



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

OFFICE OF CHEMICAL SAFETY
AND POLLUTION PREVENTION

MEMORANDUM

DATE: January 12, 2017

SUBJECT: Registration Review Update on the Four Neonicotinoid Insecticides

FROM: Neil Anderson, Chief, Risk Management and Implementation Branch I
Kelly Sherman, Chief, Risk Management and Implementation Branch III
Pesticide Re-evaluation Division

Melissa M. Hatke
for Neil Anderson

TO: Imidacloprid Registration Review Docket (EPA-HQ-OPP-2008-0844)
Clothianidin Registration Review Docket (EPA-HQ-OPP-2011-0865)
Thiamethoxam Registration Review Docket (EPA-HQ-OPP-2011-0581)
Dinotefuran Registration Review Docket (EPA-HQ-OPP-2011-0920)

With the recent issuance of preliminary pollinator risk assessments for clothianidin, thiamethoxam, and dinotefuran, the Agency has completed preliminary pollinator risk assessments for all of the nitroguanidine-substituted (neonicotinoid) insecticides (imidacloprid, clothianidin, thiamethoxam, and dinotefuran) in registration review. These assessments are important elements in the progress of registration review for the neonicotinoids. The Agency intends to align the risk analysis between the four neonicotinoids so that its understanding of pollinator risk incorporates information from all four neonicotinoids, and so that risk management efforts can be better informed and coordinated. The Agency has modified the registration review schedule for the neonicotinoids in order to facilitate this alignment. Due to this change to the schedule, the Agency is providing an updated registration review schedule for the upcoming risk assessments and risk management milestones of all four neonicotinoids in this memorandum.

The updated schedule reflects the Agency's intent to harmonize both the risk assessment and the risk management of the four neonicotinoids. Along with the issuance of this memorandum, the Agency is also releasing for a 60-day public comment period:

1. *Preliminary Aquatic Risk Assessment to Support the Registration Review of Imidacloprid* (K. Sappington, M. Ruhman, and J. Housenger, December 22, 2016),
2. *Preliminary Bee Risk Assessment to Support the Registration Review of Clothianidin and Thiamethoxam* (M. Wagman, R. Mroz, A. Blankinship, C. Koper, and K. Garber, January 5, 2017),
3. *Draft Assessment of the Potential Effects of Dinotefuran to Bees* (F. Farruggia and R. Bohaty, January 3, 2017).

Finally, the Agency is also releasing the *Response to Themes in the Public Comments Submitted on the Preliminary Pollinator Assessment to Support the Registration Review of Imidacloprid*,

January 2017. These documents, along with other supporting documents can be found in the respective dockets for these chemicals available at <http://www.regulations.gov>.

I. Ecological Risk Assessment

At the initiation of the registration review for each of the neonicotinoid compounds, the Agency identified the need for both pollinator toxicity data and pollinator exposure data for each of the neonicotinoids, that reflected the developing pollinator risk assessment, framework and new pollinator data requirements¹. The Agency originally intended that data generation for imidacloprid be completed in 2015, and that data generation for clothianidin, thiamethoxam, and dinotefuran be completed in 2016. However, due to the Agency's identification of the need for additional data to support these assessments, data are being submitted through 2017. Below is a brief discussion of the pollinator data generated to support the assessments.

a. *Exposure*

The Agency required refined (Tier II) pollinator exposure data under the registration review Data Call-In (DCI) for each of the neonicotinoids (available in the respective dockets). These data provide measured residue levels of the compound in the pollen and nectar of various crops and are associated with labeled application rates to develop a refined pollinator risk assessment consistent with the Agency's [pollinator risk assessment framework](#). The Agency did not require residue data for every registered crop, but instead identified crops that can be used as surrogates for other similar uses. To identify which crops would serve as good surrogate crops from which to collect pollen and nectar residue data, the Agency considered several variables such as, pollinator attractiveness of a crop, geographic variation in where a crop is grown, and the volume of the compound used on a crop. Initial pollen and nectar residue data for imidacloprid were required in 2012, while the initial pollen and nectar residue data for clothianidin, thiamethoxam, and dinotefuran were required in 2013.

In 2015, the Agency evaluated the Tier II exposure data it had received and determined that additional pollen and nectar residue data were needed. In early 2016, the Agency informed the technical registrants that additional pollen and nectar residue data were required for each neonicotinoid. As a result, in 2017 approximately 14 more pollen and nectar residue studies across the four neonicotinoids are anticipated to be received.

