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Director

MEMORANDUM

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TO: Karen Morrison  
Acting Chief Deputy Director  
Pesticide Programs Division

VIA: Reevaluation Program  
Pesticide Reevaluation Branch

FROM: Ecotoxicology Program  
Pesticide Evaluation Branch

DATE: February 1, 2022

SUBJECT: UPDATE TO THE IDENTIFICATION OF CROP RESIDUE STUDIES FOR  
DEVELOPMENT OF PROPOSED POLLINATOR PROTECTION REGULATIONS  
IN RESPONSE TO THE NEONICOTINOID REEVALUATION

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As a part of the Department of Pesticide Regulation's (DPR) neonicotinoid reevaluation, the Director imposed several data requirements including the collection of residue data on representative commodities grown in California. Companies submitted data to fulfill those data requirements. In addition, DPR received data required by U.S. Environmental Protection Agency (U.S. EPA) and voluntary studies submitted by companies. DPR has assessed the data as a whole and has developed proposed regulations, in response to the neonicotinoid reevaluation with the intent to protect pollinator health. This memo serves as an update and supersedes the previous memo titled "Identification of Crop Residue Studies for Development of Draft Proposed Pollinator Protection Regulations in Response to the Neonicotinoid Reevaluation," dated September 28, 2020. This memo contains three appendices that identify the following: (1) neonicotinoid crop residue studies DPR is currently using to support the application rates and timing restrictions contained in the proposed regulations, (2) neonicotinoid crop residue studies DPR received for purposes of the neonicotinoid reevaluation, and (3) additional information on the residue studies that DPR found acceptable. This information is presented in **APPENDIX 1** through **3**.

cc: Tulio Macedo, Chief, Pesticide Registration Branch  
Jill Townzen, Chief, Pesticide Evaluation Branch

**APPENDIX 1. Identification of Residue Studies by Crop Group that DPR Is Using to Support the Application Rates and Timing Restrictions Contained in the Proposed Regulations.**

For the crop groups for which DPR had acceptable data on file, **Tables 1-11** identify the crop residue studies that DPR is currently relying upon to support the application rate and timing restrictions in the proposed regulations. Report Number refers to a registrant-generated identification number assigned to the study. The specified application rates in the tables are in units of pounds of active ingredient (ai) per acre (A) per growing season (lbs. ai/A/season).

DPR currently does not have data on file for the following crop groups and miscellaneous crops: bulb vegetable crop group, herb and spices crop group, vegetables including brassica (cole) crop group, tropical and subtropical fruit (edible and inedible peel) crop groups, coffee, peanuts, globe artichoke, hops, mint, or tobacco.

**Table 1.** Identification of studies to support proposed application rate and timing restriction for **Grapes**, within the Berries and Small Fruits Crop Groups.

Active Ingredient	Soil Application		Foliar Application	
	Application Rate/Timing	Report Number	Application Rate/Timing	Report Number
Clothianidin	0.2 lbs. ai/A/season	Clothianidin VP-38992	0.1 lbs. ai/A/season	Clothianidin VP-38992
	Apply only up until bud break		Apply only between post-bloom (all flower hoods fallen) and harvest	
Dinotefuran	0.2 lbs. ai/A/season	Bridged to VP-38992	0.1 lbs. ai/A/season	Bridged to VP-38992
	Apply only up until bud break		Apply only between post-bloom (all flower hoods fallen) and harvest	
Imidacloprid	0.2 lbs. ai/A/season	Bridged to VP-38992	0.1 lbs. ai/A/season	Bridged to VP-38992
	Apply only up until bud break		Apply only between post-bloom (all flower hoods fallen) and harvest	
Thiamethoxam	0.2 lbs. ai/A/season	Bridged to VP-38992	0.1 lbs. ai/A/season	Bridged to VP-38992
	Apply only up until bud break		Apply only between post-bloom (all flower hoods fallen) and harvest	

**Table 2.** Identification of studies to support proposed application rate and timing restriction for the **Cereal Grains** Crop Groups.

Active Ingredient	Soil Application		Foliar Application	
	Application Rate/Timing	Report Number	Application Rate/Timing	Report Number
Clothianidin	0.2 lbs. ai/A/season	Clothianidin VP-39071, VP-39234, VP-39240, VP-39442	0.126 lbs. ai/A/season	Bridged to TK0258214
	Apply only at pre-planting or planting		Apply only between pre-planting until heading (inflorescence or tassel emergence)	
Dinotefuran	0.2 lbs. ai/A/season	Bridged to VP-39071, VP-39234, VP-39240, VP-39442	0.126 lbs. ai/A/season	Bridged to TK0258214
	Apply only at pre-planting or planting		Apply only between pre-planting until heading (inflorescence or tassel emergence)	
Imidacloprid	0.2 lbs. ai/A/season	Bridged to VP-39071, VP-39234, VP-39240, VP-39442	0.126 lbs. ai/A/season	Bridged to TK0258214
	Apply only at pre-planting or planting		Apply only between pre-planting until heading (inflorescence or tassel emergence)	
Thiamethoxam	0.2 lbs. ai/A/season	Bridged to VP-39071, VP-39234, VP-39240, VP-39442	0.126 lbs. ai/A/season	Thiamethoxam TK0258214
	Apply only at pre-planting or planting		Apply only between pre-planting until heading (inflorescence or tassel emergence)	

**Table 3.** Identification of studies to support proposed application rate and timing restriction for the Citrus Fruit Crop Groups.

