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MEMORANDUM

SUBJECT: Clothianidin Registration of New Products and New Uses of Sepresto 75WS and PROCEED™ OPTIMUM: Addendum to Address Mitigation of Bee Hazard

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EFED recently conducted a risk assessment for a number of proposed new agricultural uses for clothianidin products, under DP355370. That assessment characterized the potential hazard to foraging pollinators from uses of clothianidin on flowering plants. This addendum addresses in more detail the potential hazards to pollinators by identifying hazards for each crop and specific application method, and suggests measures to mitigate hazards for foliar uses of clothianidin. Because of the extreme persistence of clothianidin in soil environments (half-life = 148 to 1,155 days) and the potential for translocation of this systemic pesticide to pollen and nectar, EFED does not believe that precautionary bee labeling language will effectively mitigate hazards from soil treatment or seed application of clothianidin to cucurbits and fruiting vegetables. In addition, succeeding berry crops or rotational crops that are planted following soil treatment or seed application have the potential to expose bees to residues of clothianidin in the soil.

Background:

Clothianidin is a systemic nicotinoid insecticide that may be applied via foliar, soil, or seed application. Due to its systemic properties, it may be present in/on plant tissues following any method of application. Clothianidin is also highly toxic to bees on both an acute contact and oral exposure basis ($LD_{50} = 0.0439$ and 0.0037 ug a.i./bee, respectively), and is extremely persistent in soil environments. Thus, there is a concern from the proposed soil and seed treatment uses as well as proposed foliar application uses.

The new uses involved in this request are leafy vegetables, Brassica leafy vegetables, fruiting vegetables, cucurbits, and low-growing berries, except strawberries (both foliar and soil); tree nuts, figs, pomegranates, cotton, peaches, and soybeans (foliar only).

Attached is a table developed by David Brassard of BEAD which provides detailed information regarding the potential for bee exposure from the proposed new uses. The information in the attached table regarding relative risk may be summarized as follows:

Low potential for exposure to bees: Brassica leafy vegetables and leafy vegetables (crops are harvested prior to bloom); figs (bees are unlikely to visit this crop).

Moderate /high potential for exposure, but risk may be mitigated for foliar uses if label precautions (which prohibit application prior to and during bloom) are followed: foliar application to low-growing berries, cotton, cucurbits, fruiting vegetables, peaches, pomegranates, soybeans, and tree nuts.

Potential for exposure in pollen/nectar following soil treatment: cucurbits, fruiting vegetables, and berries. Because clothianidin is extremely persistent in soil and is a systemic pesticide, there is a potential for this chemical to be translocated from the soil up through the plant into pollen and nectar. Translocation of clothianidin from the soil to the pollen and nectar of canola has been demonstrated in field studies conducted with clothianidin-treated seeds. In addition, studies conducted by Bonmatin 2005 have found that the nitroguanidine neonicotinoid, imidacloprid, which is in the same chemical class as clothianidin, translocates from the soil to the pollen of corn and sunflower plants.¹ Thus, there is a risk concern for pollinators foraging on blooming plants following seed or soil treatment. In addition because clothianidin is persistent in soil, residues may remain in the soil and be translocated into the nectar and pollen of succeeding and rotational crops. The potential for exposure of pollinators to clothianidin via this route is significant, but mitigation measures have not been developed to protect bees from exposure to soil-applied systemic pesticides.

¹ Bonmatin, J.M., P.A. Marchand, R. Charvet, I. Moineau, E.R. Bengsh, and M.E. Colin. 2005. Quantification of Imidacloprid Uptake in Maize Crops. *J. Agric. Food Chem.* 53: 5336-5341; Bonmatin, J.M., I. Moineau, R. Charvet, M.E. Colin, C. Fleche, E.R. Bengsch. 2005. Behavior of Imidacloprid in Fields. Toxicity for Honey Bees. In *Environmental Chemistry: Green Chemistry and Pollutants in Ecosystems*, ed. E. Lichtfouse, J. Schwarzbauer, D. Robert. New York: Springer.

Potential for Honeybee Exposure to Clothianidin by Crop and Application Method

Crop/Crop Group	Pests	application method	Likelihood of application during bloom ¹	Potential for honeybee visitation ²
berries (low-growing)	Cranberry weevil, flea beetles,	Foliar post bloom	Low	High
		Soil post bloom	None ³	High
Brassica leafy vegetables	Aphids, flea beetles, leafhoppers, whiteflies	Foliar	Low	Low
		Soil	None	Low
Cotton	Aphids, Lygus bugs, whiteflies	foliar	High	Moderate
Cucurbits	Aphids, flea beetles, leafhoppers, whiteflies	Foliar	High	High
		Soil	Medium-High ⁴	High
Figs	Dried fruit beetle, fig scale, vinegar flies	Foliar post bloom	Low	Low
Fruiting vegetables	Aphids, Colorado potato beetle, flea beetles, leafhoppers, Lygus bugs, pepper weevil, stink bugs, whiteflies	Foliar	High	Moderate
		Soil	Medium-High ⁴	Moderate
leafy vegetables	Aphids, flea beetles, leafhoppers, whiteflies	Foliar	Low	Low
		Soil	None	Low
Peaches	Aphids, leafhoppers, plum curculio, scale, stink bugs	Foliar post bloom	Low	High
Pomegranates	Aphids, leafhoppers, sharpshooters, whiteflies	Foliar post bloom	Low	Moderate
Soybeans	Aphids, bean leaf beetle, leafhoppers, Lygus bugs, stink bugs, whiteflies	Foliar	High	Moderate
Tree Nuts	Aphids, hickory shuckworm, leafhoppers, leafhoppers mealybugs, pecan nut casebearer, scale, whiteflies	Foliar post bloom	Low	High

¹ Likelihood of application during bloom primarily determined by the presence of damaging pest populations during the blooming period; if growers adhere to the label restrictions against application during bloom, all of the entries in this column would be "low" except for berries, cucurbits, and fruiting vegetables.

² Potential for honeybee visitation: **high**: crop frequently pollinated by honeybees transported to the field by commercial migratory beekeepers; **moderate**: crop naturally pollinated by honeybees and other pollinator species; **low**: crop does not require pollination by honeybees to reach marketable stage

³ Soil application of clothianidin to succeeding berry crops or rotational crops may pose a hazard to bees from residues that remain in the soil.

⁴ The current label allows clothianidin to be applied to cucurbits and fruiting vegetables as a soil treatment at any time from planting through 7 days pre-harvest. Because this chemical is persistent in soil environments and systemic, any soil treatment prior to or during bloom may result in residues in pollen and nectar. Thus, there is a potential for hazard to pollinators even if the application is not made during bloom. Mitigation measures have not been developed to protect bees from this route of exposure.