



OFFICE OF CHEMICAL SAFETY AND POLLUTION PREVENTION

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MEMORANDUM

SUBJECT: Review of Extension of Exclusive Use Petition for Bicyclopyrone

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SUMMARY

Syngenta Crop Protection (2023) has petitioned the Environmental Protection Agency (EPA), under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Section 3(c)(1)(F)(ii), to extend the exclusive use period for data supporting the registration of bicyclopyrone for up to three years. Syngenta claims bicyclopyrone fills a void in current management programs and/or plays or will play a part in resistance management and integrated pest management programs, criteria I, III, and IV as defined under FIFRA 3(c)(1)(F)(ii) in 16 use sites.

All 16 use sites claimed by Syngenta meet the criterion for minor use designation, i.e., less than 300,000 acres bearing or harvested. Fourteen use sites are supported by residue trial data. For plantain and garlic, residue tolerances are based on data from banana and dry bulb onion, respectively, and no separate residue was submitted for these uses. Therefore, the registrant may claim either banana or plantain, and claim either dry bulb onion or garlic.

BEAD finds the registrant has provided sufficient evidence that nine minor use sites satisfy the criteria necessary for a three-year extension of exclusive use for bicyclopyrone under FIFRA Section 3(c)(1)(F)(ii). BEAD found that for the minor uses wormwood, lemongrass, rosemary, banana, horseradish, broccoli, and green onion, there are insufficient registered alternative herbicides for the claimed target pests in those crops. BEAD finds that for watermelon and sweet potato, bicyclopyrone plays or will play a role in resistance management of glyphosate-resistant pigweeds. Because BEAD finds that a sufficient number of use sites meet criteria I and III to qualify for a three-year extension, BEAD did not assess the remaining use sites and did not assess registrant claims for any sites under criterion IV.

BACKGROUND

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) provides certain data protection rights to data submitters for their registered pesticides. Section 3(c)(1)(F)(i) states that the original data submitter has a 10-year exclusive use period from the date of registration for the data submitted in support of the original registration. The period of exclusive use may be extended one year for each three minor uses registered, up to a total of 3 additional years, if within 7 years of the commencement of the exclusive use period the registrant demonstrates that:

- (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;
- (III) the minor use pesticide plays or will play a significant part in managing pest resistance; or
- (IV) the minor use pesticide plays or will play a significant part in an integrated pest management program.

A minor use is defined in FIFRA Section 2(II) as the use of a pesticide on an animal, on a commercial agricultural crop or site, or the protection of public health where “(1) the total U.S. acreage for the crop is less than 300,000 acres, as determined by the Secretary of Agriculture, or (2) the use does not provide sufficient economic incentive to support the initial registration or continuing registration of a pesticide for such use.”

In the case of crop groupings, FIFRA 3(c)(1)(F)(ii) states that “the registration of a pesticide for a minor use on a crop grouping . . . shall be considered for one minor use for each representative crop for which data are provided.” i.e. the maximum number of eligible distinct minor uses for a crop subgroup is equal to the number of representative crops for which residue data have been submitted. Greenhouse uses are considered separate use sites from field crops in cases where distinct residue data for field-grown crops are submitted to support the registration.

The Biological and Economic Analysis Division (BEAD) evaluates whether up to nine use sites submitted in the registrant’s petition meet the statutory requirement for an extension of data exclusivity by verifying that residue trials were submitted on a one-for-one basis with use sites, verifying minor crop acreage, and validating the claimed criteria.

CHEMICAL CHARACTERISTICS

Bicyclopyrone is an HPPD inhibitor herbicide (WSSA Group 27) used primarily to control broadleaf weeds as well as some annual grass weeds in agricultural crops. Bicyclopyrone is active on emerged weeds and also has residual activity to control weeds before weed emergence. Depending on the individual crop and whether it would be damaged by bicyclopyrone, bicyclopyrone products may be applied before planting/transplanting, before crop emergence, after crop emergence between rows only to avoid contacting a sensitive crop, or after crop emergence over the top in non-sensitive crops. Bicyclopyrone was initially registered on April 24, 2015, and the initial 10-year exclusive use period will end on April 24, 2025. If the registrant qualifies for the maximum 3-year extension, the exclusive use period would end on April 24, 2028.

