, but only because there is no other herbicide currently registered for this specific type of sorghum and therefore, EPA concluded that the risk could not be reduced. This is clear evidence that sweet sorghum meets the "insufficient efficacious alternative registered pesticides criterion (criterion I) of FIFRA Section 3(c)(1)(F)(ii).

Each of the 12 crops in today's submission satisfies at least 1 the first 3FIFRA Section 3(c)(1)(F)(ii) criteria, and most satisfy all 3 of them. The 3 criteria are:

(I) *there are insufficient efficacious alternative registered pesticides available for the use;*

(II) *the alternatives to the minor use pesticide pose greater risks to the environment or human health;* and

(III) *the minor use pesticide plays or will play a significant part in managing pest resistance.*

Syngenta has elected not to submit information to justify criterion (IV) (*the minor use pesticide plays or will play a significant part in an integrated pest management program*), because only 1 criterion is needed by crop and each crop is justified 1 or multiple times for criteria I, II, or III.

Methodology Used To Justify Extension For Each Crop:

For each crop, Syngenta queried NPIRS (Exhibit 1: "Key to Abbreviations Used In This Submittal.") to identify all herbicide active ingredients registered for that crop. Based on herbicidal characteristics, weed species controlled, residual activity, or other similar practical factors, Syngenta identified alternatives that would potentially compete with mesotrione and then determined whether mesotrione meets one or more of the FIFRA Section 3(c)(1)(F)(ii) criteria. The other registered active ingredients that are not considered viable alternatives are also identified for each crop. These active ingredients are not evaluated in the analysis because they are not considered possible alternatives to mesotrione from an efficacy

standpoint. Exhibit 2, "Active Ingredients Within The Analyses Across Crops That Are Not Considered Viable Alternatives To Mesotrione" contains the list of active ingredients and the reasons each is not a viable alternative to mesotrione in one or more of the 12 crops. Exhibit 3 "Mesotrione will control weed species that have developed resistant biotypes to other families of chemistry" provides information on the mode of action with the HRAC and WSSA Group classification of active ingredient considered in these analyses. The weed species that have developed resistant biotypes, obtained from the "International Survey of Herbicide Resistant Weeds", that mesotrione controls are listed to show mesotrione's contribution in controlling resistant biotypes. To aid in the selection of alternatives, actual herbicide use per crop was obtained from dmrkynetec (formerly Doane AgroTrak). The National Pesticide Use Database (2002) was queried for crops not surveyed by Doane AgroTrak to determine if the chosen alternatives are actually used on the crop. Estimates were obtained from university or commodity group crop experts for crops not available in the databases listed above.

For each of the selected active ingredients per crop, pertinent attributes were compared to mesotrione. These are shown in Tables 1 – 4 for each crop, as described below.

Mesotrione Exclusive Use Extension: Exhibit 1
Key to Abreviations Used In This Submittal

Abreviation	Definition
HRAC	Herbicide Resistance Action Committee
WSSA	Weed Science Society of America
COC	Crop Oil Concentrate - An additive used within the spray solution
UAN	Urea Ammonia Nitrate - An additive used within the spray solution
AMS	Ammonium Sulfate - An additive used within the spray solution
NIS	Non-ionic Surfactant - An additive used within the spray solution

Mesotrione Exclusive Use Extension: Exhibit 2

Active Ingredients Within The Analyses Across Crops That Are Not Considered Viable Alternatives To Mesotrione

Registered For One Or More Crops	Reason Not An Alternative For Mesotrione In One Or More Crops
Mesotrione	**Mesotrione provides preemergence and postemergence control of a many broadleaf weeds, and partial control of others. On the postemergence label there are 32 broadleaf species controlled and 11 partially controlled. Within the preemergence section, there are 22 controlled and 5 partially controlled. On the Callisto label, there are two grass species controlled both pre and postemergence. In cranberries, there are additional species unique to that crop. Application to the crop is preemergence or postemergent with Callisto providing residual preemeergence control or postemergence control to weeds with following residual control.**
Alachlor	Primarily a preemergence grass herbicide, with control of a very narrow broadleaf spectrum. No postemergence activity. Not a viable broadleaf alternative..
Bentazon	Primarilya postemergence broadleaf herbicide with no preemergence or residual soil activity. Product is not widely used. Limited spectrum. Only registered for flax and grain sorghum.
Carfentrazone	Postemergence broadleaf product applied to small weeds. Limited spectrum does not match mesotrione. Weed coverage is essential. No preemergence activity and no residual weed control of later emerging weeds. Only registered in oats, grain sorghum, and grain sorghum.
Clethodim	Postemergence grass herbicide with no broadleaf spectrum. Does not match mesotrione's weed spectrum.
Dimethenamid	Primarily a preemergence grass herbicide. No postemergence activity. Narrow broadleaf spectrum. Not a viable broadleaf alternative.
Dimethenamid-P	Primarily a preemergence grass herbicide. No postemergence activity. Narrow broadleaf spectrum. Not a viable broadleaf alternative.
Diquat	Non-selective postemergence burndown for control of grasses and broadleaf weeds. No residual activity for control of later emerging weeds. No crop selectivity.
Diuron	Preemergence or postemergence, depending on crop, for control of certain broadleaf weeds in certain crops. Relatively high application rates. Potential for crop injury.
Fluazifop-P-butyl	Postemergence grass herbicide with no broadleaf spectrum. Does not match mesotrione weed spectrum.
Flucarbazone	Primarily a postemergence grass herbicide in cereals and grasses grown for seed with a limited broadleaf spectrum. Short residual product of ALS mode of action with many weed species with resistant biotypes. Broadleaf spectrum is insufficient as alternative to mesotrione. Only registered in KY bluegrass grown for seed.
Fluroxypyr	Postemergence broadleaf product. Controls only weeds emerged at time of application. Activity subject to environmental conditions. Limited broadleaf spectrum in comparison to mesotrione. No residual control of later emerging weeds. Only registered in grasses grown for seed and oats.
Glufosinate	Non-selective postemergence burndown for control of grasses and broadleaf weeds. No residual activity for control of later emerging weeds. No in-season use in these crops.
Glyphosate	Non-selective postemergence burndown for control of grasses and broadleaf weeds. No residual activity for control of later emerging weeds or for in season weed control in these crops..
Isoxaben	Good preemergence incorporated broadleaf spectrum. Can only be used in non-bearing crops, therefore not a viable alternative. Only registered in blueberry.

Glufosinate	Non-selective postemergence burndown for control of grasses and broadleaf weeds. No residual activity for control of later emerging weeds. No in-season use in these crops.
Glyphosate	Non-selective postemergence burndown for control of grasses and broadleaf weeds. No residual activity for control of later emerging weeds or for in season weed control in these crops..
Isoxaben	Good preemergence incorporated broadleaf spectrum. Can only be used in non-bearing crops, therefore not a viable alternative. Only registered in blueberry.
Metam-sodium	A soil fumigant used prior to crop establishment for weed control. Cannot be used for in season weed control. Only registered in blueberry.
Metolachlor	Primarily a preemergence grass herbicide, with control of a very narrow broadleaf spectrum. No postemergence activity. Not a viable broadleaf alternative..
MSMA	A postemergence product primiarily for grass control with no preemergence or residual activity. Not a viable broadleaf alternative.
Oxadiazon	High rate preemergence product for control of broadleaves and certain grasses. Only on ornamental cranberries, so not a viable alternative to mesotrione.
Paraquat	Non-selective postemergence burndown for control of grasses and broadleaf weeds. No residual activity for control of later emerging weeds. No in-crop use.
Pelargonic Acid	Non-selective postemergence burndown for control of grasses and broadleaf weeds. No residual activity for control of later emerging weeds. No in-crop use.
Pendimethalin	Primarily a preemergence grass herbicide. Limited broadleaf spectrum. Not a viable alternative to mesotrione.
Primisulfuron	A postemergence product primarily for control of certain grass weeds and certain broadleaves. Some residual activity. Spectrum differes from mesotrione. Not a viable alternative for mesotrione. Only registered in bluegrass grown for seed.
Propachlor	Primarily a preemergence grass herbicide, with very limited broadleaf spectrum. Not a viable alternative for mesotrione.
Prosulfuron	Primarily a postemergence broadleaf product with residual activity. Very limited use. Many resistant weed biotypes. Only registered for use in oats, pearl millet, and grain sorghum.
Pyrasulfotole	Very limited postemergence broadleaf spectrum, making it impractical as an alternative. Limited residual activity. Only registered for use in oats.
Sethoxydim	Postemergence grass herbicide with no residual control or broadleaf spectrum. Not a viable alternative for mesotrione.
S-metolachlor	Primarily a preemergence grass herbicide, with control of a very narrow broadleaf spectrum. No postemergence activity. Not a viable broadleaf alternative..
Tribenuron-methyl	Not commonly used alone. Only recommended in combination with other products for use in grasses grown for seed. Poor residual control. Many weed species with resistant biotypes. Only registered in grasses grown for seed.
Trifluralin	Primarily a preplant incorporated grass herbicide. Not a viable alternative to mesotrione.