Active Ingredient	Soil Application		Foliar Application	
	Application Rate/Timing	Report Number	Application Rate/Timing	Report Number
Clothianidin	0.2 lbs. ai/A/season	Clothianidin VP-38685, VP-38980	0.172 lbs. ai/A/season	Bridged to TK0250069
	Apply only between petal fall and September 17		Apply only between petal fall and November 20	
Dinotefuran	0.172 lbs. ai/A/season	Bridged to TK0124743, TK0124745, TK0177221	0.172 lbs. ai/A/season	Bridged to TK0250069
	Apply only between petal fall and February 10		Apply only between petal fall and November 20	
Imidacloprid	0.25 lbs. ai/A/season	Imidacloprid EBTNL056-7	0.172 lbs. ai/A/season	Bridged to TK0250069
	Apply only between petal fall and December 6		Apply only between petal fall and November 20	
Thiamethoxam	0.172 lbs. ai/A/season	Thiamethoxam TK0124743, TK0124745, TK0177221	0.172 lbs. ai/A/season	Thiamethoxam TK0250069
	Apply only between petal fall and February 10		Apply only between petal fall and November 20	

**Table 4.** Identification of studies to support proposed application rate and timing restriction for the **Cucurbit Vegetables Crop Group**

Active Ingredient	Soil Application		Foliar Application	
	Application Rate/Timing	Report Number	Application Rate/Timing	Report Number
Clothianidin	0.2 lbs. ai/A/season	Clothianidin VP-38263, VP-38938, VP-38971	0.2 lbs. ai/A/season	Clothianidin VP-38313, VP-38971
	Apply only from pre-planting until primary side shoot formation		Apply only from pre-planting until bloom	
Dinotefuran	0.536 lbs. ai/A/season	Dinotefuran 10934.4104	0.172 lbs. ai/A/season	Bridged to TK0242074
	None		Apply only from pre-planting until bloom	
Imidacloprid	0.172 lbs. ai/A/season	Bridged to TK0222530, TK0024668	0.172 lbs. ai/A/season	Bridged to TK0242074
	Apply only from pre-planting until fifth true leaf on main stem unfolded		Apply only from pre-planting until bloom	
Thiamethoxam	0.172 lbs. ai/A/season	Thiamethoxam TK0222530, TK0024668	0.172 lbs. ai/A/season	Thiamethoxam TK0242074
	Apply only from pre-planting until fifth true leaf on main stem unfolded		Apply only from pre-planting until bloom	

Exceptions:

The bloom exception for dinotefuran as a soil application is based on study report 10934.4104.

The exceptions for cucumbers are based on study report TK0222532.

The exception for melon is based on study report VP-39242.

**Table 5.** Identification of studies to support proposed application rate and timing restriction for the **Fruiting Vegetables** Crop Groups

Active Ingredient	Soil Application		Foliar Application	
	Application Rate/Timing	Report Number	Application Rate/Timing	Report Number
Clothianidin	0.172 lbs. ai/A/season	Bridged to TK0242072	Prohibited	Bridged to TK0222531
	Apply only from pre-planting until third leaf on main shoot unfolded			
Dinotefuran	0.172 lbs. ai/A/season	Bridged to TK0242072	Prohibited	Dinotefuran 10934.4103
	Apply only from pre-planting until third leaf on main shoot unfolded			
Imidacloprid	0.172 lbs. ai/A/season	Bridged to TK0242072	Prohibited	Bridged to TK0222531
	Apply only from pre-planting until third leaf on main shoot unfolded			
Thiamethoxam	0.172 lbs. ai/A/season	Thiamethoxam TK0242072	Prohibited	Thiamethoxam, TK0222531
	Apply only from pre-planting until third leaf on main shoot unfolded			

The exceptions for the nectar-producing fruiting vegetables, peppers, goji berry, ground cherry, martynia, okra, roselle, or tomatillo are based on study report TK0236306.

**Table 6.** Identification of studies to support proposed application rate and timing restriction for the **Legume Vegetable** Crop Group

Active Ingredient	Soil Application		Foliar Application	
	Application Rate/Timing	Report Number	Application Rate/Timing	Report Number
Clothianidin	Prohibited	No data	Prohibited	Bridged to TK0250070
Dinotefuran	Prohibited	No data	0.126 lbs. ai/A/season	Bridged to TK0250070
			Apply only from pre-planting until bloom	
Imidacloprid	Prohibited	No data	Prohibited	Bridged to TK0250070
Thiamethoxam	Prohibited	No data	Prohibited	Thiamethoxam TK0250070

**Table 7.** Identification of studies to support proposed application rate and timing restriction for the **Oilseed** Crop Group

Active Ingredient	Soil Application		Foliar Application	
	Application Rate/Timing	Report Number	Application Rate/Timing	Report Number
Clothianidin	Prohibited	No data	Prohibited	Clothianidin VP-38259, VP-39066
Dinotefuran	Prohibited	No data	Prohibited	Dinotefuran 43411B104
Imidacloprid	Prohibited	Imidacloprid, EBNTN011	0.3 lbs. ai/A/season	Imidacloprid EBNTY010
			Apply only from pre-planting until bloom	
Thiamethoxam	Prohibited	No data	Prohibited	Thiamethoxam TK0177223

**Table 8.** Identification of studies to support proposed application rate and timing restriction for the **Pome Fruits** Crop Groups