REGISTRANT SUBMISSION

The registrant claims that bicyclopyrone satisfies the FIFRA Section 3(c)(1)(F)(ii) requirements for the following 16 use sites: wormwood, lemongrass, rosemary, banana, plantain, horseradish, broccoli, hops, strawberry, papaya, watermelon, dry bulb onion, green onion, garlic, timothy grass grown for seed, and sweet potato (Foderaro and Belles, 2023). The registrant claims all uses are individually associated with a residue trial, are grown on less than 300,000 acres, and that there are insufficient registered alternative pesticides and bicyclopyrone plays or will play a part in resistance management and/or an integrated pest management program (criteria I, III, and/or IV) for each of the claimed minor use sites.

REQUIREMENTS TO QUALIFY FOR THE CLAIMED CRITERIA

Requirements for Criterion I, there are insufficient efficacious alternative registered pesticides for the use site. EPA considers Criterion I to be met in situations where the pesticide: 1) fills a void in the current program (e.g., unique timing window); 2) controls a broader spectrum of pests than currently registered alternatives; 3) controls a different life stage for the pest; or 4) provides a crucial timing advantage (e.g., shorter pre-harvest interval or re-entry interval).

Requirements for Criterion II, the alternatives to the minor use pesticide pose greater risks to the environment or human health. BEAD cannot evaluate risk and does not provide the registration division with information related to Criterion II.

Requirements for Criterion III, the minor use pesticide plays or will play a significant part in managing pest resistance. EPA considers Criterion III to be met in situations where there is reliable information that the chemical being evaluated is used either to delay the development of pest resistance to other chemicals with different modes of action or where one or more of the target pests have already developed resistance in the U.S. to alternative chemicals.

Requirements for Criterion IV, the minor use pesticide plays or will play a significant part in an integrated pest management program. EPA considers Criterion IV to be met in situations where there is reliable information that the chemical being evaluated is useful in managing target pests while having low-to-no impact on other aspects of integrated pest management (IPM), such as inclusion of non-chemical pest control strategies (e.g. biological control).

BEAD ANALYSIS

BEAD and the Registration Division (RD) first confirm that residue trial data are sufficient such that there is a one-for-one relationship for each use site, and that bicyclopyrone was registered in all claimed crops within 7 years following the first registration of bicyclopyrone. Then, BEAD confirms that each crop meets the definition of a minor crop per FIFRA Section 2(II)(1), wherein each crop must be grown on less than 300,000 acres in the U.S. by consulting the most recent Census of Agriculture conducted by the United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS). Finally, BEAD evaluates the evidence submitted by the registrant to determine if the claimed criteria are met. If BEAD finds nine qualifying use sites meet at least one claimed criterion, the evaluation is complete, as that is the requirement for the maximum three-year extension of data exclusivity.

Residue Trial Analysis

Of the 16 crops listed in the registrant submission, 14 are supported by residue data (Table 1). Because plantain and garlic residue tolerances are based on data from banana and dry bulb onion, respectively, and no separate residue was submitted for these uses, the registrant may claim either banana or plantain and either dry bulb onion or garlic, provided at least one of the required criteria are met. The registrant may claim up to 14 minor use sites if all use sites are cultivated on less than 300,000 acres and if minor use site criteria are met. For all 16 crops, uses are registered for individual crops rather than crop groups or subgroups, and so the crop group is not applicable even if a crop is part of a crop group. Bicyclopyrone was registered in

wormwood, lemongrass, and rosemary on January 14, 2022, and in the remaining crops on March 17, 2022, which for all crops is within 7 years following the initial registration of bicyclopyrone April 24, 2015.