Mesotrione Exclusive Use Extension: Exhibit 3

Mesotrione Will Control Weed Species That Have Developed Resistant Biotypes To Other Families of Chemistry.

Mode of Action ; Chemical Family	HRAC Group	WSSA Group	AIs Included In The Analysis As Potential / Partial Alternatives To Mesotrione.	Statement of Resistance For MOA And Weed Species With Resistant Biotypes Controlled by Mesotrione - From WSSA Database.
Acetolactate synthase (ALS)	B	2	Chorsulfuron, Flucarbazone, Halosulfuron-methyl, Metsulfuron-methyl, Primisulfuron, Prosulfuron, Tribenuron-methyl, Thifensulfuron, Trifloxysulfuron	Several species have developed biotypes resistant to this ALS (B / 2) group of herbicides. Mesotrione will control many of these species (Amaranth (palmer, Powell), cocklebur, chickweed, horseweed, kochia, lambsquarters, mustard, eastern black nightshade, pigweed (redroot, smooth), ragweed (common, giant), teaweed, sunflower, and waterhemps).
Photosystem II Triazines, Triazinone, Uracil	C1	5	Ametryn, Atrazine, Hexazinone, Metribuzin, Simazine, Terbacil	Several species have developed biotypes resistant to this PS II (C1 / 5) group of herbicides. Mesotrione will control many of these species (Amaranth (palmer, Powell), kochia, jimsonweed, lambsquarters, eastern black nightshade, pigweed (redroot, smooth), ragweed (common), smartweeds, teaweed, sunflower, velvetleaf, waterhemps).
Photosystem II Urea	C2	7	Diuron, Linuron	Several species have developed biotypes resistant to this (C2 / 7) group of herbicides. Mesotrione will control several of these species including Powell amaranth, horseweed, and redroot pigweed.
Photosystem II Nitriles, benzothiadiazinone	C3	6	Bentazon, Bromoxynil	Only one species has developed a resistant biotype to this (C3 / 6) group of chemistry and it is not controlled by Mesotrione.
Protoporphyrinogen oxidase PPO	E	14	Carfentrazone-ethyl, Flumioxazin, Fluthiacet-methyl, Oxyfluorfen	Two species in the US have developed a resistant biotype to this (E / 14) group of herbicides (common ragweed and waterhemp) and they are controlled by mesotrione.
Carotenoid biosynthesis - pyridazinone	F1	12	Norflurazon	No species in the US has developed a resistant biotype to this (F1 / 12) group of herbicides.
4-hydroxyphenyl - pyruvate - dioxygenase (4-HPPD)	F2	28	Pyrasulfotole, Mesotrione (28)	No species in the US has developed a resistant biotype to this (F2 / 27) group of herbicides.

Mode of Action ; Chemical Family	HRAC Group	WSSA Group	AIs Included In The Analysis As Potential / Partial Alternatives To Mesotrione.	Statement of Resistance For MOA And Weed Species With Resistant Biotypes Controlled by Mesotrione - From WSSA Database.
Microtubule assembly inhibition: Dinitroaniline	K1	3	Oryzalin, Pendimethalin, Pronamide, Trifluralin	Several species have developed biotypes resistant to this (K1 / 3) group of herbicides. Mesotrione will control one of these - palmer amaranth.
Very Long Chain Fatty Acids (inhibition of cell division) Chloroacetamide	K3	15	Napropamide	One species in the US has developed a resistant biotype to this (K3 / 15) group of herbicides and it is not controlled by mesotrione.
Cell wall (cellulose) synthesis: Nitrile, Benzamide	L	20,21,27	Dichlobenil (20), Isoxaben (21),	No species in the US has developed a resistant biotype to this (L / 20, 21, 26) group of herbicides.
Lipid synthesis - not ACCase: Thiocarbamates	N	16	Ethofumesate	resistant to this (N / 8,26) group of herbicides. None are controlled by mesotrione.
Action like indole acetic acid: Synthetic Auxins	O	4	2,4-D, Clopyralid, Dicamba, Fluroxypyr, MCPA,	Several species have developed biotypes resistant to this (O / 4) group of herbicides. Mesotrione will control two of these - wild carrot and kochia.

Table 1 is titled "FIFRA Exclusive Use Extension Criterion I: There Are Insufficient Efficacious Alternatives To Mesotrione." This Table demonstrates that mesotrione meets FIFRA Section 3(c)(1)(F)(ii) Criterion I (Insufficient Efficacious Alternatives).

Table 1 contrasts the weed control spectrum of alternative products compared to mesotrione, based on the product labels. The full mesotrione weed spectrum is listed and then for each potential alternative product there is an indication of which of those species are on the alternative's label and the level of control (C = Control; PC = Partial Control, S= Suppression, Est. = Estimated to be controlled, and NC = No Control). Table 1 also shows information on weed biotypes that have developed and confirmed resistance to the alternative chemical family as indicated by color shading. Exhibit 3 contains the chemical family of the active ingredients, its HRAC and WSSA grouping, representative active ingredients included in the analysis and a statement concerning the resistant biotypes within the chemical family mode of action that mesotrione controls. A professional scientific-based judgement has been provided on whether there are sufficient alternatives (two active ingredients of different modes of action are needed at a minimum) to fully control a specific weed species. The column labelled "Count of Active Ingredient Controlling Species" sums the number of active ingredients that claim "Control" of the particular weed species. The other designations on the product label for level of control are not counted, since complete control does not occur. Also, if confirmed resistant biotypes occur for a weed species, the product is not considered as an alternative to mesotrione since that weed species with resistant biotypes is no longer controlled. At the bottom of Table 1, the row labelled "Count of Species Controlled" shows the number of species across application methods that each active ingredient controls. For mesotrione, there is a total of 58, compared to that of each of the other alternatives. This information is used to answer the question for Criterion I: "Insufficient efficacious alternative to Mesotrione." Syngenta provides its conclusion for each active ingredient as a "Yes" or "No".

Table 2 is titled "FIFRA Exclusive Use Extension Criterion II: Alternative Registered Pesticides Pose Greater Risks To The Environment Or Human Health Than Mesotrione." This Table shows that mesotrione meets FIFRA Section 3(c)(1)(F)(ii) criterion II (environmental or human health risks).

Table 2 compares mesotrione to the alternatives based on: whether the active ingredient and use are "reduced risk", seven human safety criteria, label statements on the active ingredient's characteristics based on human and environmental safety, comparable application methods and application rates, and evaluation of several other label statements. Some of the characteristics are compared between products using an experienced subjective comparison to mesotrione based on information from the product label. Table 2 includes a listing of the other registered active ingredients that are not considered as viable mesotrione alternatives. The information is used to answer the question for Criterion II: "Alternative Poses Greater Human Or Environmental Risk." Syngenta provides its conclusion for each active ingredient as a "Yes" or "No".

Table 3 is titled "FIFRA Exclusive Use Extension Criterion III: Mesotrione Plays Or Will Play A Significant Part In Managing Pest Resistance." The Table shows that mesotrione meets FIFRA Section 3(c)(1)(F)(ii) criterion III (managing pest resistance).

Table 3 demonstrates mesotrione plays or will play a role in managing pest resistance by showing the mode of action of each active ingredient (HRAC and WSSA), the number of resistant biotypes reported in the US by the WSSA HRAC web site for the mode of action, the number of those weeds controlled by mesotrione, and whether mesotrione would be an effective tool in managing resistance to another active ingredient. The information is used to answer the question for Criterion III: whether "Mesotrione Will Play Role In Managing Pest Resistance To This Active". Syngenta provides its conclusion for each active ingredient as a "Yes" or "No".

Table 4 is titled "Mesotrione Meets FIFRA Section 3(c)(1)(F)(ii) Criteria I, II, and III" and combines in summary format the information from Tables 1, 2, and 3.

Table 4 contains the active ingredients considered as potential mesotrione alternatives for each crop and whether the active is classified by EPA as "reduced risk". For each of the extension criterion (I, II, or III), it also displays Syngenta's conclusion for each active. The supporting information for this Table 4 is provided in Tables 1, 2, and 3.

Each of the 12 crops included in today's submission is presented in this format to aid in EPA's review.