Active Ingredient	Soil Application		Foliar Application	
	Application Rate/Timing	Report Number	Application Rate/Timing	Report Number
Clothianidin	0.38 lbs. ai/A/season	Bridged to EBNTN014	0.187 lbs. ai/A/season	Clothianidin VP-38552
	Apply only between post-bloom and harvest		Apply only between post-bloom and harvest	
Dinotefuran	0.38 lbs. ai/A/season	Bridged to EBNTN014	0.187 lbs. ai/A/season	Bridged to VP-38552
	Apply only between post-bloom and harvest		Apply only between post-bloom and harvest	
Imidacloprid	0.38 lbs. ai/A/season	Imidacloprid EBNTN014	0.187 lbs. ai/A/season	Bridged to VP-38552
	Apply only between post-bloom and harvest		Apply only between post-bloom and harvest	
Thiamethoxam	0.38 lbs. ai/A/season	Bridged to EBNTN014	0.187 lbs. ai/A/season	Bridged to VP-38552
	Apply only between post-bloom and harvest		Apply only between post-bloom and harvest	



**Table 9.** Identification of studies to support proposed application rate and timing restriction for the **Root and Tuber Vegetables** Crop Groups

Active Ingredient	Soil Application		Foliar Application	
	Application Rate/Timing	Report Number	Application Rate/Timing	Report Number
Clothianidin	0.2 lbs. ai/A/season	Clothianidin VP-38985	0.05 lbs. ai/A/season	Clothianidin VP-38985
	Apply only at pre-planting or planting		Apply only from pre-planting until bloom	
Dinotefuran	0.338 lbs. ai/A/season	Dinotefuran 10934.41	0.05 lbs. ai/A/season	Bridged to VP-38985
	Apply only from pre-planting until the beginning of main stem elongation or crop cover		Apply only from pre-planting until bloom	
Imidacloprid	0.2 lbs. ai/A/season	Bridged to VP-38985	0.05 lbs. ai/A/season	Bridged to VP-38985
	Apply only at pre-planting or planting		Apply only from pre-planting until bloom	
Thiamethoxam	0.2 lbs. ai/A/season	Bridged to VP-38985	0.05 lbs. ai/A/season	Bridged to VP-38985
	Apply only at pre-planting or planting		Apply only from pre-planting until bloom	

**Table 10.** Identification of studies to support proposed application rate and timing restriction for the **Stone Fruits** Crop Groups

Active Ingredient	Soil Application		Foliar Application	
	Application Rate/Timing	Report Number	Application Rate/Timing	Report Number
Clothianidin	0.38 lbs. ai/A/season	Bridged to EBNTN013	0.2 lbs. ai/A/season	Clothianidin VP-38563
	Apply only between post- bloom and harvest		Apply only between post- bloom and harvest	
Dinotefuran	0.38 lbs. ai/A/season	Bridged to EBNTN013	0.54 lbs. ai/A/season	Dinotefuran 10934.4105
	Apply only between post- bloom and harvest		Apply only between post- bloom and harvest	
Imidacloprid	0.38 lbs. ai/A/season	Imidacloprid EBNTN013	0.5 lbs. ai/A/season	Imidacloprid EBNTY008
	Apply only between post- bloom and harvest		Apply only between post- bloom and harvest	
Thiamethoxam	0.38 lbs. ai/A/season	Bridged to EBNTN013	0.172 lbs. ai/A/season	Thiamethoxam TK0177222
	Apply only between post- bloom and harvest		Apply only between post- bloom and harvest	

**Table 11.** Identification of studies to support proposed application rate and timing restriction for the **Tree Nuts** Crop Groups

Active Ingredient	Soil Application		Foliar Application	
	Application Rate/Timing	Report Number	Application Rate/Timing	Report Number
Clothianidin	Prohibited	No data	0.2 lbs. ai/A/season	Clothianidin VP-38473
			Apply only between post-bloom and harvest	
Dinotefuran	Prohibited	No data	0.2 lbs. ai/A/season	Bridged to VP-38473
			Apply only between post-bloom and harvest	
Imidacloprid	Prohibited	No data	0.2 lbs. ai/A/season	Bridged to VP-38473
			Apply only between post-bloom and harvest	
Thiamethoxam	Prohibited	No data	0.2 lbs. ai/A/season	Bridged to VP-38473
			Apply only between post-bloom and harvest	

**APPENDIX 2. List of all neonicotinoid crop residues studies that were submitted during the neonicotinoid reevaluation.**

<b>Active Ingredient</b>	<b>Report Number</b>	<b>DPR Data Processing Number</b>	<b>U.S. EPA MRID No.</b>	<b>Acceptable for use in Risk Evaluation</b>
<b><u>Berries</u></b>				
Clothianidin	VP-38992	52884-0282	50154305	X
Dinotefuran	10934.4101	52911-0458	49841002	X
Dinotefuran	10934.4107	52911-0486	50145707	X
Imidacloprid	EBNTL056-04	51950-0812	49090502	
Imidacloprid	EBNTY006	51950-0881	49511701	
Thiamethoxam	TK0177224	52691-0574	50265502	X
Thiamethoxam	TK0236307	52691-0536	49804102	X
Thiamethoxam	TK0250068	52691-0582	50266001	X
Thiamethoxam	TK0250072	52691-0586	50425901	X
<b><u>Cereal Grains</u></b>				
Clothianidin	VP-39071	52884-0278	50154301	X
Clothianidin	VP-39234	52884-0291	50312701	X
Clothianidin	VP-39240	52884-0315	49372102	X
Clothianidin	VP-39442	52884-0292	50312702	X
Imidacloprid	EBNTY009*	51950-0871	49511701	X
Thiamethoxam	TK0258214	52691-0579	50265505	X
<b><u>Citrus Fruit</u></b>				
Clothianidin	VP-38685	52884-0247	49317901	X
Clothianidin	VP-38980	52884-0298	50478201	X
Clothianidin	VP-39259	52884-0273	49944702	
Imidacloprid	EBNTL056-07	51950-0798	49090504	X
Imidacloprid	EBNTY007	51950-0874	49521301	X
Thiamethoxam	TK0124743	52691-0546	49881001	X
Thiamethoxam	TK0124745	52691-0545	49881002	X
Thiamethoxam	TK0177221	52691-0571	50131102	X
Thiamethoxam	TK0250069	52691-0587	50425902	X
<b><u>Cucurbit Vegetables</u></b>				
Clothianidin	VP-38263	52884-0245	49602801	X
Clothianidin	VP-38313	52884-0244	49602802	X
Clothianidin	VP-38938	52884-0263	49705901	X
Clothianidin	VP-38971	52884-0266	49910601	X
Clothianidin	VP-39242	52884-0283	50154306	X
Dinotefuran	10934.4102	52911-0459	49841003	
Dinotefuran	10934.4104	52911-0461	49852701	X
Dinotefuran	S16-01165	52911-0479	50145701	