Table 1. Proposed crops and representative residue data by crop subgroup.

Minor Use Claimed	Crop Group (Subgroup)	Crop Residue Data Submitted for Subgroup (Date; MRID)	Maximum Number of Use Sites Allowed
Wormwood	Not applicable	Wormwood (2/28/2017; 50835906) (7/9/2020; 51154502)	1
Lemongrass	Not applicable	Lemongrass (2/28/2017; 50835905) (9/11/2020; 51154501)	1
Rosemary	Not applicable	Rosemary (2/2/2018; 50835901)	1
Banana	Not applicable	Banana (4/4/2020; 51154304)	1
Plantain	Berry and Small Fruit (13-07G)	Strawberry (2/2/11; 49114802)	1
Horseradish	Not applicable	Horseradish (1/25/2018; 51154301)	1
Broccoli	Not applicable	Broccoli (2/24/2020; 51154308)	1
Hops	Not applicable	Hops (3/26/2020; 51154305) (7/9/2020; 51154601)	1
Strawberry	Not applicable	Strawberry (12/13/2019; 51154311) (7/9/2020; 51154602)	1
Papaya	Not applicable	Papaya (2/28/2020; 51154306)	1
Watermelon	Not applicable	Watermelon (2/24/2020; 51154307)	1
Onion, dry bulb	Not applicable	Onion, dry bulb (6/3/2020; 51154312)	1
Garlic			
Onion, green	Not applicable	Onion, green (5/26/2020; 51154313)	1
Timothy grass grown for seed	Not applicable	Timothy grass (8/30/2018; 51154302)	1
Sweet potato	Not applicable	Sweet Potato (2/5/2018; 51154303)	1

Minor Use Analysis

The Agency relies on the USDA Census of Agriculture for data on crops grown in the United States (EPA 2018, USDA 2022). If a crop is not listed in the Census of Agriculture, as is the case with wormwood, lemongrass and rosemary, the acreage of the crop can be assumed to be less than 300,000 (EPA 2018). For the minor use qualification, fruit and tree nut crops are evaluated for bearing acreage. For plantains, USDA NASS did not survey plantain in the Census of Agriculture in 2022, but surveyed plantain in the Puerto Rico Census of Agriculture in 2018, and only provides data for combined bearing and non-bearing acreage. All other crops are evaluated for harvested acreage. For all 16 sites listed in Table 1, the total U.S. acreage is less than 300,000 acres, qualifying them as minor crops. However, due to a lack of residue data in plantain and garlic (Table 1), the registrant may claim up to 14 minor use sites if criteria for extension of exclusive use are met.

Table 2. Acreage of crops and criteria considered for extension of exclusive use for bicyclopyrone.

Minor Use Site	Crop Acres Grown ¹	Criteria Claimed
Wormwood	Not surveyed ²	I, III, IV
Lemongrass	Not surveyed ³	I, III, IV
Rosemary	Not surveyed ³	I, III, IV
Banana	1,230	I, III, IV
Plantain	10,336 ⁴	I, III, IV
Horseradish	4,621	I, III, IV
Broccoli	147,485	I, III, IV
Hops	63,320	I, III, IV
Strawberry	70,709	I, III, IV
Papaya	882	I, III, IV
Watermelon	142,389	I, III, IV
Onion, dry bulb	166,166	I, III, IV
Garlic	34,445	I, III, IV
Onion, green	6,018	I, III, IV
Timothy grass grown for seed	2,177	I, III, IV
Sweet potato	168,052	I, III, IV

¹USDA NASS 2022

²USDA NASS does not survey wormwood, indicating that crop acreage is well below 300,000 acres. There are no available recent estimates of national wormwood acreage online. The registrant states acreage is about 500 acres, but BEAD was unable to verify this claim.

³USDA NASS does not survey lemongrass or rosemary individually, but surveys total herb production. Nationally, a total of 21,543 acres of fresh cut herbs and 18,546 acres of dry herbs were harvested in 2022, so lemongrass and rosemary production are well below 300,000 acres.