Brief Summary:

Syngenta's submission today provides the information necessary for EPA to confirm that Syngenta has met the requirements to extend the period of protection for mesotrione exclusive use data from June 4, 2001, to June 4, 2014. There are at least 9 uses that are important tools for minor use growers and that EPA approved within the first 7 years of mesotrione's initial registration. Syngenta has included 12 crops in today's submission, to help ensure that EPA has an ample basis to approve the maximum 3-year extension. In the same vein, Syngenta also has provided information supporting more than one of the four statutory criteria for each use, even though only one criterion is needed per crop to meet the statutory standard for the extension. As noted above, EPA itself has made determinations about these 12 uses that provide clear evidence that at least 1 of the FIFRA Section 3(c)(1)(F)(ii) criteria is met for each of the 12 uses.

The following Table titled "Submission Summary Table: Mesotrione Meets FIFRA Section 3(c)(1)(F)(ii) Criteria I, II, And III" lists the 12 crops addressed in this submission, lists mesotrione's reduced risk classification for each, and finally lists the answer to the question whether the 3 extension criteria are met for each of the crops based on the information provided in the subsequent crop-by-crop sections of today's submission.

Submission Summary Table: Mesotrione Meets FIFRA Section 3(c)(1)(F)(ii) Criteria I, II, And III.

CROP	**EPA Classified** Mesotrione As Reduced Risk	**Criterion I: Insufficient** Efficacious Alternative To Mesotrione	**Criterion II: Alternative** Poses Greater Human Or Environmental Risk	**Criterion III Mesotrione Will** Play Role in Managing Pest Resistance To This Crop
Asparagus	Yes	Yes	Yes	Yes
Blueberries	Yes	Yes	Yes	Yes
Cranberries	Yes	Yes	Yes	Yes
Grasses For Seed				
Peren. Rye	Yes	Yes	Yes	Yes
KY Blue	Yes	Yes	Yes	Yes
Tall Fescue	Yes	Yes	Yes	Yes
Rhubarb	Yes	Yes	Yes	Yes
Pearl Millet	Yes	Yes	Yes	Yes
Flax	Yes	Yes	Yes	Yes
Oats	Yes	Yes	Yes	Yes
Sorghum, Gr	Yes	Yes	Yes	Yes
Sorghum, Swt.	No	Yes		

Asparagus

US asparagus production is estimated to be 71,602 acres in the 2002 National Pesticide Use Database, qualifying it as a minor crop. Mesotrione was registered on asparagus on March 17, 2008, which is within the first 7 years after the initial June 4, 2001 registration of mesotrione. On May 20, 2008 EPA granted mesotrione Reduced Risk status on asparagus.

Conclusion:
Mesotrione fulfils FIFRA Criteria I, II, and/or III compared to each registered alternative.

Criterion I: Mesotrione provides low rate (0.094-0.24 lbs.ai/A) preemergence and postemergence control of a large number of broadleaf weeds. Of the twelve potential alternatives, none provide as broad a spectrum of weed control. As to the weeds included on mesotrione's label, some are not controlled by any other product; most are controlled by only 1 to 3 other products, and only a few by multiple products. No one product provides a broad spectrum of weed control comparable to mesotrione.

Criterion II: Mesotrione is safer across the human safety, environmental impact and application criteria than any other alternative. As noted, some alternatives, diuron, halosulfuron, linuron, napropamide are better than mesotrione in one or more, but not all, characteristics.

Criterion III: No weeds have developed resistant biotypes to the mesotrione family of chemistry. Thus, mesotrione will manage resistance that has developed for most of the alternative families of chemistry. The exceptions are napropamide and norflurazon whose resistant biotypes are not controlled by mesotrione.

Asparagus: Mesotrione Meets FIFRA Section 3(c)(1)(F)(ii) Criteria I, II, And III

Active Ingredient	EPA Classified As Reduced Risk	Criterion I: Insufficient Efficacious Alternative To Mesotrione	Criterion II: Alternative Poses Greater Human Or Environmental Risk*	Criterion III: Mesotrione Will Play Role In Managing Pest Resistance To This Active
Mesotrione	Yes			
2, 4 – D	No	Yes	Yes	Yes
Clopyralid	No	Yes	Yes	Yes
Dicamba	No	Yes	Yes	Yes
Diuron	No	Yes	Yes	Yes
Flumioxazin	No	Yes	Yes	Yes
Halosulfuron	No	Yes	Yes	Yes
Linuron	No	Yes	Yes	Yes
Metribuzin	No	Yes	Yes	Yes
Napropamide	No	Yes	Yes	No
Norflurazon	No	Yes	Yes	No
Terbacil	No	Yes	Yes	Yes
Trifluralin	No	Yes	Yes	Yes

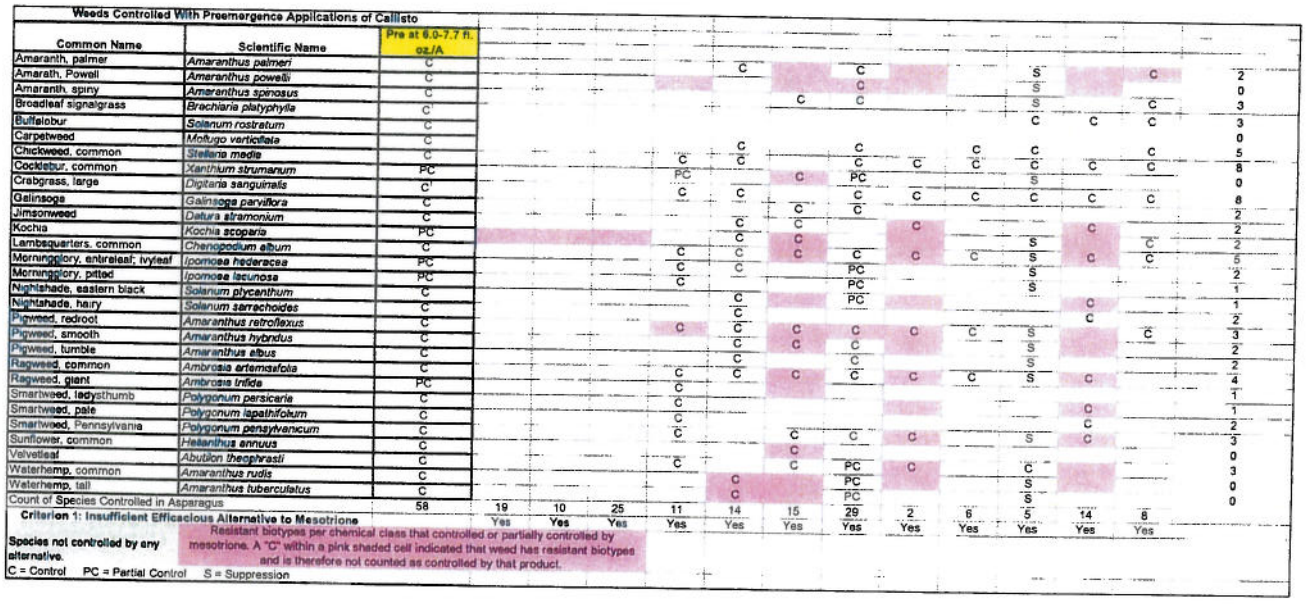
*Combined evaluation of human safety, application rate, and environmental impact.

Table 1: FIFRA Exclusive Use Extension Criterion I: There Are Insufficient Efficacious Alternatives To Mesotrione on Asparagus