<b>Active Ingredient</b>	<b>Report Number</b>	<b>DPR Data Processing Number</b>	<b>U.S. EPA MRID No.</b>	<b>Acceptable for use in Risk Evaluation</b>
Dinotefuran	S16-02008	52911-0481	50145703	X
Dinotefuran	S16-02009	52911-0482	50145704	
Imidacloprid	EBNTL056-02	51950-0811	49090501	
Thiamethoxam	TK0024668	52691-0466	49550801	X
Thiamethoxam	TK0222530	52691-0576	50265501	X
Thiamethoxam	TK0222532	52691-0534	49804105	X
Thiamethoxam	TK0242074	52691-0580	50265506	X
<b>Fruiting Vegetables</b>				
Dinotefuran	10934.4103	52911-0460	49841004	X
Dinotefuran	S16-01167	52911-0480	50145702	
Imidacloprid	EBNTL056-05	51950-0786	49090503	
Imidacloprid	EBNTN012	51950-0918	49894502	
Thiamethoxam	TK0025811	52691-0455	50023201	
Thiamethoxam	TK0222531	52691-0533	49804101	X
Thiamethoxam	TK0236306	52691-0535	49804103	X
Thiamethoxam	TK0242072	52691-0581	50265507	X
<b>Legume Vegetables</b>				
Clothianidin	EBTIP060* SG-OT-18-03	52884-0302	49803701	X
Thiamethoxam	TK0222529*	52691-0532	49804104	X
Thiamethoxam	TK0250070	52691-0577	50265503	X
<b>Oilseed</b>				
Clothianidin	VP-38259	52884-0251	49733302	X
Clothianidin	VP-39066 EBTIN115	52884-0264	49904901	X
Dinotefuran	43411B104	52911-0490	50198501	X
Imidacloprid	EBNTL011	51950-0917	49894501	X
Imidacloprid	EBNTY010	51950-0872	49511702	X
Imidacloprid	EBNTL056-01	51950-0785	49103301	X
Thiamethoxam	TK0177223	52691-0590	49686801	X
<b>Pome Fruits</b>				
Clothianidin	VP-38552	52884-0281	50154304	X
Imidacloprid	EBNTN014	51950-0903	49662101	X
Thiamethoxam	TK0250071	52691-0578	50265504	X
<b>Root and Tuber Vegetables</b>				
Clothianidin	VP-38985	52884-0262	49705902	X
Dinotefuran	10934.4100	52911-0457	49841001	X

<b>Active Ingredient</b>	<b>Report Number</b>	<b>DPR Data Processing Number</b>	<b>U.S. EPA MRID No.</b>	<b>Acceptable for use in Risk Evaluation</b>
Clothianidin	VP-38563	52884-0280	50154303	X
Dinotefuran	10934.4105	52911-0485	50145706	X
Dinotefuran	10934.4109	52911-0491	50456901	
Imidacloprid	EBNTN013	51950-0904	49819401	X
Imidacloprid	EBNTY008	51950-0882	49535601	X
Thiamethoxam	TK0177222	52691-0531	50096606	X
Clothianidin	VP-38473	52884-0279	50154302	X

\*Report Number consists of seed-treatment trial only. While these are residue studies, they do not pertain to current draft regulations, which are focused on soil and foliar applications, only.

### **Appendix 3. Additional Information on Acceptable Crop Residue Studies**

The following tables present the 90<sup>th</sup> percentile of pollen and nectar residue values for the acceptable residue trials used for risk evaluation. For estimation of exposure, the concentration chosen at a specified percentage of the sample is the value that represents the exposure value that would be compared to the no observed effects concentration (NOEC) value derived from colony feeding studies to characterize potential risk. The 90th percentile value was determined to be a point in the distribution where the value represented a realistic, yet protective approach to determining risk (Troiano et al. 2018).

For imidacloprid, DPR evaluated risks to bees based on concentrations of total residues, which are the summation of residues of the parent imidacloprid and its bee-toxic metabolites, imidacloprid-olefin and imidacloprid-5-hydroxy. For thiamethoxam, DPR evaluated risks based on concentrations of total residues, which are the summation of the parent thiamethoxam and the clothianidin metabolite. For clothianidin and dinotefuran, the metabolites that formed were determined to be orders of magnitude less toxic to honey bees than the parent active ingredient clothianidin or dinotefuran, and thus DPR evaluated risk based on the parent residues alone.