The Agency did not require pollinator exposure data for non-agricultural uses as part of the generic DCIs for the neonicotinoids. However, the Agency has had discussions

¹ At the time the Agency issued the registration review data call-in for imidacloprid, it had not yet brought its framework for pesticide risk assessment for bees to the FIFRA Science Advisory Panel (SAP) (occurred in September 2012). At the time that the Agency issued the registration review data call-in for clothianidin, thiamethoxam, and dinotefuran, the Agency had completed the FIFRA SAP review of the pollinator risk assessment framework, but had not yet completed its final pollinator risk assessment framework guidance. The data and process EPA is now using to assess potential risk from the four neonicotinoids is consistent with the EPA's guidance for pesticide risk assessment for bees (<https://www.epa.gov/pollinator-protection/pollinator-risk-assessment-guidance>).

with technical registrants and other stakeholders, such as Inter-Regional Research Group 4 (IR-4), who believe it is important to have exposure data that are specific to these uses, rather than using exposure data from commercial agricultural crops as a surrogate for residential and ornamental uses. As a consequence, these stakeholders have initiated development of pollinator exposure data (initiated in late-2016 and expected to be completed in mid-2018²) with the aim of informing the Agency’s pollinator assessment for the residential and ornamental uses of the neonicotinoids. The Agency will use what data are available by mid-2017 to inform its risk analysis for the residential/ornamental uses of the neonicotinoids.

By late-2017, the Agency will have a refined exposure data set (*i.e.*, pollen and nectar residue data) across the four neonicotinoids, that considers a wide range of use sites and application methods. The Agency will consider all available exposure data across all the four neonicotinoids, as appropriate, to inform its final pollinator risk assessment for each of the neonicotinoids. Table 1 identifies the status of exposure data for each of the neonicotinoids. Table 1 does not include residue data for residential or ornamental uses since these data were not required under registration review. The residential and ornamental residue data are being generated voluntarily by external stakeholders as described above. Blank fields in Table 1 indicate that data were not anticipated to be received, or that the use is not registered for the active ingredient. Where a compound is registered for a use, but data were not generated, the Agency anticipates bridging data from a similar crop and application method.

Table 1 - Summary of Pollen and Nectar Residue Data Anticipated to Support the Registration Review of the Neonicotinoid Insecticides

Crop	Application Method	Status			
		Imidacloprid	Clothianidin	Thiamethoxam	Dinotefuran
Potato	Foliar		Data received		
	Soil		Data received		Data received
Soybean	Foliar	Some data received; Additional data expected in 2017		Some data received; Additional data expected in 2017	
	Seed	Some data received; Additional data expected in 2017	Data received	Data received	
Tomato	Foliar			Data received	Data received
	Soil	Data received			Data received
Bell Pepper	Soil			Data received	
	Foliar			Data received	Data received

² See the U.S Department of Agriculture, National Institute of Food and Agriculture, Current Research Information System (CRIS), *Protecting Pollinator with Economically Feasible and Environmentally Sound Ornamental Horticulture* (<http://cris.nifa.usda.gov/cgi-bin/starfinder/0?path=fastlink1.txt&id=anon&pass=&search=R=72057&format=WEBLINK>).

Crop	Application Method	Status			
		Imidacloprid	Clothianidin	Thiamethoxam	Dinotefuran
	Soil		Data received		Data received
Melon	Soil	Data received	Data received	Some data received; Additional data expected in 2017	Data received
	Seed		Data received		
Pumpkin	Foliar		Data received	Additional data expected in 2017	Data received
	Soil		Data received	Additional data expected in 2017	Data received
Squash (summer, including zucchini)	Soil		Data received		Data received
Squash (summer, including butternut)	Soil		Data received		Data received
Citrus fruits	Foliar	Data received		Additional data expected in 2017	
	Soil	Data received	Data received		
Apples	Foliar		Additional data expected in 2017	Additional data expected in 2017	
Cherries	Foliar	Data received			Data received
	Tree Injection				Data received
Peach	Foliar		Additional data expected in 2017	Data received	Additional data expected in 2017
Blueberry	Foliar			Additional data expected in 2017	Data received
	Soil	Data received			
Strawberry	Foliar	Data received		Data received	
	Soil			Additional data expected in 2017	
Cranberry	Foliar			Data received	Data received
Grape	Foliar		Data received		
Almond	Foliar		Additional data expected in 2017		
Corn	Seed	Data received	Data received	Data received	
Cotton	Foliar	Data received	Data received		Data received
	Seed		Data received	Data received	
Sunflower	Seed	Data received		Data received	
Canola	Seed	Data received	Data received	Data received	

b. Toxicity

Additional pollinator toxicity data are also anticipated to be received in 2017. For clothianidin and thiamethoxam, repeat Tier II colony feeding studies are due to be submitted³. For imidacloprid, Tier III full-field colony studies in pumpkin and cotton are due to be submitted in early 2017. The Agency does not anticipate Tier III full-field colony feeding studies for the other neonicotinoids. For dinotefuran, a Tier II colony feeding study was received in December 2016. Therefore, by late-2017, the Agency expects to have a sound data base of toxicity information across the four neonicotinoids. The Agency will consider all of the available toxicity data across all four neonicotinoids, as appropriate, to inform its final pollinator risk assessments. Table 2 identifies the status of Tier II and III toxicity data for each of the neonicotinoids. Blank fields in Table 2 indicate that data have not been required at this time.