Asparagus		Mesotrione HRAC Group F2 / (WSSA Group 28) Callisto Post emergence at 3.0 fl. oz/A Plus Adjuvant*	O / (4)	O / (4)	O / (4)	C2 / (7)	E / (14)	B / 2)	C2 / (7)	C1 / (5)	K3 / (15)	F1 / (12)	C1 / (5)	K1 / (3)	Count of AIs Controlling species. S, PC, or Resistance not included.
Common Name	Scientific Name	Apply to weeds <5"	2,4-D	Clopyralid	Dicamba	Diuron	Flumioxazin	Halosulfuron	Linuron	Metribuzin	Napropamide	Norflurazon	Terbacil	Trifluralin	
Weeds Controlled With Postemergence Applications															
Amaranth, palmer	*Amaranthus palmeri*	C	C						C						2
Amaranth, Powell	*Amaranthus powellii*	C	C						C						1
Amaranth, spiny	*Amaranthus spinosus*	C	C		C			C	C						4
Atriplex	*Chenopodium orach*	C													0
Broadleaf signalgrass	*Brachiaria platyphylla*	C[1]											C		1
Buckwheat, wild	*Polygonum convolvulus*	PC							C						1
Buffalobur	*Solanum rostratum*	C		S	C										1
Burcucumber	*Sicyos angulatus*	PC			C			S							1
Carpetweed	*Mollugo verticillata*	C			C				C						1
Carrot, wild	*Daucus carota*	C													2
Chickweed, common	*Stellaria media*	C			C				C						0
Cocklebur, common	*Xanthium strumarium*	C	C	C	C			C	C				C		3
Crabgrass, large	*Digitaria sanguinalis*	C[1]							C				C		4
Dock, curly	*Rumex crispus*	PC	C												2
Galinsoga	*Galinsoga parviflora*	C		C				C							1
Hemp	*Cannabis sativa*	C													2
Horse nettle	*Solanum carolinense*	C						C							0
Horseweed/Marestail	*Conyza canadensis*	PC		C	C			S					PC		1
Jimsonweed	*Datura stramonium*	C	C	C	C								C		2
Knotweed, prostrate	*Polygonum aviculare*	PC	C		C								C		3
Kochia	*Kochia scoparia*	PC[1]			C								C		3
Lambsquarters, common	*Chenopodium album*	C	C		C			S					C		0
Morningglory, entireleaf; ivyleaf	*Ipomoea hederacea*	PC	C		C				C						3
Morningglory, pitted	*Ipomoea lacunosa*	PC						S	C						3
Mustard, wild	*Brassica kaber*	C	C		C			C	C				C		1
Nightshade, black	*Solanum nigrum*	C		C	C			C					C		5
Nightshade, eastern black	*Solanum ptycanthum*	C		C									C		4
Nightshade, hairy	*Solanum sarrachoides*	C		C									C		1
Nutsedge, yellow	*Cyperus esculentus*	PC											C		2
Pigweed, redroot	*Amaranthus retroflexus*	C	C		C			C	C						0
Pigweed, smooth	*Amaranthus hybridus*	C	C		C			C	C						2
Pigweed, tumble	*Amaranthus albus*	C	C		C				C						3
Pokeweed, common	*Phytolacca americana*	PC						C							1
Potatoes, volunteer	*Solanum spp.*	C													0
Pusley, Florida	*Richardia scabra*	C[1]			C				C				C		3
Ragweed, common	*Ambrosia artemisiifolia*	PC	C	C	C			C	C				C		3
Ragweed, giant	*Ambrosia trifida*	C	C	C	C			C							3
Sesbania, hemp	*Sesbania exaltata*	C			C			C	C						3
Smartweed, ladysthumb	*Polygonum persicaria*	C	C	S				C					C		2
Smartweed, pale	*Polygonum lapathifolium*	C	C										C		2
Smartweed, Pennsylvania	*Polygonum pensylvanicum*	C	C		C			C	C				C		4
Sunflower, common	*Helianthus annuus*	C	C	C	C			C							3
Velvetleaf	*Abutilon theophrasti*	C			C			C	C						3
Waterhemp, common	*Amaranthus rudis*	C			C										1
Waterhemp, tall	*Amaranthus tuberculatus*	C			C										1

*Adjuvant = COC or NIS plus UAN or AMS

[1] Apply before weed exceeds 2 inches in height.



Weeds Controlled With Preemergence Applications of Callisto

Common Name	Scientific Name	Pre at 6.0-7.7 fl. oz/A												
Amaranth, palmer	*Amaranthus palmeri*	C				C		C			S		C	2
Amaranth, Powell	*Amaranthus powellii*	C						C			S			0
Amaranth, spiny	*Amaranthus spinosus*	C					C	C			S		C	3
Broadleaf signalgrass	*Brachiaria platyphylla*	C									C	C	C	3
Buffalobur	*Solanum rostratum*	C												0
Carpetweed	*Mollugo verticillata*	C			C	C		C		C	C		C	5
Chickweed, common	*Stellaria media*	C		C	C			C	C	C	C	C	C	8
Cocklebur, common	*Xanthium strumarium*	PC		PC		C		PC			S			0
Crabgrass, large	*Digitaria sanguinalis*	C		C	C			C	C	C	C	C	C	8
Galinsoga	*Galinsoga parviflora*	C				C		C						2
Jimsonweed	*Datura stramonium*	C			C	C			C			C		2
Kochia	*Kochia scoparia*	PC			C	C		C			S		C	2
Lambsquarters, common	*Chenopodium album*	C		C	C	C		C	C	C	S	C	C	5
Morningglory, entireleaf; ivyleaf	*Ipomoea hederacea*	PC		C	C			PC			S			2
Morningglory, pitted	*Ipomoea lacunosa*	PC		C				PC			S			1
Nightshade, eastern black	*Solanum ptycanthum*	C			C			PC				C		1
Nightshade, hairy	*Solanum sarrachoides*	C			C	C		C	C	C	S	C	C	3
Pigweed, redroot	*Amaranthus retroflexus*	C		C	C	C		C			S			2
Pigweed, smooth	*Amaranthus hybridus*	C			C	C		C			S			2
Pigweed, tumble	*Amaranthus albus*	C			C			C			S			2
Ragweed, common	*Ambrosia artemisiifolia*	C		C	C	C		C	C	C	S	C		4
Ragweed, giant	*Ambrosia trifida*	PC		C										1
Smartweed, ladysthumb	*Polygonum persicaria*	C		C								C		1
Smartweed, pale	*Polygonum lapathifolium*	C		C		C	C	C			S	C		3
Smartweed, Pennsylvania	*Polygonum pensylvanicum*	C		C		C								0
Sunflower, common	*Helianthus annuus*	C		C		C		PC	C		C			3
Velvetleaf	*Abutilon theophrasti*	C			C			PC			S			0
Waterhemp, common	*Amaranthus rudis*	C			C	C		PC			S			0
Waterhemp, tall	*Amaranthus tuberculatus*	C			C	C		PC						0
Count of Species Controlled in Asparagus		58	19	10	25	11	14	15	29	2	6	5	14	8
Criterion 1: Insufficient Efficacious Alternative to Mesotrione			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Species not controlled by any alternative.

Resistant biotypes per chemical class that controlled or partially controlled by mesotrione. A "C" within a pink shaded cell indicated that weed has resistant biotypes and is therefore not counted as controlled by that product.

C = Control PC = Partial Control S = Suppression

Table 2: FIFRA Exclusive Use Extension Criterion II: Alternative Registered Pesticides Pose Greater Risks To The Environment Or Human Health Than Mesotrione on Asparagus

Characteristic	Mesotrione Reduced Risk AI	2,4-D	Clopyralid	Dicamba	Diuron	Flumioxazin	Halosulfuron	Linuron	Metribuzin	Napropamide	Norflurazon	Terbacil	Trifluralin
EPA Reg. No.	100-1131	1381-103	34704-885	66330-276	19713-36	59639-99	10163-254	352-686	264-735	70506-36	100-849	352-317	62719-250
Reduced Risk by EPA	Yes	No	No	No	No	No	No	No	No	No	No	No	No
Label Signal Word	Caution	Caution/Danger	Caution	Danger	Warning	Caution	Caution	Caution	Caution	Danger	Warning	Caution	Warning
Gene Toxicity	Negative	Negative	Negative	Positive	Positive	Positive	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Teratogenicity	Negative	Negative	Negative	Negative	Negative	Positive	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Reproductive Toxicity	Negative	Negative	Negative	Negative	Negative	Positive	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Carcinogenic Potential	Not Likely	D	Not Likely	D	Known / Likely	Not Likely	Not Likely	C	D	E	C	E	C
Acute Neurotoxicity	Negative	Positive	ND	Positive	ND	ND	Negative	ND	Negative	ND	Negative	ND	ND
Subchronic/Chronic Neurotoxicity	Negative	Positive	ND	Positive	ND	ND	Negative	ND	Positive	ND	ND	Positive	ND
REI in Hours*	12	48	12	24	12	12	12	24	12	12	12	12	12
PHI in Days*	NL	NL	2	1	NL	14	NL	NL	14	NL	NL	5	NL
**PPE*	Chem resist gloves	3	2	2	1	1	1	2	1	1	1	1	2
Applic. Method (Pre)	Yes	No	No	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Pre lbs ai./A	0.188-0.24	NL	NL	NL	0.8-3.2	0.188	NL	1.0-2.0	1.0-2.0	4.0	1.97-3.93	0.4-1.6	1.0-2.0
Applic. Method (Post)	After harvest	Yes	Yes	Yes	No	Post Dormant	Post, AH	Yes	Yes	No	No	No	No
Post lbs ai./A	0.094	1.42-1.9	0.19-0.25	0.25-0.5	NL	0.188	0.023-0.07	1.0-2.0	1.0-1.5	NL	NL	NL	NL
No. Applic. / year	2	2	2	1	2	1	2	3	2	1	1	2	2
Max. AI lbs./yr	0.24	NL	0.25	0.5	3.2	0.188	0.094	2.0	2.0	4.0	3.93	2.0	2.0
US or Regional label	US	US	US	RL	US	US	US	US	US	US	US	US	US
**Environmental Hazard	Surface Water Advisory, runoff	3	1	1	0	1	1	1	2	0	1	1	2
Criterion II: Alternative Poses Greater Human or Environmental Risk		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Other registered active ingredients that are not considered as viable mesotrione alternatives: Clethodim, Fluazifop-P-butyl, Sethoxydim, Diquat, Glyphosate, Paraquat, Pelargonic Acid, Pendimethalin, and *S*-metolachlor. Refer to Attachment "Active Ingredients Within The Analyses Across Crops That Are Not Considered Viable Alternatives To Mesotrione".