The boxes in the tables shaded grey indicate when 90<sup>th</sup> percentile residue values exceed the respective pollen or nectar NOEC value for that active ingredient. The final nectar NOECs that DPR used to evaluate risk are 23, 34 19, and 71 micrograms of active ingredient per kilogram of feed ( $\mu\text{g ai/kg feed}$ ) for imidacloprid, thiamethoxam, clothianidin, and dinotefuran, respectively. The final pollen NOEC that DPR used was 372  $\mu\text{g ai/kg feed}$  for all four neonicotinoids.

**Table 1.** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Berries and Small Fruits** Crop Groups

Active Ingredient	Application Method	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Crop Growth Stage at Application	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile	
					Parent Residue ug /kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Clothianidin	Soil	0.2	VP-38992 Grape	Sprouting/bud development (pre-bloom)	N/A	N/A	157	174
Thiamethoxam	Soil	0.129	TK0250068 Strawberry	Sprouting/bud development (at transplant)	134	145	252	340
		0.188	TK0250068 Strawberry	Sprouting/bud development (at transplant)	45	45.2	807	848
Clothianidin	Foliar	0.1	VP-38992 Grape	Development of fruit (post-bloom)	N/A	N/A	16.7	17.3
				Leaf development (pre-bloom)	N/A	N/A	1230	1489
Dinotefuran	Foliar	0.36	10934.4107 Blueberry	Two applications at inflorescence emergence to flowering (pre-bloom to bloom)	471	501	469	1157
			10934.4101 Cranberry	Two applications at inflorescence emergence to flowering (pre-bloom to bloom)	781	813	764	1314



**Table 1 (Continued).** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Berries and Small Fruits** Crop Groups

Active Ingredient	Application Method	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Crop Growth Stage at Application	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile	
					Parent Residue ug /kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Thiamethoxam	Foliar	0.063	TK0250072 Blueberry	Sprouting/bud development to inflorescence emergence (pre-bloom)	9.4	61.9	144	151
		0.188	TK0250072 Blueberry	Three applications at sprouting/bud development to inflorescence emergence (pre-bloom)	267	613	757	836
			TK0236307 Cranberry	Three applications at inflorescence emergence to flowering (pre-bloom to bloom)	835	922	1150	1226
		0.189	TK0177224 Strawberry	Three applications at inflorescence emergence to maturity of fruit (pre-bloom to bloom)	296	301	7349	7411

N/A = Not applicable. Grape flowers do not produce nectar.

**Table 2.** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Cereal Grains** Crop Groups

Active Ingredient	Application Method*	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Crop Growth Stage at Application	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile	
					Parent Residue ug/kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Clothianidin	Soil	0.16	VP-39234 Corn	At seed planting	N/A	N/A	37.7	42.3
		0.2	VP-39240 Corn	At seed planting	N/A	N/A	5.3	6.1
			VP-39442 Corn	At seed planting	N/A	N/A	25.9	33.4
	Soil and seed treatment	0.16 (soil) 0.25 mg ai/seed	VP-39234 Corn	At seed planting	N/A	N/A	5.1	6.4
			VP-39071 Corn	At seed planting	N/A	N/A	5.2	6.1
		0.16 (soil) 0.5 mg ai/seed	VP-39234 Corn	At seed planting	N/A	N/A	20.2	24.5
			VP-39071 Corn	At seed planting	N/A	N/A	6.2	8.2
			VP-39442 Corn	At seed planting	N/A	N/A	18.2	20.9
		0.16 (soil) 1.25 mg ai/seed	VP-39071 Corn	At seed planting	N/A	N/A	2.3	2.6
	Soil and seed treatment	0.18 (soil) 0.25 mg ai/seed	VP-39240 Corn	At seed planting	N/A	N/A	0.4	4.8

**Table 2 (Continued).** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Cereal Grains** Crop Groups

Active Ingredient	Application Method	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Crop Growth Stage at Application	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile	
					Parent Residue ug/kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Thiamethoxam	Foliar and seed treatment	0.086 (foliar) 1.25 g ai/seed	TK0258214 Corn	Two foliar applications at vegetative stages	N/A	N/A	5.5	14.8
				Two foliar applications at reproductive stages	N/A	N/A	528	539
		0.126 (foliar) 1.25 g ai/seed	TK0258214 Corn	Two foliar applications at vegetative stages	N/A	N/A	6	15.1
				Two foliar applications at reproductive stages	N/A	N/A	559	566

\* In certain trials, soil or foliar application was made in addition to planting treated seed as noted in table.  
 N/A = Not applicable. Corn does not produce nectar.

**Table 3.** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Citrus Fruit** Crop Groups

Active Ingredient	Application Method	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Days After Last Application (DALA) for Sample Collection <sup>1</sup>	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile	
					Parent Residue ug/kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Clothianidin	Soil	0.2	VP-38685 Orange	47	6.8	7.51	N/C	N/C
				75	4.3	4.77	N/C	N/C
				21	11.9	12.9	N/C	N/C
				18	0.4	0.4	N/C	N/C
				46	7.0	7.66	N/C	N/C
				77	8.0	8.89	N/C	N/C
				112	9.3	10.48	N/C	N/C
				116	5.0	5.63	N/C	N/C
				144	4.7	5.26	N/C	N/C
				146	8.5	10.2	N/C	N/C
			174	3.1	3.62	N/C	N/C	
			VP-38980 Orange, Lemon	58	39.4	44.3	246*	322.9*
				181	2.31	2.72	3.94*	4.76*
				223	2.66	3.06	5.65*	6.64*
				186	10.8	12.0	29.3*	34.7*
				164	23.0	25.0	76.9*	88.6*
				88	9.98	11.1	25.0*	30.3*
121	16.4	18.4		24.0*	27.8*			

