



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

OFFICE OF
CHEMICAL SAFETY AND
POLLUTION PREVENTION

Memorandum

DATE: April 19, 2018

SUBJECT: Transmission of Background Materials and Charge to the Panel for the July 17-20, 2018 Session of the FIFRA Scientific Advisory Panel (FIFRA SAP) Reviewing Resistance in Lepidopteran Pests to *Bacillus Thuringiensis* (Bt) Plant Incorporated Protectants in The United States: EPA's Analysis of Scientific Uncertainties Related to Resistance Management and Proposals to Enhance the Current Insect Resistance Management Program

TO: Steven Knott
Executive Secretary
FIFRA Scientific Advisory Panel Staff
Office of Science Coordination and Policy

FROM: Robert McNally, Director
Biopesticides and Pollution Prevention Division
Office of Pesticide Programs

Transmitted with this memo are copies of the EPA white paper, essential background documents (or links to them), and the charge to the Panel for the July 17 through 20, 2018 session of the FIFRA SAP reviewing Resistance in Lepidopteran Pests to *Bacillus thuringiensis* (Bt) Plant Incorporated Protectants (PIPs) in The United States: EPA's Analysis of Scientific Uncertainties Related to Resistance Management and Options to Enhance the Current Insect Resistance Management (IRM) Program. These documents do not contain any information protected under statute as Confidential Business Information (CBI). Some of these materials contain information, which may be proprietary in nature and/or are protected from disclosure to foreign and multi-national pesticide producers under FIFRA Section 10(g). In addition, several materials include information protected by copyright. The tabulated documents have completed QA/QC review and are listed below in the attached Table 1.

Table 1: Transmission of Background Materials and Charge to the Panel for the July 17-20, 2018 Session of the FIFRA Scientific Advisory Panel (FIFRA SAP) Reviewing Resistance in Lepidopteran Pests to *Bacillus thuringiensis* (Bt) Plant Incorporated Protectants (PIPs) in The United States: EPA’s Analysis of Scientific Uncertainties Related to Resistance Management and Options to Enhance the Current Insect Resistance Management (IRM) Program

Document Title	Author(s)	Date	FIFRA 10(g) Protected?	QA/QC	Master Record Identification Number (MRID)*
Resistance in Lepidopteran Pests to <i>Bacillus thuringiensis</i> (Bt) Plant Incorporated Protectants (PIPs) in The United States: EPA’s Analysis of Scientific Uncertainties Related to Resistance Management and Options to Enhance the Current Insect Resistance Management (IRM) Program	(Martinez et al., 2018)			X	Not applicable
EPA Charge Questions to the Scientific Advisory Panel Related to Identified Risk Factors for Lepidopteran Resistance to Bt and Resistance Monitoring Improvements	(Martinez et al, 2018)			X	Not applicable
BPPD Review of ABSTC’s 2014 – 2016 Compliance Assurance Program (CAP) Reports for Bt Corn Products Targeting Corn Borer and Corn Rootworm	(Martinez and Reynolds, 2017)			X	Not applicable
White paper on corn rootworm resistance monitoring for Bt Plant-Incorporated Protectants	(U.S. EPA, 2013)			X	Not applicable
Terms and Conditions for Bt Corn Registrations	(U.S. EPA, 2010)			X	Not applicable
Monitoring the susceptibility of field populations of <i>Heliothis virescens</i> and <i>Helicoverpa zea</i> to Cry1Ac and Cry2Ab2 proteins: 2016 monitoring results	Berman, K., D. Sumerford, P. Price	2017	FIFRA 10(g)	X	No MRID
Baseline susceptibility of bollworm (<i>Helicoverpa zea</i>) and tobacco budworm (<i>Heliothis virescens</i>) larvae to Cry1Ab and Cry2Ae Bt proteins – 2013	Payne, G., S. Piper, T. Dennehy, C.	2014	FIFRA 10(g)	X	No MRID