* REI = Restricted Entry Interval. PHI = Pre Harvest Interval. PPE = Personal Protective Equipment

** = Ranking into 4 Classes: 0 = Better than mesotrione, 1 = similar to mesotrione, 2 = worse than mesotrione, 3 much worse than mesotione.

NL = None listed or not mentioned, or the application method is not labeled for a specific active ingredient.

Table 3: FIFRA Exclusive Use Extension Criterion III: Mesotrione Plays Or Will Play A Significant Part In Managing Pest Resistance on Asparagus

Characteristic	Mesotrione Reduced Risk AI	2,4-D	Clopyralid	Dicamba	Diuron	Flumioxazin	Halosulfuron	Linuron	Metribuzin	Napropamide	Norflurazon	Terbcil	Trifluralin
EPA. Reg. No.	100-1131	1381-103	34704-885	66330-276	19713-36	59639-99	10163-254	352-686	264-735	70506-36	100-849	352-317	62719-250
HRAC / WSSA Classification of Active Ingredient Chemistry Class by Mode of Action	F 2 / (28)*	O / (4)	O / (4)	O / (4)	C 2 (7)	E / (14)	B / (2)	C 2 / (7)	C 1 / (5)	K 3 / (15)	F 1 / (12)	C1 / (5)	K 1 / (3)
Total No. Weed Species With Resistant Biotypes Per Chemistry Class in US	0	8	8	8	7	2	38	7	23	1	1	23	6
No. of biotypes Controlled or Partially Controlled by Mesotrione		2	2	2	3	2	14	3	14	0	0	14	1
Criterion III: Mesotrione will play role in managing Pest Resistance to this Active		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Criterion III: Mesotrione will play a role in managing pest resistance in Asparagus	YES												

* Active Ingredient grouping based on HRAC / WSSA. Mesotrione is WSSA 28 compared to the original classification of 27 used by EPA and currently on Syngenta's EPA labels.

Asparagus Table 4: Mesotrione Meets FIFRA Section 3(c)(1)(F)(ii) Criteria I, II, and III.				
Active Ingredient	EPA Classified As Reduced Risk	Criterion I: Insufficient Efficacious Alternative To Mesotrione	Criterion II: Alternative Poses Greater Human Or Environmental Risk*	Criterion III: Mesotrione Will Play Role In Managing Pest Resistance To This Active
Mesotrione	Yes			
2, 4 - D	No	Yes	Yes	Yes
Clopyralid	No	Yes	Yes	Yes
Dicamba	No	Yes	Yes	Yes
Diuron	No	Yes	Yes	Yes
Flumioxazin	No	Yes	Yes	Yes
Halosulfuron	No	Yes	Yes	Yes
Linuron	No	Yes	Yes	Yes
Metribuzin	No	Yes	Yes	Yes
Napropamide	No	Yes	Yes	No
Norflurazon	No	Yes	Yes	No
Terbacil	No	Yes	Yes	Yes
Trifluralin	No	Yes	Yes	Yes
*Combined evaluation of human safety, application rate, and environmental impact.				

Blueberries

US blueberry production is estimated to be 69,126 acres in the 2002 National Pesticide Use Database, qualifying it as a minor crop. Mesotrione was registered on blueberries on January 9, 2008, which is within the first 7 years after the initial June 4, 2001 registration of mesotrione. On May 20, 2008 EPA granted mesotrione Reduced Risk status on blueberries.

Conclusion:
Mesotrione fulfils FIFRA Criteria I, II, and/or III compared to each registered alternative.

Criterion I: Mesotrione provides low rate (0.188 lbs. ai/A) postemergence and residual preemergence control of a large number of broadleaf weeds. Of the ten potential alternatives, none provide as broad a spectrum of weed control. As to the weeds included on mesotrione's label, some are not controlled by any other product; most are controlled by only 1 to 3 other products, and only a few by multiple products. No one product provides a broad spectrum of weed control comparable to mesotrione.

Criterion II: Mesotrione is safer across the human safety, environmental impact and application criteria than any other alternative. As noted, some alternatives, diuron, napropamide, oryzalin, or pronamide are better than mesotrione in one or more, but not all, characteristics.

Criterion III: No weeds have developed resistant biotypes to the mesotrione family of chemistry. Thus, mesotrione will manage resistance that has developed for most of the alternative families of chemistry. The exceptions are the families for dichlobenil, which has no resistant biotypes, and napropamide and norflurazon, whose resistant biotypes are not controlled by mesotrione.

Blueberries: Mesotrione Meets FIFRA Section 3(c)(1)(F)(ii) Criteria I, II, and III.

Active Ingredient	EPA Classified As Reduced Risk	Criterion I: Insufficient Efficacious Alternative To Mesotrione	Criterion II: Alternative Poses Greater Human Or Environmental Risk*	Criterion III: Mesotrione Will Play Role In Managing Pest Resistance To This Active
Mesotrione	Yes			
2, 4 - D	No	Yes	Yes	Yes
Dichlobenil	No	Yes	Yes	No
Diuron	No	Yes	Yes	Yes
Hexazinone	No	Yes	Yes	Yes
Napropamide	No	Yes	Yes	No
Norflurazon	No	Yes	Yes	No
Oryzalin	No	Yes	Yes	Yes
Pronamide	No	Yes	Yes	Yes
Simazine	No	Yes	Yes	Yes
Terbacil	No	Yes	Yes	Yes

*Combined evaluation of human safety, application rate, and environmental impact.

Table 1: FIFRA Exclusive Use Extension Criterion 1: There Are Insufficient Efficacious Alternatives To Mesotrione On Blueberries

Blueberry (High bush). Low bush only in non-bearing year.		Mesotrione HRAC Group F2 / (WSSA Group 28) Callisto Postemergence Directed at 6.0 fl. oz/A Plus Adjuvant*	O / (4) 2,4-D	L / (20) Dichlobenil	C2 / (7) Diuron	C1 / (5) Hexazinone	K3 / (15) Napropamide	F1 / (12) Norflurazon	K1 / (3) Oryzalin	K1 / (3) Pronamide	C1 / (5) Simazine	C1 / (5) Terbacil	Count of AIs controlling spp. S, PC, Est., or Resitance not included
Common Name	**Scientific Name**	**Apply to weeds <5"**											
Weeds Controlled With Postemergence Applications													
Amaranth, palmer	*Amaranthus palmeri*	C	Est										0
Amaranth, Powell	*Amaranthus powellii*	C	Est										0
Amaranth, spiny	*Amaranthus spinosus*	C	Est										0
Atriplex	*Chenopodium orach*	C											0
Broadleaf signalgrass	*Brachiaria platphylla*	C[1]											0
Buckwheat, wild	*Polygonum convolvulus*	PC				C							1
Buffalobur	*Solanum rostratium*	C											0
Burcucumber	*Sicyos angulatus*	PC											0
Carpetweed	*Mollugo verticillata*	C	C										1
Carrot, wild	*Daucus carota*	C											0
Chickweed, common	*Stellaria media*	C				C							1
Cocklebur, common	*Xanthium strumarium*	C	C										1
Crabgrass, large	*Digitaria sanguinalis*	C[1]											0
Dock, curly	*Rumex crispus*	PC	C										1
Galinsoga	*Galinsoga parviflora*	C	C										1
Hemp	*Cannabis sativa*	C	C										1
Horse nettle	*Solanum carolinense*	C											0
Horseweed/ Marestail	*Conyza canadensis*	PC											0
Jimsonweed	*Datura stramonium*	C	C										1
Knotweed, prostrate	*Polygonum aviculare*	PC											0
Kochia	*Kochia scoparia*	PC[1]				C							0
Lambsquarters, common	*Chenopodium album*	C	C			C							1
Morningglory, entireleaf; ivy	*Ipomoea hederacea*	PC	Est										0
Morningglory, pitted	*Ipomoea lacunosa*	PC	Est										0
Mustard, wild	*Brassica kaber*	C	C			C							2
Nightshade, black	*Solanum nigrum*	C											0
Nightshade, eastern black	*Solanum ptycanthum*	C											0
Nightshade, hairy	*Solanum sarrachoides*	C											0
Nutsedge, yellow	*Cyperus esculentus*	PC											0
Pigweed, redroot	*Amaranthus retroflexus*	C	C			C							1
Pigweed, smooth	*Amaranthus hybridus*	C	Est										0
Pigweed, tumble	*Amaranthus albus*	C	Est										0
Pokeweed, common	*Phytolacca americana*	PC											0
Potatoes, volunteer	*Solanum spp.*	C											0
Pusley, Florida	*Richardia scabra*	C[1]											0
Ragweed, common	*Ambrosia artemisiifolia*	PC	C										1
Ragweed, giant	*Ambrosia trifida*	C	Est										0
Sesbania, hemp	*Sesbania exaltata*	C											0
Smartweed, ladysthumb	*Polygonum persicaria*	C	C										1
Smartweed, pale	*Polygonum lapathifolium*	C	Est										0
Smartweed, Pennsylvania	*Polygonum pensylvanicum*	C	C										1
Sunflower, common	*Helianthus annuus*	C	C										1
Velvetleaf	*Abutilon theophrasti*	C	C										1
Waterhemp, common	*Amaranthus rudis*	C	Est										0
Waterhemp, tall	*Amaranthus tuberculatus*	C	Est										0

*Adjuvant = COC

[1] Apply before weed exceeds 2 inches in height.