**Table 3 (Continued).** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Citrus Fruit** Crop Groups

Active Ingredient	Application Method	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Days After Last Application (DALA) for Sample Collection <sup>1</sup>	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile	
					Parent Residue ug /kg	Total Residue ug/kg	Parent Residue ug /kg	Total Residue ug/kg
Imidacloprid	Soil	0.25	EBTNL056-7 Orange	101	6.06	8.73	N/C	N/C
		0.5	EBTNL056-7 Orange	198	16.43	24.59	N/C	N/C
Thiamethoxam	Soil	0.086	TK0124743 Orange	91	1.55	2.49	N/C	N/C
				51	1.25	1.75	N/C	N/C
				46	2.26	3.176	N/C	N/C
				126	1.21	1.868	N/C	N/C
			TK0124745 Orange	44	9.28	11.13	20.5	32.3
				57, 58	4.78	6.17	18.3	34.8
				78	0.99	0.99	1.69	5.37
				38	1.64	2.2	3.57	6.74
		0.129	TK0124745 Orange	129	0.7	1.37	8.08	18.59
				84	1.42	2.01	5.08	27.9
				71	3.85	5.11	89	100.6
				84, 85	4.7	6.28	11.2	21.5

**Table 3 (Continued).** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Citrus Fruit** Crop Groups

Active Ingredient	Application Method	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Days After Last Application (DALA) for Sample Collection <sup>1</sup>	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile	
					Parent Residue ug/kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Thiamethoxam	Soil	0.172	TK0124745 Orange	53	5.04	6.25	8.49	32.43
				75	5.85	7.36	19.7	43.38
				38	5.15	6.17	15.02	20.11
				128	4.57	6.2	17.02	47.34
				81	3.95	5.47	20.02	44.97
			TK0177221 Orange, Lemon	45	<LOD <sup>2</sup>	<LOD <sup>3</sup>	2.64	3.78
				49	5.85	7.23	51.8	51.8
				59	16.9	21.59	67.2	107.8
				35	<LOD <sup>2</sup>	<LOD <sup>3</sup>	1.25	7.78
			TK0124743 Orange	91	1.97	2.47	N/C	N/C
		51		6.91	7.463	N/C	N/C	
		46		1.63	2.13	N/C	N/C	
		126		2.0	2.895	N/C	N/C	
		0.256	TK0124743 Orange	83, 59	16.71	18.65	210.41	291.59
				91, 93	27.15	31.83	67.68	117.46
				41, 38	21.96	24.52	235.31	329.85
				60, 59	38.1	46.99	322.48	577.06
				105, 104	15.38	18.04	285.94	362.04
109, 111	24.93			31.9	159.38	317.42		

**Table 3 (Continued).** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Citrus Fruit** Crop Groups

Active Ingredient	Application Method	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Days After Last Application (DALA) for Sample Collection <sup>1</sup>	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile	
					Parent Residue ug/kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Thiamethoxam	Soil	0.257	TK0124745 Orange	45	15.4	18.53	28.9	49
				60, 61	13	15.28	20	36.3
				36	4.02	4.93	38.35	41.58
				118	12.51	18.36	48.18	53.84
				72	16.3	21.39	36.1	69.7
				87, 88	6.14	8.09	30	60.1
		0.556	TK0124745 Orange	47	17.3	20.47	53.1	91
				62, 63	30.6	36.07	91	152.6
				36	16.24	32.48	50.36	60.94
				119	24.11	31.15	80.39	163.68
				74	27.3	33.3	93.6	161.5
				89, 90	20	25.46	52.1	125.38
		0.558	TK0124743 Orange	91	16.7	20.06	N/C	N/C
51	18.8			22.33	N/C	N/C		
46	6.51			7.53	N/C	N/C		
126	13.8			16.39	N/C	N/C		
Imidacloprid	Foliar	0.5	EBNTY007 Orange	44	243	267.1	2846	3257.9

**Table 3 (Continued).** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Citrus Fruit Crop Groups**

Active Ingredient	Application Method	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Days After Last Application (DALA) for Sample Collection <sup>1</sup>	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile	
					Parent Residue ug /kg	Total Residue ug/kg	Parent Residue ug /kg	Total Residue ug/kg
Thiamethoxam	Foliar	0.086	TK0250069 Orange	53	3.3	4.8	248	484
		0.172	TK0250069 Orange	117	0.6	1.3	91.2	97.4
				53	4.8	7.4	276	565

N/C = Not collected. Residue samples were not collected for pollen.

\* Residues in anthers used as surrogate for pollen.

<sup>1</sup> A single value in this column represents the sample timing for both pollen and nectar samples. Values separated by commas represent the sample timing for nectar and pollen, respectively.

<sup>2</sup> The nectar Limit of Detection (LOD) for this study was 0.5 µg/kg.

<sup>3</sup> The pollen LOD for this study was 1 µg/kg.