⁴USDA NASS reports plantain production in cuerdas, a Puerto Rican unit of area equivalent to 0.971 acres. In 2018, there were 10,642 bearing and non-bearing cuerdas (10,336 acres) of plantains in Puerto Rico, the only area of the United States with reported plantain production.

Registrant Claims & BEAD Assessment

Applicability of Criterion I to Bicyclopyrone. The registrant claims that there are insufficient efficacious alternative registered pesticides to bicyclopyrone in all 16 use sites proposed for extension of exclusive use: wormwood, lemongrass, rosemary, banana, plantain, horseradish, broccoli, hops, strawberry, papaya, watermelon, dry bulb onion, green onion, garlic, timothy grass grown for seed, and sweet potato. BEAD considers this criterion to be met in wormwood, lemongrass, rosemary, banana, horseradish, broccoli, and green onion, and discusses below. BEAD evaluates registrant claims until 9 qualifying use sites are identified as that is that is the requirement for the maximum 3-year exclusive use extension, and so not all use sites were evaluated for each criterion.

The registrant states there are nine herbicide active ingredients registered for use in wormwood, and claims that bicyclopyrone is the only active ingredient that can be used for broadleaf weed control in non-dormant wormwood. BEAD confirmed the number of active ingredients registered for use in wormwood, and evaluated the registrant's claim by examining labels of herbicides registered in wormwood. Prodiamine is registered only on ornamental wormwood but not in agricultural wormwood production. DCPA is registered only for wormwood nursery stock but not in established agricultural wormwood production. Of the remaining six alternatives, BEAD confirmed that there are no alternatives to bicyclopyrone that can be used in non-dormant wormwood rows for broadleaf weed control. Clomazone can only be used prior to crop emergence. Capric/caprylic acid (octanoic acid), carfentrazone, and glyphosate can be used postemergence but would damage non-dormant wormwood, and therefore can only be used between rows with a hooded sprayer, and would not provide weed control within crop rows. Clethodim and fluazifop-p-butyl can be used in wormwood rows but are primarily grass herbicides and would not provide adequate control of bicyclopyrone's target broadleaf weeds. Therefore, BEAD concludes that wormwood growers have insufficient efficacious alternatives based on crop safety, pest spectrum, and application timing, and qualifies as a use site under Criterion I.

In lemongrass, the registrant states that there are six herbicide active ingredients registered for use in lemongrass: bicyclopyrone, carfentrazone, clethodim, clomazone, glyphosate, and capric/caprylic acid, and that bicyclopyrone is the only one that can be used for postemergence over the top broadleaf weed control without crop damage. The registrant claims this means the primary means of weed control in lemongrass rows after crop emergence is hand weeding. BEAD reviewed labels of herbicide products registered for use in lemongrass and confirmed that other than bicyclopyrone, there are no other registered active ingredients that can be used within rows of emerged lemongrass to control broadleaf weeds. Clomazone can only be used before crop emergence. Capric/caprylic acid, carfentrazone, and glyphosate can be used postemergence but would damage lemongrass and so can only be used between rows with a shielded sprayer. Clethodim can be used in lemongrass rows but is primarily a grass herbicide and would not provide adequate control of bicyclopyrone's target weeds. Therefore, BEAD concludes that lemongrass growers have insufficient efficacious alternatives based on crop safety and bicyclopyrone's target weed spectrum.