Weeds Controlled With Preemergence Applications of Callisto														
Common Name	Scientific Name	6.0 fl. oz./A When Used Alone												
Amaranth, palmer	*Amaranthus palmeri*	C			Est			S			Est			0
Amaranth, Powell	*Amaranthus powellii*	C			Est			S			Est			0
Amaranth, spiny	*Amaranthus spinosus*	C			Est			S	C		Est			1
Broadleaf signalgrass	*Brachiaria platyphylla*	C[1]									C	C		2
Buffalobur	*Solanum rostratum*	C												0
Carpetweed	*Mollugo verticillata*	C	C			C	C	C	C	C				6
Chickweed, common	*Stellaria media*	C		C	C	C	C	C	C	C	C	C		8
Cocklebur, common	*Xanthium strumarium*	PC		PC			S							0
Crabgrass, large	*Digitaria sanguinalis*	C[1]	C	C		C	C	C	C	C	C	C		8
Galinsoga	*Galinsoga parviflora*	C												0
Jimsonweed	*Datura stramonium*	C			C		S					C		0
Kochia	*Kochia scoparia*	PC	C	C	C	C	S	C	C		C	C		5
Lambsquarters, common	*Chenopodium album*	C		C			S	PC	annual		Est			2
Morningglory, entireleaf; ivy	*Ipomoea spp.*	PC		Est.			S	PC			Est			0
Morningglory, pitted	*Ipomoea lacunosa*	PC								C	Est	C		1
Nightshade, eastern black	*Solanum ptycanthum*	C	C	C	C	C	S	C			Est			3
Nightshade, hairy	*Solanum sarrachoides*	C		Est			S	C			Est			0
Pigweed, redroot	*Amaranthus retroflexus*	C		Est			S	C			Est			1
Pigweed, smooth	*Amaranthus hybridus*	C	C	C			S	PC			C	C		2
Pigweed, tumble	*Amaranthus albus*	C		Est			PC				Est			0
Ragweed, common	*Ambrosia artemisiifolia*	C		Est			PC				Est	C		1
Ragweed, giant	*Ambrosia trifida*	PC	C	C			S	PC			C	C		2
Smartweed, ladysthumb	*Polygonum persicaria*	C		Est				PC			Est			0
Smartweed, pale	*Polygonum lapathifolium*	C	C	Est				PC			Est	C		1
Smartweed, Pennsylvania	*Polygonum pensylvanicum*	C	C	Est				PC	C		Est	C		3
Sunflower, common	*Helianthus annuus*	C	C	C			S	PC			C	C		2
Velvetleaf	*Abutilon theophrasti*	C		C			C	PC						0
Waterhemp, common	*Amaranthus rudis*	C		Est			S				Est			2
Waterhemp, tall	*Amaranthus tuberculatus*	C		Est			S				Est			0
Count of Species Controlled in Blueberries		58	14	8	7	4	5	4	7	7	4	4		0
Criteria 1: Insufficient Efficacious Alternative to Mesotione			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Species not controlled by any alternative	Resistant biotypes per chemical class that controlled or partially controlled by mesotrione. A "C" within a pink shaded cell indicated that weed has resistant biotypes and is therefore not counted as controlled by that product.													
C = Control PC = Partial Control S = Suppression Est = Estimated to be controlled.														

Table 2: FIFRA Exclusive Use Extension Criterion II: Alternative Registered Pesticides Pose Greater Risks To The Environment Or Human Health Than Mesotrione On Blueberries

Characteristic	Mesotrione Reduced Risk AI	2,4-D	Dichlobenil	Diuron	Hexazinone	Napropamide	Norflurazon	Oryzalin	Pronamide	Simazine	Terbacil
EPA Reg. No.	100-1131	19713-345	400-168	19713-36	352-392	70506-34	100-849	70506-43	62719-397	100-526	352-317
Reduced Risk by EPA	Yes	No	No	No	No	No	No	No	No	No	No
Label Signal Word	Caution	Caution	Caution	Warning	Danger	Danger	Warning	Caution	Caution	Caution	Caution
Gene Toxicity	Negative	Negative	Negative	Positive	Negative	Negative	Negative	Positive	Negative	Negative	Negative
Teratogenicity	Negative	Negative	Positive	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Reproductive Toxicity	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Carcinogenic Potential	Not Likely	D	Caution	Known / likely	D	E	C	Likely	B2	Not likely	E
Acute Neurotoxicity	Negative	Positive	ND	ND	ND	ND	Negative	ND	ND	ND	ND
Subchronic/Chronic Neurotoxicity	Negative	Positive	ND	ND	ND	ND	ND	ND	ND	ND	Positive
REI in Hours*	12	12	12	12	24	12	12	24	24	12	12
PHI in Days*	NL	730	NL	NL	90 / 450	NL	60	NL	NL	NL	NL
**PPE*	Chem resist gloves	3	2	1	2	1	0	2	3	1	0
Applic. Method (Pre)	Pre	NL	Fall Pre	Pre	Pre	Pre	Pre	Pre	Pre	Pre	Pre
Pre lbs ai./A	0.094-0.188	NL	6.0	3.2	2.0 - 3.0	4.0	3.93	6.0	2.0	2.0-4.0	1.6-2.4
Applic. Method (Post)	Post Direct.	Post	NL	NL	NL	NL	NL	NL	NL	NL	NL
Post lbs ai./A	0.094-0.188	0.50%	NL	NL	NL	NL	NL	NL	NL	NL	NL
No. Applic. / year	2	1	1	2	1	1	1	2	1	2	1
Max. AI lbs./yr	0.188	1.0	6.0	3.2	3.0	4.0	3.93	12.0	2.0	4.0	2.4
US or Regional label	US	RL	US	RL	US	US	US	US	RL	US	US
**Environmental Hazard	Surface Water Advisory, runoff	3	1	0	2	0	2	0	0	1	1
Criterion II: Alternative Poses Greater Human or Environmental Risk		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Other registered active ingredients that are not considered as viable mesotrione alternatives: carfentrazone, clethodim, diquat, fluazifop, glufosinate, glyphosate, isoxben, metam-sodium, paraquat, pelargonic acid, sethoxydim, triclopyr, and trifluralin. Refer to Attachment "Active Ingredients Within The Analyses Across Crops That Are Not Considered viable Alternatives to Mesotrione."

* REI = Restricted Entry Interval. PHI = Pre Harvest Interval. PPE = Personal Protective Equipment

** = Ranking into 4 Classes: 0 = Better than mesotrione, 1 = similar to mesotrione, 2 = worse than mesotrione, 3 much worse than mesotione.

NL = None listed or not mentioned, or application method is not labeled for a specific active ingredient.

Table 3: FIFRA Exclusive Use Extension Criterion III: Mesotrione Plays Or Will Play A Significant Part In Managing Pest Resistance on Blueberries

Characteristic	Mesotrione Reduced Risk AI	2,4-D	Dichlobenil	Diuron	Hexazinone	Napropamide	Norflurazon	Oryzalin	Pronamide	Simazine	Terbcil
EPA. Reg. No.	100-1131	1381-103	400-168	19713-36	352-392	70506-34	100-849	70506-43	62719-397	100-526	352-317
HRAC / WSSA Classification of Active Ingredient Chemistry Class by Mode of Action	F 2 / (28)*	O / (40	L / (20)	C 2 / (7)	C1 / (5)	K 3 / (1)5	F 1 / (12)	K1 / (3)	K1 / (3)	C1 / (5)	C1 / (5)
Total No. Weed Species With Resistant Biotypes Per Chemistry Class in US	0	8	0	7	23	1	1	6	6	23	23
No. of biotypes Controlled or Partially Controlled by Mesotrione		2	0	3	14	0	0	1	1	14	14
Criterion III: Mesotrione will play role in managing Pest Resistance to this Active		Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Criterion III: Mesotrione will play a role in managing pest resistance in Blueberries	YES										

* Active Ingredient grouping based on HRAC / WSSA. Mesotrione is WSSA 28 compared to the original classification of 27 used by EPA and currently on Syngenta's EPA labels.