Table 2 - Summary of Toxicity Data Anticipated to Support the Registration Review of the Neonicotinoid Insecticides

Test	Status			
	Imidacloprid	Clothianidin	Thiamethoxam	Dinotefuran
Tier II				
Colony-Level Feeding Study	Data received (2015)	Data received (2015), submission of repeat study expected to be submitted in 2017	Data received (2015), submission of repeat study expected to be submitted in 2017	Data received (2016)
Tier III				
Full Field Testing for Pollinators	Data expected for cotton and pumpkin in 2017			

c. Pollinator Risk Assessments

To date, the Agency has completed preliminary pollinator-only assessments for agricultural uses, but has not quantitatively assessed any non-agricultural uses for the four neonicotinoids. With the completion and review of remaining pollinator exposure and toxicity data in 2017, the Agency expects to complete its pollinator assessment for all registered uses, in addition to completing non-pollinator assessments (all other non-target taxa) for the four neonicotinoids.

- i. *Agricultural uses*: The Agency will review the exposure data to be submitted in 2017, and consider them along with existing exposure data to complete a full assessment of the agricultural uses in final pollinator risk assessments expected in 2018.

³Colony feeding studies for clothianidin and thiamethoxam were submitted to the Agency in late 2015. While the Agency was able to draw information from the pre-wintering portion of these studies, because of poor colony survival in the over-wintering portion of these studies the Agency required new colony feeding studies for both clothianidin and thiamethoxam.

- ii. *Non-agricultural uses:* As discussed above, no formal requirements have been issued for data from the non-agricultural uses of the neonicotinoids (e.g., to products sold at retail). However, the Agency has engaged with stakeholders, such as IR-4, the Floral Research Institute, and co-operative extensions, who are independently generating exposure data on the residential and ornamental uses of the neonicotinoids⁴. The stakeholders have agreed to share the data they are generating with the Agency, and have indicated that some of these data will be available in 2017. The Agency expects to use the available residential and ornamental exposure data and available toxicity data to assess the non-agricultural uses of the neonicotinoids in the final pollinator risk assessments expected in 2018.

d. *Non-pollinator Risk Assessments*

As previously described, the Agency is currently issuing its *Preliminary Aquatic Risk Assessment to Support the Registration Review of Imidacloprid* for public comment. The Agency will issue risk assessments in 2017 for other wildlife taxa, such as aquatic organisms, terrestrial mammals, and birds, for the remaining three neonicotinoids.

II. Human Health Risk Assessment

As part of registration review, the Agency will also complete human health risk assessments for each neonicotinoid. The Agency intends to complete a preliminary human health risk assessment for imidacloprid in March 2017, and preliminary human health risk assessments for clothianidin, thiamethoxam, and dinotefuran in September 2017.

III. Risk Management and Benefits

Risks to pollinators from the neonicotinoids were identified in the preliminary pollinator-only risk assessments released in January 2016 (imidacloprid) and January 2017 (clothianidin, thiamethoxam, and dinotefuran). The Agency intends to mitigate risk from the uses of these neonicotinoids where appropriate. To address potential pollinator risk, the Agency is interested in receiving input from stakeholders such as growers, beekeepers, cooperative extension, grower groups and others regarding measures or practices that would mitigate potential risk while maintaining the benefits of the neonicotinoids to manage pests. The Agency encourages efforts to identify or develop risk management options that reflect the needs of growers, beekeepers, or others at a local or crop specific level. The Agency also intends, prior to implementing any risk management on the neonicotinoids, to seek comment from stakeholders on any proposed regulatory approach.

⁴ For example, EPA provided technical assistance to Rutgers Research Extension in the development of the coordinated agricultural project proposal, *Protecting Pollinators with Economically Feasible and Environmentally Sound Ornamental Horticulture* (<http://cris.nifa.usda.gov/cgi-bin/starfinder/0?path=fastlink1.txt&id=anon&pass=&search=R=72057&format=WEBLINK>).

Because the neonicotinoid compounds have certain similarities in terms of chemical structure, environmental fate properties, toxicity, and registered use patterns, the Agency may consider risk management for all four compounds at the same time to ensure consistent risk management across neonicotinoids with similar use patterns, and to ensure that usage does not shift unnecessarily between the compounds without reducing risk, which could happen if risk mitigation is taken on one neonicotinoid but not on the others. The Agency has adjusted the schedule of the neonicotinoids so that both the scientific assessments and risk management decisions are ultimately done on the same timetable across all four compounds.