**Table 4.** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Cucurbit Vegetables** Crop Groups

Active Ingredient	Application Method	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Crop Growth Stage at Application	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile	
					Parent Residue ug/kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Clothianidin	Soil	0.2	VP-38263 Pumpkin	Germination (at seed planting)	4.5	5	10.6	12.3
				Formation of side shoots (pre-bloom)	15.9	18.9	37.6	42.3
			VP-38938 Cucumber, Melon, Pumpkin, Squash	Germination (at seed planting)	10.7	11.8	15.6	18.9
				VP-38971 Pumpkin	Germination (at seed planting)	5.1	6	8.7
				Leaf development (pre-bloom)	9.9	11.3	20.3	22.9
			VP-39242 Melon	Germination (at seed planting)	35.7	41	33.7	39.2
Dinotefuran	Soil	0.536	10934.4104 Pumpkin	Two applications at inflorescence emergence to flowering (pre-bloom to bloom)	39	50.5	88.3	145

**Table 4 (Continued).** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Cucurbit Vegetables** Crop Groups

Active Ingredient	Application Method	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Crop Growth Stage at Application	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile	
					Parent Residue ug/kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Thiamethoxam	Soil	0.125	TK0222530 Pumpkin	Leaf development (pre-bloom)	4.8	5.9	5.2	8
		0.172	TK0222530 Pumpkin, Squash, Melon	Leaf development (pre-bloom)	21.4	23.6	10.6	19.7
			TK0024668 Cucumber	Germination (at seed planting)	11.4	13.2	8.2	10.8
Clothianidin	Foliar	0.2	VP-38313 Pumpkin	Two applications at flowering (at bloom)	5	8.1	71	80
		0.1	VP-38971 Pumpkin	Leaf development (pre-bloom)	0.3	0.5	1.4	1.7
Dinotefuran	Foliar	0.268	S16-02008 Pumpkin	Two applications at inflorescence emergence to flowering (pre-bloom to bloom)	N/C	N/C	532.9	568.4
Thiamethoxam	Foliar	0.046	TK0242074 Pumpkin	Two applications at flowering (at bloom)	1.7	9.7	4.8	7.2
		0.172	TK0222532 Cucumber	Two applications at formation of side shoots to inflorescence emergence (pre-bloom)	263	289	1050	1080
			TK0242074 Pumpkin	Two applications at flowering (at bloom)	8.6	15	14.7	18

N/C = Not collected. Residue samples were not collected for nectar.

**Table 5.** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Fruiting Vegetables** Crop Groups

Active Ingredient	Application Method	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Crop Growth Stage at Application	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile	
					Parent Residue ug/kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Thiamethoxam	Soil	0.125	TK0242072 Tomato	Leaf development (pre-bloom)	N/A	N/A	75.3	191
		0.172	TK0242072 Tomato	Leaf development (pre-bloom)	N/A	N/A	67	157
			TK0236306 Pepper	Leaf development to formation of side shoots (pre-bloom)	67	181	46	260
Dinotefuran	Soil	0.536	10934.4103 Tomato	Two applications at formation of side shoots to flowering (pre-bloom to bloom)	N/A	N/A	9813	24467
Thiamethoxam	Foliar	0.172	TK0222531 Tomato	Inflorescence emergence to flowering (pre-bloom to bloom)	N/A	N/A	6116	6520
Dinotefuran	Foliar	0.268	10934.4103 Tomato	Two applications at flowering to development of fruit (during bloom)	N/A	N/A	22839	60320

N/A = Not applicable. Tomato flowers do not produce nectar.

**Table 6.** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Legume Vegetables** Crop Groups

Active Ingredient	Application Method	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Crop Growth Stage at Application	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile	
					Parent Residue ug/kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Thiamethoxam	Foliar	0.126	TK0250070 Soybean	Two applications at leaf development to flowering (pre-bloom to bloom)	1.3 <sup>^</sup>	4.7 <sup>^</sup>	34 <sup>*</sup>	41 <sup>*</sup>

\* Residues in anthers used as surrogate for pollen.

<sup>^</sup> Residues sampled from honey stomachs used as a surrogate for nectar. A conversion factor was employed to convert nectar values generated from bee honey stomachs to the equivalent flower collected nectar (Tafarella, et al. 2021).

**Table 7.** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Oilseed** Crop Group

Active Ingredient	Application Method*	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Crop Growth Stage at Application	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile		Extrafloral Nectar 90 <sup>th</sup> Percentile	
					Parent Residue ug /kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Clothianidin	Foliar and seed treatment	0.083 (foliar) 0.353 mg ai/seed	VP-39066/ EBTIN115 Cotton	Inflorescence emergence to Beginning of Flowering (pre-bloom to bloom)	4	24.1	184	329	450	696
	Foliar	0.2	VP-38259 Cotton	Two applications at Inflorescence emergence to Flowering (pre-bloom to bloom)	79.4	128	246	308	2083	2341
		0.083	VP-39066/ EBTIN115 Cotton	Inflorescence emergence to Beginning of Flowering (pre-bloom to bloom)	4.8	32.7	163	283	2315	2629
Dinotefuran	Foliar	0.27	43411B104 Cotton	Two applications at Inflorescence Emergence to Beginning of Flowering (pre-bloom to bloom)	263	318	6521	11235	1920	2846