Blueberries Table 4: Mesotrione Meets FIFRA Section 3(c)(1)(F)(ii) Criteria I, II, and III.				
Active Ingredient	EPA Classified As Reduced Risk	Criterion I: Insufficient Efficacious Alternative To Mesotrione	Criterion II: Alternative Poses Greater Human Or Environmental Risk*	Criterion III: Mesotrione Will Play Role In Managing Pest Resistance To This Active
Mesotrione	Yes			
2, 4 - D	No	Yes	Yes	Yes
Dichlobenil	No	Yes	Yes	No
Diuron	No	Yes	Yes	Yes
Hexazinone	No	Yes	Yes	Yes
Napropamide	No	Yes	Yes	No
Norflurazon	No	Yes	Yes	No
Oryzalin	No	Yes	Yes	Yes
Pronamide	No	Yes	Yes	Yes
Simazine	No	Yes	Yes	Yes
Terbacil	No	Yes	Yes	Yes
*Combined evaluation of human safety, application rate, and environmental impact.				

Cranberries

US cranberry production is estimated to be 40,265 acres in the 2002 National Pesticide Use Database, qualifying it as a minor crop. Mesotrione was registered on cranberry on January 9, 2008, which is within the first 7 years after the initial June 4, 2001 registration of mesotrione. Prior to the Section 3 label, Callisto had Section 18 labels in MA, OR, and WA one or more years since 9/30/2004. On May 20, 2008 EPA granted mesotrione Reduced Risk status on cranberry.

Conclusion:
Mesotrione fulfils FIFRA Criteria I, II, and/or III compared to each registered alternative.

Criterion I: Mesotrione provides low rate (0.25 lbs.ai/A) preemergence and postemergence control of a large number of broadleaf weeds, and the specific cranberry weeds like rushes, sedges, yellow loosestrife, silverleaf, and St. John's wort. Of the six potential alternatives, none provide as broad a spectrum of weed control. As to the weeds included on mesotrione's label, most are not controlled by any other product; and a few are controlled by only 1 to 3 other products. No one product provides a broad spectrum of weed control comparable to mesotrione.

Criterion II: Mesotrione is safer across the human safety, environmental impact and application criteria than any other alternative. As noted, some alternatives, such as napropamide are better than mesotrione in one or more, but not all, characteristics.

Criterion III: No weeds have developed resistant biotypes to the mesotrione family of chemistry. Thus, mesotrione will manage resistance that has developed for many of the alternative families of chemistry. The exceptions are dichlobenil, napropamide, and norflurazon whose resistant biotypes are not controlled by mesotrione.

Cranberries: Mesotrione Meets FIFRA Section 3(c)(1)(F)(ii) Criteria I, II, and III.

Active Ingredient	EPA Classified As Reduced Risk	Criterion I: Insufficient Efficacious Alternative To Mesotrione	Criterion II: Alternative Poses Greater Human Or Environmental Risk*	Criterion III: Mesotrione Will Play Role In Managing Pest Resistance To This Active
Mesotrione	Yes			
2, 4 - D	No	Yes	Yes	Yes
Clopyralid	No	Yes	Yes	Yes
Dichlobenil	No	Yes	Yes	No
Napropamide	No	Yes	Yes	No
Norflurazon	No	Yes	Yes	No
Simazine	No	Yes	Yes	Yes

*Combined evaluation of human safety, application rate, and environmental impact.

Table 1: FIFRA Exclusive Use Extension Criterion 1: There Are Insufficient Efficacious Alternatives To Mesotrione On Cranberry

Cranberry		Mesotrione HRAC Group F2 / (WSSA Group 28)	O / (4)	O / (4)	L / (20)	K 3 / (15)	F 1 / (12)	C 1 / (5)	
		Callisto Post emergence at 8.0 fl. oz/A Plus Adjuvant*	2,4-D	Clopyralid	Dichlobenil	Napropamide	Norflurazon	Simazine	Count of AI Controlling Species. S, PC, Est., or Resistance not included.
Common Name	**Scientific Name**	Apply to weeds <5"							
Weeds Controlled With Postemergence Applications									
Amaranth, palmer	*Amaranthus palmeri*	C							0
Amaranth, Powell	*Amaranthus powellii*	C							0
Amaranth, spiny	*Amaranthus spinosus*	C							0
Atriplex	*Chenopodium orach*	C							0
Broadleaf signalgrass	*Brachiaria platphylla*	C[1]							0
Buckwheat, wild	*Polygonum convolvulus*	PC							0
Buffalobur	*Solanum rostratium*	C							0
Burcucumber	*Sicyos angulatus*	PC							0
Carpetweed	*Mollugo verticillata*	C							0
Carrot, wild	*Daucus carota*	C							0
Chickweed, common	*Stellaria media*	C							0
Cocklebur, common	*Xanthium strumarium*	C							0
Crabgrass, large	*Digitaria sanguinalis*	C[1]							0
Dock, curly	*Rumex crispus*	PC							0
Galinsoga	*Galinsoga parviflora*	C							0
Hemp	*Cannabis sativa*	C							0
Horse nettle	*Solanum carolinense*	C							0
Horseweed/Marestail	*Conyza canadensis*	PC							0
Jimsonweed	*Datura stramonium*	C							0
Knotweed, prostrate	*Polygonum aviculare*	PC							0
Kochia	*Kochia scoparia*	PC[1]							0
Lambsquarters, common	*Chenopodium album*	C							0
Morningglory, entireleaf; ivyleaf	*Ipomoea hederacea*	PC							0
Morningglory, pitted	*Ipomoea lacunosa*	PC							0
Mustard, wild	*Brassica kaber*	C							0
Nightshade, black	*Solanum nigrum*	C							0
Nightshade, eastern black	*Solanum ptycanthum*	C							0
Nightshade, hairy	*Solanum sarrachoides*	C							0
Nutsedge, yellow	*Cyperus esculentus*	PC							0
Pigweed, redroot	*Amaranthus retroflexus*	C							0
Pigweed, smooth	*Amaranthus hybridus*	C							0
Pigweed, tumble	*Amaranthus albus*	C							0
Pokeweed, common	*Phytolacca americana*	PC							0
Potatoes, volunteer	*Solanum spp.*	C							0
Pusley, Florida	*Richardia scabra*	C[1]							0
Ragweed, common	*Ambrosia artemisiifolia*	PC	C	C					2
Ragweed, giant	*Ambrosia trifida*	C	Est	Est					0
Sesbania, hemp	*Sesbania exaltata*	C							0
Smartweed, ladysthumb	*Polygonum persicaria*	C							0
Smartweed, pale	*Polygonum lapathifolium*	C							0
Smartweed, Pennsylvania	*Polygonum pensylvanicum*	C							0
Sunflower, common	*Helianthus annuus*	C							0
Velvetleaf	*Abutilon theophrasti*	C							0
Waterhemp, common	*Amaranthus rudis*	C							0
Waterhemp, tall	*Amaranthus tuberculatus*	C							0
St. John's wort	*Hypericum boreala*	C			C				1
Rushes	*Juncus spp.*	C					Est		0
Sedges	*Carex spp.*	C							0
Yellow loosestrife	*Lysimachia terrestris*	C	Est						0
Silverleaf	*Potentilla pacifica*	C							0

[1] Apply before weed exceeds 2 inches in height.