The registrant claims that in rosemary there are 18 herbicide active ingredients registered, and that bicyclopyrone is the only one that can be used for postemergence over the top broadleaf weed control without crop damage. BEAD examined labels of products registered for use in rosemary, and found that dithiopyr, isoxaben, oryzalin, benefin plus oryzalin, oxyfluorfen plus oryzalin, prodiamine, and sulfosulfuron are registered for use in ornamental rosemary only and not agricultural rosemary, while bicyclopyrone is registered for use in agricultural rosemary only. Clomazone and napropamide cannot be applied after crop emergence. Pendimethalin and trifluralin will not control emerged weeds, and so are not alternatives to bicyclopyrone for

control of emerged weeds. Clethodim, sethoxydim, and fluazifop-p-butyl are primarily grass herbicides and would not provide adequate control of bicyclopyrone's target weeds. Capric/caprylic acid, carfentrazone, glyphosate, and pelargonic acid can be used in established rosemary but would damage the crop, and so can only be used between rows with a shielded sprayer. Therefore, BEAD concludes that rosemary growers have insufficient efficacious alternatives based on crop safety, pest spectrum, and lack of registered alternatives for rosemary as a food use.

In banana, of the 14 registered herbicide active ingredients, only two broadleaf herbicides have both pre- and postemergence activity, bicyclopyrone and diuron. Diuron has a two-year plantback interval for any crop except sugarcane and pineapple following application in banana, which means it likely cannot be used near the end of the banana cropping cycle. Other herbicides with residual activity are available. However, isoxaben and trifluralin are registered for non-bearing trees only. Indaziflam provides only residual activity but no postemergent activity. To adequately replace bicyclopyrone which has both postemergent and residual activity, indaziflam would need to be combined with a postemergent broadleaf herbicide. The postemergent herbicides glyphosate, paraquat, diquat, carfentrazone, capric/caprylic acid, pelargonic acid, acetic acid, and clove oil are registered for use in banana, although they may not all provide adequate control of bicyclopyrone's target pests and would need to be combined with a preemergent herbicide like indaziflam to replace bicyclopyrone. Fluazifop-p-butyl is also registered in banana but is primarily a grass herbicide. Therefore, BEAD concludes that banana growers have insufficient efficacious alternatives based on few alternatives for bearing banana, plantback intervals, target pest spectrum, and need for multiple chemicals to replace bicyclopyrone.

In horseradish, of the 14 registered herbicide active ingredients, bicyclopyrone is the only broadleaf herbicide with pre- and postemergence activity that can be used after horseradish emergence. Dimethanimid-P can be used after crop emergence but only has residual activity but no postemergent activity, and so to adequately replace bicyclopyrone would need to be combined with a postemergence herbicide such as glyphosate, carfentrazone, pelargonic acid, or capric/caprylic acid. Linuron, oxyfluorfen, pyraflufen-ethyl, S-metolachlor, DPCA, and sulfentrazone can only be used at planting or before crop emergence. Clethodim and sulfoxadim are primarily grass herbicides. BEAD finds that horseradish growers have insufficient efficacious alternatives based on application timing, pest spectrum and need for multiple chemicals to replace bicyclopyrone.

Broccoli has 21 registered herbicide active ingredients, but bicyclopyrone fills a unique niche in broccoli weed control. Bicyclopyrone, clopyralid, pendimethalin, and oxyfluorfen are the only herbicides with residual activity that can be used after crop emergence. According to product labels, clopyralid can be used over the top of emerged broccoli and has residual activity, but does not control some key bicyclopyrone target weeds such as pigweeds, morningglory species,

or lambsquarters. Pendimethalin can only be applied up until the 2-4 leaf broccoli stage, while bicyclopyrone can be applied until 14 days before harvest. Oxyfluorfen has a Special Local Needs (24c) registration for use after crop emergence in Arizona, Delaware, Michigan, New Jersey, Pennsylvania, and Texas, but is not registered for use after crop emergence in all broccoli-producing states, including California, the leading broccoli production state (USDA NASS 2017). Clomazone, flumioxazin, sulfentrazone, trifluralin, and napropamide have residual activity but can only be applied before crop emergence or transplant. DCPA can only be used at planting or transplanting, and clomazone can only be used within 48 hours of transplanting. Bensulide, glyphosate, paraquat, pyraflufen, pyridate, carfentrazone, pelargonic acid, acetic acid, and capric/caprylic acid have little or no residual activity. Clethodim and sethoxydim are primarily grass herbicides. BEAD finds that broccoli growers have insufficient efficacious alternatives based on application timing, bicyclopyrone's target weed spectrum, and lack of registration of alternatives in major broccoli production states.