IV. Timeline

At the time the Agency initiated the registration review for imidacloprid, it received comments that it should accelerate the registration review schedule for the other neonicotinoids, since the initiation of the registration review for imidacloprid preceded that of the other neonicotinoids by approximately one year. In response to those comments, the Agency has accelerated the registration review schedules for clothianidin, thiamethoxam and dinotefuran. With the Agency’s release of the preliminary pollinator-only risk assessments for clothianidin, thiamethoxam, and dinotefuran, the pollinator risk assessments between the four neonicotinoids have come closer to aligning. As discussed above, there remains outstanding data on all of the neonicotinoids, which is expected to be received in 2017. The Agency intends to use these data, as appropriate, across all four neonicotinoids, which will ultimately align the registration review risk assessment schedule for all four of neonicotinoids. In addition, while the Agency continues to receive and review the remaining data, it will continue to complete other components of registration review (*i.e.*, the remaining ecological and human health risk assessments).

The Agency intends to identify and work to resolve risk management issues during 2017. In 2018, the Agency intends to issue the final pollinator assessment and proposed interim decisions (PID) for the four neonicotinoids. The PIDs for all four neonicotinoids, will address all previously assessed pollinator risks, other non-target ecological risk (*e.g.*, aquatic organisms), and human health risk as appropriate.

Table 3 provides an updated schedule for completing risk assessments and taking risk management steps for the registration review of the neonicotinoid insecticides currently undergoing registration review.

Table 3 - Updated Registration Review Schedule for the Neonicotinoids

Activities	Estimated Date
Preliminary Pollinator Risk Assessments	
Imidacloprid	January 2016 – Completed
Clothianidin, Thiamethoxam, and Dinotefuran	January 2017 - Completed
Ecological Assessments (not including pollinators)	
Imidacloprid – Aquatic Only	January 2017 – Completed

Activities	Estimated Date
Clothianidin, Thiamethoxam, and Dinotefuran	September 2017
Human Health Assessments	
Imidacloprid	March 2017
Clothianidin, Thiamethoxam, and Dinotefuran	September 2017
Revised Pollinator and Ecological Risk Assessments	
Imidacloprid, Clothianidin, Thiamethoxam, and Dinotefuran	Spring 2018 ⁵
Registration Review Proposed Interim Decisions	
Imidacloprid, Clothianidin, Thiamethoxam, and Dinotefuran	Spring 2018
Registration Review Interim Decisions	
Imidacloprid, Clothianidin, Thiamethoxam, and Dinotefuran	Winter 2018/2019

V. Anticipated Needs for Information

The Agency plans to continue to receive and review data to better inform the pollinator risk assessment for the four neonicotinoids. In developing risk management for the neonicotinoids, the Agency has identified areas where additional information would aid in reaching a risk management decision. These areas are:

- Information on the benefits of neonicotinoid use.
 - Information on use, application rates, application methods, and application timing of the neonicotinoids.
 - Information on key pests that the neonicotinoids are used to manage.
 - Information on likely alternatives for managing the key pests for which the neonicotinoids are applied.
 - Information on expected costs to growers from switching to alternative pest control tools/methods, including information on potential impacts to yield or quality from switching to alternative pest control tools/methods.
- Information regarding potential ways to mitigate risks to pollinators identified in the Agency's assessments of the neonicotinoids.
 - Information on management practices including any best management practices, integrated pest management strategies, or other practices that could mitigate potential risk to bees.
 - Information on the extent to which such practices have or have not been adopted and why.
- Risk Assessment Information.
 - In the *Preliminary Bee Risk Assessment to Support the Registration Review of Clothianidin and Thiamethoxam*, the Agency introduced an approach to assess potential risk from the pollen route of exposure. The Agency welcomes comment on

⁵ The completion of the registration review action by this date is based on the Agency's current understanding of the date additional data to support this action are expected to be received.

the approach or methodology for assessing exposure, hazard or risk from the pollen route of exposure. The Agency also welcomes any information that may contribute to the Agency's understanding of the pollen route of exposure, such as:

- Additional data on individual and colony level toxic effects resulting from bee exposure to pollen containing neonicotinoid residues.
- Information on bee bread, such as the pollen to nectar ratio, moisture content, and presence of neonicotinoid residues in bee bread.

Any information that would add to the Agency's assessment or management of ecological risk may be submitted during the 60-day public comment period for the risk assessments for the neonicotinoids (*i.e.*, a preliminary pollinator risk assessment for clothianidin and thiamethoxam, preliminary bee assessment for dinotefuran, and preliminary aquatic risk assessment for imidacloprid), available in their respective dockets at www.regulations.gov.