*Adjuvant = COC

Weeds Controlled With Preemergence Applications of Callisto			2,4-D	Clopyralid	Dichlobenil	Napropamide	Norflurazon	Simazine	Count of AI Controlling Species. S, PC, Est., or		
Common Name	**Scientific Name**	**8.0 fl. oz./A**									
Amaranth, palmer	*Amaranthus palmeri*	C						Est	0		
Amarath, Powell	*Amaranthus powellii*	C						Est	0		
Amaranth, spiny	*Amaranthus spinosus*	C						Est	0		
Broadleaf signalgrass	*Brachiaria platyphylla*	C[1]						C	1		
Buffalobur	*Solanum rostratum*	C							0		
Carpetweed	*Mollugo verticillata*	C			C	C		C	3		
Chickweed, common	*Stellaria media*	C			C	C		C	3		
Cocklebur, common	*Xanthium strumarium*	PC							0		
Crabgrass, large	*Digitaria sanguinalis*	C[1]			C	C		C	3		
Galinsoga	*Galinsoga parviflora*	C							0		
Jimsonweed	*Datura stramonium*	C							0		
Kochia	*Kochia scoparia*	PC							0		
Lambsquarters, common	*Chenopodium album*	C			C	C		C	2		
Morningglory, entireleaf; ivy	*Ipomoea hederacea*	PC						Est	0		
Morningglory, pitted	*Ipomoea lacunosa*	PC						Est	0		
Nightshade, eastern black	*Solanum ptycanthum*	C						Est	0		
Nightshade, hairy	*Solanum sarrachoides*	C						Est	0		
Pigweed, redroot	*Amaranthus retroflexus*	C			C	C		Est	2		
Pigweed, smooth	*Amaranthus hybridus*	C						Est	0		
Pigweed, tumble	*Amaranthus albus*	C						Est	0		
Ragweed, common	*Ambrosia artemisiifolia*	C		C	C	PC		C	2		
Ragweed, giant	*Ambrosia trifida*	PC		Est	Est			Est	0		
Smartweed, ladysthumb	*Polygonum persicaria*	C						Est	0		
Smartweed, pale	*Polygonum lapathifolium*	C						Est	0		
Smartweed, Pennsylvania	*Polygonum pensylvanicum*	C			C			C	1		
Sunflower, common	*Helianthus annuus*	C							0		
Velvetleaf	*Abutilon theophrasti*	C							0		
Waterhemp, common	*Amaranthus rudis*	C						Est	0		
Waterhemp, tall	*Amaranthus tuberculatus*	C						Est	0		
Count of Spp. Combined		63	1	2	8	5	0	4			
Criteria 1: Insufficient Efficacious Alternative to Mesotrione			Yes	Yes	Yes	Yes	Yes	Yes			
	Resistant biotypes per chemical class that controlled or partially controlled by mesotrione. A "C" within a pink shaded cell indicates that weed has resistant biotypes and is therefore not counted as controlled by that product.										

Table 2: FIFRA Exclusive Use Extension Criterion II: Alternative Registered Pesticides Pose Greater Risks To The Environment Or Human Health Than Mesotrione On Cranberry

Characteristic	Mesotrione Reduced Risk AI	2,4-D	Clopyralid	Dichlobenil	Napropamide	Norflurazon	Simazine
	100-1131	71368-1	62719-73	400-168	70506-36	5481-506	100-526
Reduced Risk by EPA	Yes	No	No	No	No	No	No
Label Signal Word	Caution	Danger	Caution	Caution	Caution	Caution	Caution
Gene Toxicity	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Teratogenicity	Negative	Negative	Negative	Positive	Negative	Negative	Negative
Reproductive Toxicity	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Carcinogenic Potential	Not Likely	D	Not Likely	C	E	C	Not likely
Acute Neurotoxicity	Negative	Positive	ND	ND	ND	Negative	ND
Subchronic/Chronic Neurotoxicity	Negative	Positive	ND	ND	ND	ND	ND
REI in Hours*	12	48	12	12	12	12	12
PHI in Days*	After bud break	NL	50	NL	NL	NL	NL
**PPE*	Chem resist gloves	3	2	2	1	0	1
Applic. Method (Pre)	Pre	NL	NL	Pre	Pre	Pre	Pre
Pre lbs ai./A	0.25	NL	NL	4.0	4.0-15.0	4.0-8.0	2.0-4.0
Applic. Method (Post)	Post	Wipe	Yes	NL	NL	NL	NL
Post lbs ai./A	0.25	33%	0.063-0.188	NL	NL	NL	NL
No. Applic. / year	2	1	2	2	1	1	2
Max. AI lbs./yr	0.5	Not specified	0.375	4.0	15.0	8.0	4.0
US or Regional label	US	RL - MA	RL - WI	US	US	US	US
**Environmental Hazard	Surface Water Advisory, runoff	3	2	1	0	2	1
Criterion II: Alterntive Poses Greater Human or Environmental Risk		Yes	Yes	Yes	Yes	Yes	Yes

oxadiazon, pelargonic acid, and sethoxydim. Refer to Attachment "Active Ingredients Within The Analyses Across Crops That Are Not Considered Viable Alternatives To Mesotrione".

*REI = Restricted Entry Interval. PHI = Pre Harvest Interval. PPE = Personal Protective Equipment.

** = Ranking into 4 Classes: 0 = Better than Mesorione, 1 = similar to mesotrione, 2 = worse than mesotrione, 3 = much worse than mesotrione.

NL = None listed or not mentioned, or application method is not labeled for a specific active ingredient.

Table 3: FIFRA Exclusive Use Extension Criterion III: Mesotrione Plays Or Will Play A Significant Part In Managing Pest Resistance in Cranberries

Characteristic	Mesotrione Reduced Risk AI	2,4-D	Clopyralid	Dichlobenil	Napropamide	Norflurazon	Simazine
EPA. Reg. No.	100-1131	71368-1	62719-73	400-168	70506-36	5481-506	100-526
HRAC / WSSA Classification of Active Ingredient Chemistry Class by Mode of Action	F 2 / (28)*	O / (4)	O / (4)	L / (20)	K 3 / (15)	F 1 / (12)	C1 / (5)
Total No. Weed Species With Resistant Biotypes Per Chemistry Class in US	0	8	8	0	1	1	23
No. of Biotypes Controlled or Partially Controlled by Mesotrione		2	2	0	0	0	14
Criterion III: Mesotrione will play role in managing Pest Resistance to this Active		Yes	Yes	No	No	No	Yes
Criterion III: Mesotrione will play a role in managing pest resistance in Cranberries	YES						

* Active Ingredient classification based on HRAC / WSSA. Mesotrione is WSSA 28 compared to the original classification of 27 used by EPA and currently on Syngenta's EPA labels.

Cranberries Table 4: Mesotrione Meets FIFRA Section 3(c)(1)(F)(ii) Criteria I, II, and III.				
Active Ingredient	EPA Classified As Reduced Risk	Criterion I: Insufficient Efficacious Alternative To Mesotrione	Criterion II: Alternative Poses Greater Human Or Environmental Risk*	Criterion III: Mesotrione Will Play Role In Managing Pest Resistance To This Active
Mesotrione	Yes			
2, 4 - D	No	Yes	Yes	Yes
Clopyralid	No	Yes	Yes	Yes
Dichlobenil	No	Yes	Yes	No
Napropamide	No	Yes	Yes	No
Norflurazon	No	Yes	Yes	No
Simazine	No	Yes	Yes	Yes
*Combined evaluation of human safety, application rate, and environmental impact.				

Grasses Grown For Seed: Perennial Ryegrass

US perennial ryegrass grown for seed is estimated to be 193,000 acres by Extension Weed Specialist at OR State University, qualifying it as a minor crop. Mesotrione was registered on perennial ryegrass grown for seed on March 17, 2008, which is within the first 7 years after the initial June 4, 2001 registration of mesotrione. On May 20, 2008 EPA granted mesotrione Reduced Risk status on perennial ryegrass grown for seed.

Conclusion:
Mesotrione fulfils FIFRA Criteria I, II, and/or III compared to each registered alternative.

Criterion I: Mesotrione provides low rate (0.188 lbs.ai/A) preemergence or (0.094 – 0.188 lbs.ai/A) postemergence control of a large number of broadleaf weeds and select grasses. Of the seven potential alternatives, none provide as broad a spectrum of weed control. As to the weeds included on mesotrione's label, some are not controlled by any other product; most are controlled by only 1 to 3 other products, and only a few by multiple products. No one product provides a broad spectrum of weed control comparable to mesotrione.

Criterion II: Mesotrione is safer across the human safety, environmental impact and application criteria than any other alternative.

Criterion III: No weeds have developed resistant biotypes to the mesotrione family of chemistry. Thus, mesotrione will manage resistance that has developed for most of the alternative families of chemistry. The exceptions are bromoxynil and ethofumesate, whose resistant biotypes are not controlled by mesotrione.

Perennial Ryegrass Grown For Seed: Mesotrione Meets FIFRA Section 3(c)(1)(F)(ii) Criteria I, II, and III.

Active Ingredient	EPA Classified As Reduced Risk	Criterion I: Insufficient Efficacious Alternative To Mesotrione	Criterion II: Alternative Poses Greater Human Or Environmental Risk*	Criterion III: Mesotrione Will Play Role In Managing Pest Resistance To This Active
Mesotrione	Yes			
2, 4 - D	No	Yes	Yes	Yes
Bromoxynil	No	Yes	Yes	No
Dicamba	No	Yes	Yes	Yes
Diuron	No	Yes	Yes	Yes
Ethofumesate	No	Yes	Yes	No
Metribuzin	No	Yes	Yes	Yes
Oxyfluorfen	No	Yes	Yes	Yes

*Combined evaluation of human safety, application rate, and environmental impact.