In green onion, there are 12 registered herbicide active ingredients, but bicyclopyrone fills a unique niche in green onion weed control. Bicyclopyrone, dimethenamid, DCPA, and pendimethalin are the only herbicides with residual activity that can be used after planting. Dimethenamid, DCPA, and pendimethalin do not control already emerged weeds and to be a suitable alternative to bicyclopyrone would need to be combined with an herbicide that is active on emerged weeds, such as carfentrazone. Glyphosate, carfentrazone, capric/caprylic acid, pelargonic acid, and acetic acid have little or no residual activity. Clethodim, sethoxydim, and flazifop-p-butyl are primarily grass herbicides. BEAD finds that green onion growers have insufficient efficacious alternatives based on application timing and need for multiple chemicals to replace bicyclopyrone.

In total, BEAD finds that seven use sites meet the requirement for an extension of data exclusivity under criteria I: wormwood, lemongrass, rosemary, banana, horseradish, broccoli, and green onion.

Applicability of Criterion III to Bicyclopyrone. The registrant claims that bicyclopyrone plays or will play a significant part in managing pest resistance in wormwood, lemongrass, rosemary, banana, plantain, horseradish, broccoli, hops, strawberry, papaya, watermelon, dry bulb onion, green onion, garlic, timothy grass grown for seed, and sweet potato. BEAD considers this criterion to be met in watermelon and sweet potato and discusses below.

As the only HPPD inhibitor (WSSA Group 27 herbicides) registered for use in watermelon, bicyclopyrone provides a unique mode of action for herbicide rotations to manage resistant weeds. The registrant claims that in watermelon, bicyclopyrone can be used before or after crop emergence between crop rows to control Palmer amaranth, redroot pigweed, and common ragweed resistant to glyphosate. Glyphosate-resistant redroot pigweed has been confirmed in the southeast U.S. (Heap, 2024) where watermelon is frequently produced (USDA NASS, 2024), and is considered among the most common and troublesome weeds in cucurbit production (Van Wychen, 2022). Bicyclopyrone controls pigweed species (Mississippi State

University, 2023), and is one of several herbicides recommended in Georgia for control of broadleaf and grass weeds between watermelon rows after crop emergence (Culpepper and Vance, 2024). WSSA Group 2, 3, 10, 15, and 22 herbicides are also recommended for preemergence or postemergence control of broadleaf and grass weeds between rows, and include glufosinate, paraquat, S-metolachlor, halosulfuron, ethalfluralin, trifluralin, and pendimethalin (Culpepper and Vance, 2024). However, resistance to Group 2 herbicides in redroot pigweed have also been documented in watermelon-producing states (Heap, 2024). BEAD finds that as a unique mode of action in watermelon, bicyclopyrone could play a role in resistance management of pigweeds in watermelon.

As the only HPPD inhibitor registered for use in sweet potato, bicyclopyrone provides a unique mode of action for herbicide rotations to manage resistant weeds. The registrant claims that in sweet potato, bicyclopyrone can be used before or after crop emergence between crop rows to control Palmer amaranth, redroot pigweed, and common ragweed resistant to glyphosate. Glyphosate-resistant redroot pigweed has been confirmed in North Carolina (Heap, 2024). North Carolina is the leading producer of sweet potato in the U.S., followed by Louisiana and California (USDA NASS, 2024). Bicyclopyrone controls pigweed species and is recommended for pigweed control in sweet potato in Mississippi (Mississippi State University, 2023). In North Carolina, S-metolachlor (Group 15) napropamide (Group 15), flumioxazin (Group 14), and fomesafen (Group 14) are recommended for preemergence control pigweeds, and carfentrazone can provide postemergence control of pigweeds between rows (North Carolina State University, 2024). Fomesafen and S-metolachlor are available under Special Local Needs 24c registration in North Carolina and may not be available in all states where sweet potato is produced. BEAD finds that as a unique mode of action in sweet potato, bicyclopyrone could play a role in resistance management of pigweeds in sweet potato.