Document Title	Author(s)	Date	FIFRA 10(g) Protected?	QA/QC	Master Record Identification Number (MRID)*
	Sansone				
Unusual survival report: susceptibility of bollworm (<i>Helicoverpa zea</i>) to Cry2Ae and Cry1Ab <i>Bacillus thuringiensis</i> (Bt) proteins – 2016	Payne, G., T. Dennehy, C. Sansone	2017	FIFRA 10(g)	X	MRID 503633-01
Monitoring the susceptibility of southwestern corn borer, <i>Diatraea grandiosella</i> , collected from unexpected damage fields containing event DAS-01507-1	Crespo, A.E., Z. Pan, J. Staley, C. Pilcher, R. Binning	2015	FIFRA 10(g)	X	MRID 497854-01
Monitoring the susceptibility of southwestern corn borer (<i>Diatraea grandiosella</i>) to the Cry1F protein in southeastern Arizona: 2015 collection	Crespo, A., E. Huang, C. Pilcher	2017	FIFRA 10(g)	X	MRID 501749-01
The Impact of Inter-Kernel Movement in the Evolution of Resistance to Dual-Toxin Bt-Corn Varieties in <i>Helicoverpa zea</i> (Lepidoptera: Noctuidae)	(Caprio et al., 2016)			X	
Field-evolved resistance in corn earworm to Cry proteins expressed by transgenic sweet corn	(Dively et al., 2016)			X	
Cry1F resistance in Fall armyworm <i>Spodoptera frugiperda</i> : single gene versus pyramided Bt maize	(Huang et al., 2014)			X	
Evaluation of tolerance to <i>Bacillus thuringiensis</i> toxins among laboratory-reared western bean cutworm (Lepidoptera: Noctuidae)	(Dyer et al., 2013)			X	
Monitoring susceptibility of western bean cutworm (Lepidoptera: Noctuidae) field populations to <i>Bacillus thuringiensis</i> Cry1F protein	(Ostrem et al., 2016)			X	
Evidence for field-evolved resistance of <i>Striacosta albicosta</i> (Lepidoptera: Noctuidae) to Cry1F	(Smith et al., 2017)			X	

Document Title	Author(s)	Date	FIFRA 10(g) Protected?	QA/QC	Master Record Identification Number (MRID)*
<i>Bacillus thuringiensis</i> protein and transgenic corn hybrids in Ontario, Canada					
Susceptibility of field populations of the cotton bollworm in the southern US to four individual Bt proteins	(Yang et al., 2017a)			X	
Pollen contamination in seed mixture increases the dominance of resistance to Bt maize in <i>Spodoptera frugiperda</i> (Lepidoptera: Noctuidae)	(Yang et al., 2017b)			X	
Blended Refuge and insect resistance management for insecticidal corn	(Onstad et al., 2018)			X	
Factors associated with willingness to plant non-Bt maize refuge and suggestions for increasing refuge compliance	(Reisig, 2017)			X	
Can pyramids and seed mixtures delay resistance to Bt crops?	(Carrière et al., 2016)			X	
Density dependence and growth rate: evolutionary effects on the resistance development to Bt (<i>Bacillus thuringiensis</i>)	(Martinez et al., 2017)			X	
An empirical test of the F ₂ screen for detection of <i>Bacillus thuringiensis</i> -resistant alleles in tobacco budworm (Lepidoptera: Noctuidae)	(Blanco et al., 2008)			X	
Mechanism and DNA-based detection of field-evolved resistance to transgenic Bt corn in fall armyworm (<i>Spodoptera frugiperda</i>)	(Banerjee et al., 2017)			X	
Considerations for design of insecticides resistance monitoring programs	(Roush and Miller, 1986)			X	
Insect resistance to Bt crops: evidence versus theory	(Tabashnik et al., 2008)			X	
Field evolved resistance to Bt toxins	(Moar et al., 2008)			X	

Document Title	Author(s)	Date	FIFRA 10(g) Protected?	QA/QC	Master Record Identification Number (MRID)*
Defining Terms for Proactive Management of Resistance to Bt Crops and Pesticides	(Tabashnik et al., 2014)			X	
Early detection and mitigation of resistance to Bt maize by western corn rootworm (Coleoptera: Chrysomelidae)	(Andow et al., 2016)			X	
Impact of small fitness costs on pest adaptation to crop varieties with multiple toxins: a heuristic model	(Gould et al., 2006)			X	
Cross-resistance to toxins used in pyramided Bt crops and resistance to Bt sprays in <i>Helicoverpa zea</i>	(Welch et al., 2015)			X	
Two-toxin strategies for management of insecticidal transgenic crops: can pyramiding succeed where pesticide mixtures have not?	(Roush, 1998)			X	
Susceptibilities of <i>Helicoverpa zea</i> and <i>Heliothis virescens</i> (Lepidoptera: Noctuidae) populations to Cry1Ac insecticidal proteins	(Ali et al., 2006)			X	

*If applicable

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