**Table 7 (Continued).** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Oilseed** Crop Group

Active Ingredient	Application Method*	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Crop Growth Stage at Application	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile		Extrafloral Nectar 90 <sup>th</sup> Percentile	
					Parent Residue ug /kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Imidacloprid	Soil	0.329	EBNTN011 Cotton	At planting	47	50	15	16	18	19
	Soil and foliar	0.171	EBNTN011 Cotton	Soil application at planting. Three foliar applications at flowering (during bloom)	129 <sup>1</sup>	135 <sup>1</sup>	401 <sup>1</sup>	409 <sup>1</sup>	1427 <sup>1</sup>	1470 <sup>1</sup>
				Soil application at planting. Three foliar applications at flowering (pre-bloom to bloom)	66 <sup>2</sup>	70 <sup>2</sup>	160 <sup>2</sup>	166 <sup>2</sup>	86 <sup>2</sup>	91 <sup>2</sup>
	Foliar and seed treatment	0.3 (foliar) /0.375 mg ai/seed	EBNTY010 Cotton	Five applications from leaf development to beginning of flowering (pre-bloom to bloom)	17.4	18.4	6.2	6.6	12.1	13.3
	Foliar	0.063	EBNTL056 Cotton	Flowering (during bloom)	52.2	55.6	N/C	N/C	N/C	N/C

**Table 7 (Continued).** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Oilseed** Crop Group

Active Ingredient	Application Method *	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Crop Growth Stage at Application	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile		Extrafloral Nectar 90 <sup>th</sup> Percentile	
					Parent Residue ug/kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Thiamethoxam	Foliar	0.126	TK0177223 Cotton	Two applications at inflorescence emergence (pre-bloom)	5.9	6.4	96.4	102.5	178	186.4

\* In certain trials, soil or foliar applications were made to crops grown from seeds treated with one of the AIs.

<sup>1</sup> Sample residues 4-5 days after last foliar application.

<sup>2</sup> Sample residues 10-14 days after last foliar application.

N/C = Not collected. Residue samples were not collected for pollen or extrafloral nectar.

**Table 8.** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Pome Fruits** Crop Groups

Active Ingredient	Application Method	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Crop Growth Stage at Application	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile	
					Parent Residue ug/kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Clothianidin	Foliar	0.187	VP-38552 Apple	Maturity of fruit and seed (post-bloom, pre-harvest)	0.6	0.8	31.1	31.6
Imidacloprid	Soil and Foliar	0.38 (soil) 0.12 (foliar)	EBNTN014 Apple	Soil application at development of fruit to senescence; Two foliar applications at flowering to senescence	1.2	3.45	45.9	58.5
Thiamethoxam	Foliar	0.086	TK0250071 Apple	Inflorescence emergence (pre-bloom)	216	225	1880	1955



**Table 9.** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Root and Tuber Vegetables** Crop Groups

Active Ingredient	Application Method	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Crop Growth Stage at Application	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile	
					Parent Residue ug /kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Clothianidin	Soil	0.2	VP-38985 Potato	At planting	N/A	N/A	113.9	213.4
Dinotefuran	Soil	0.338	10934.4100 Potato	Emergence to main stem elongation (pre-bloom)	N/A	N/A	56.9*	134.9*
Clothianidin	Foliar	0.05	VP-38985 Potato	Main stem elongation to inflorescence emergence (pre-bloom)	N/A	N/A	36.2	76.8

\* Residues in anthers used as surrogate for pollen.  
 N/A = Not applicable. Potato flowers do not produce nectar.

**Table 10.** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Stone Fruit** Crop Groups

Active Ingredient	Application Method	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Crop Growth Stage at Application	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile	
					Parent Residue ug/kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Imidacloprid	Soil and Foliar	0.38 (soil) 0.12 (foliar)	EBNTN013 Cherry, plum, apricot, peach	One soil and two foliar applications at senescence (post-bloom, post-harvest)	5.9	32	127.7	133.4
				One soil and two foliar at development of fruit to maturity of fruit and seed (post-bloom, pre-harvest)	5.9	7.4	122.1	139
Clothianidin	Foliar	0.2	VP-38563 Peach	Two applications at development of fruit to maturity of fruit and seed (post-bloom, pre-harvest)	0.3	0.9	10	12.3
Dinotefuran	Foliar	0.54	10934.4105 Cherry	Two applications at senescence (post-bloom, post-harvest)	12.5	28.5	130.5	167.1
Imidacloprid	Foliar	0.5	EBNTY008 Cherry	Five applications at senescence (post-bloom, post-harvest)	3.7	6.4	387.1	418.2
				Five applications at development of fruit to maturity of fruit and seed (post-bloom, pre-harvest)	1.1	2.05	48.4	52.3
Thiamethoxam	Foliar	0.172	TK0177222 Peach, plum, cherry	Two applications post-bloom, pre-harvest	1.5	1.6	51.6	51.8

**Table 11.** 90<sup>th</sup> Percentiles of Acceptable Residue Studies for the **Tree Nuts** Crop Groups

Active Ingredient	Application Method	Application Rate (lbs. ai/A/season)	Report Number and Crop Type	Crop Growth Stage at Application	Nectar 90 <sup>th</sup> Percentile		Pollen 90 <sup>th</sup> Percentile	
					Parent Residue ug /kg	Total Residue ug/kg	Parent Residue ug/kg	Total Residue ug/kg
Clothianidin	Foliar	0.2	VP-38473 Almond	First application at Development of fruit; Second application at Maturity of fruit and seed to Senescence (Post-bloom)	0.8	1	12.7	17

**References**

1. Troiano, J., Tafarella, B., Kolosovich, A., Cameron, R., Alder, D., Darling, R. (2018). “California Neonicotinoid Risk Determination.” Environmental Monitoring and Pesticide Registration Branches, DPR. July 2018.
2. Tafarella, B., Clendenin, B. (2022). “Response to the External Scientific Peer Review Comments on DPR’s Neonicotinoid Risk Determination.” Pesticide Evaluation Branch and Pesticide Registration Branch, California Department of Pesticide Regulation. Memorandum dated February 1, 2022.