BEAD finds that two use sites meet the requirement for an extension of data exclusivity under criteria III: watermelon and sweet potato. Combined with the seven use sites assessed under criteria I above, this totals nine qualifying use sites (Table 3). BEAD did not assess further use sites, as nine qualifying use sites is sufficient for the maximum 3-year data exclusivity extension.

Table 3. Qualifying criteria for the 9 use sites that were assessed by BEAD.

Minor Use Site	Qualifying Criteria
Wormwood	I
Lemongrass	I
Rosemary	I
Banana	I
Plantain	Not Assessed
Horseradish	I
Broccoli	I
Hops	Not Assessed
Strawberry	Not Assessed
Papaya	Not Assessed
Watermelon	III

Onion, dry bulb	Not Assessed
Garlic	Not Assessed
Onion, green	I
Timothy grass grown for seed	Not Assessed
Sweet potato	III

CONCLUSION

BEAD finds the registrant has provided sufficient evidence that nine minor use sites satisfy the criteria necessary for a three-year extension of exclusive use for bicyclopyrone under FIFRA Section 3(c)(1)(F)(ii). BEAD found that for the minor uses wormwood, lemongrass, rosemary, banana, horseradish, broccoli, and green onion, there are insufficient registered alternative herbicides for the claimed target pests in those crops. BEAD finds that for watermelon and sweet potato, bicyclopyrone plays or will play a role in resistance management of glyphosate-resistant pigweeds. Because BEAD finds that a sufficient number of use sites met criteria I and III to qualify for the maximum three-year extension, BEAD did not assess the remaining use sites and did not assess registrant claims for any sites under criteria IV.

REFERENCES

Culpepper, A.S., and J.C. Vance. 2024 Watermelon Weed Control Programs. University of Georgia Extension. Accessed online March 6, 2024. Available at: <http://www.gaweed.com/HomepageFiles/2024%20Watermelon.pdf>

Environmental Protection Agency (EPA). 2018. Pesticide Registration (PR) Notice 2018-1: Determination of Minor Use under Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Section 2(II).

Foderaro, A.M. and D. Belles. 2023. Optogen™ (Bicyclopyrone) Application for an Extension of the Exclusive Use Period as Permitted by FIFRA Section 3(c)(1)(F)(ii). Syngenta Crop Protection.

Heap, I. 2024. The International Herbicide-Resistant Weed Database. Accessed March 7, 2024. Available at: www.weedscience.org

North Carolina State University 2024. North Carolina Agricultural Chemicals Manual. Accessed March 7, 2024. Available at: <https://content.ces.ncsu.edu/north-carolina-agricultural-chemicals-manual>

Mississippi State University. 2023. Weed Control Guidelines for Mississippi. Mississippi State University Extension. Accessed April 8, 2024. Available at: https://extension.msstate.edu/sites/default/files/publications/publications/P1532_web.pdf

United States Department of Agriculture (USDA). 2022. Census of Agriculture. National Agricultural Statistics Services (NASS). Available online at <https://agcensus.usda.gov/Publications/2022/>

United States Department of Agricultural National Agricultural Statistics Service (USDA NASS). 2024. QuickStats. Accessed March 2024. Available at: <https://quickstats.nass.usda.gov/>

Van Wychen L 2022. 2022 Survey of the Most Common and Troublesome Weeds in Broadleaf Crops, Fruits & Vegetables in the United States and Canada. Weed Science Society of America National Weed Survey Dataset. Available: [http://wssa.net/wp-content/uploads/2022 Weed-Survey Broadleaf crops.xlsx](http://wssa.net/wp-content/uploads/2022%20Weed-Survey%20Broadleaf%20crops.xlsx)