Subject: Re: Massachusetts IPM Berry Blast 6/21/11
From: Sonia Schloemann <sgs@umext.umass.edu>
Date: Mon, 27 Jun 2011 10:57:54 -0400
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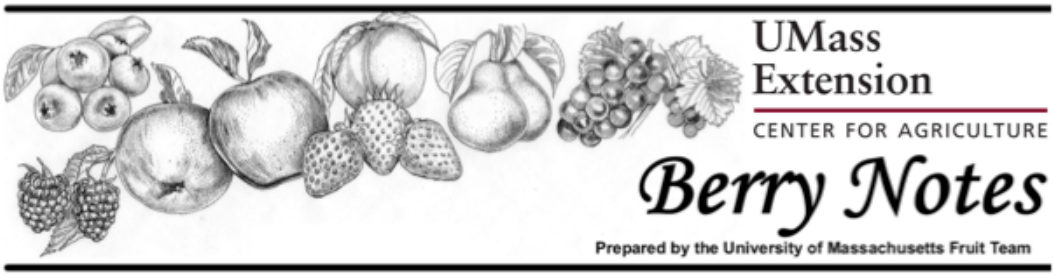

Massachusetts IPM Berry Blast 6/21/11

IN THIS BLAST:
RAINFAST CHARACTERISTICS OF INSECTICIDES (FROM MICHIGAN STATE UNIV.)

Rainfast Characteristics of Insecticides:
Know the factors that influence the amount of impact precipitation has on a pesticide's performance
John Wise, State University Extension, Department of Entomology

The numerous rainfall events experienced in Michigan over the last several weeks has prompted many questions about the relative "rainfastness" of the insecticides used in fruit production. In 2006, AgBioResearch provided funds to purchase and install a state-of-the-art rainfall simulation chamber at the MSU Trevor Nichols Research Center after which we have begun conducting trials (with generous funding support from Michigan fruit commodity groups) on fruit crops for a range of insecticides.

There are several critical factors that influence impact of precipitation on a pesticide's performance. First is the plant penetrative characteristic of the various compounds. Some pesticide chemistries, like organophosphates, have limited penetrative potential in plant tissue, and thus are considered as primarily surface materials. Many compounds, such as spinosyns, diamides, carbamates, avermectin, pyrethroids and some Insect Growth Regulators readily penetrate plant cuticles and have limited translaminar movement in leaf tissue. Others, like the neonicotinoid insecticides, are systemic and can have translaminar as well as acropetal movement in the plant's vascular.

Second is the inherent toxicity of an insecticide on the target pest. A given compound may be highly susceptible to wash-off, but if the target pest is very sensitive to the compound, there may be sufficient residue remaining to protect the crop. Related to this is the importance of understanding pest biology and behavior and the resulting threat to the crop. For an indirect pest that feeds primarily on leaves, the rainfastness of a compound on foliage is the most relevant and generally tolerance of leaf feeding injury is high compared to that of fruit. For direct pests that threaten a crop, the rainfastness of residues on fruit and leaves are both relevant. We have learned that wash-off potential for a given compound may be different on fruit than on leaves.

The fourth factor is the amount of rain received from a precipitation event. Our research suggests that the duration of a precipitation event is relatively unimportant, but the amount of rainfall will significantly impact the insecticide residues remaining on the fruit and leaves of the plant. Thus, the

decision making process whether to re-apply or not must include knowledge of the pest, the precipitation event as well as the compound's rainfastness characteristics and relative toxicity to the target pest.

In general, organophosphate insecticides have the highest susceptibility to wash-off from precipitation, although their toxicity level to most insect pests can often overcome the necessity for an immediate re-application. Neonicotinoid insecticides are moderately susceptible to wash-off, although residues that have moved systemically into plant tissue are highly rainfast, and surface residues less so. Pyrethroid, carbamate and Insect Growth Regulators insecticides are moderately susceptible to wash-off, and vary in their toxicity to the range of relevant fruit pests. Diamide and spinosyn insecticides have proven to be highly rainfast. There is much more work to be done in this area of research, so we expect to update our findings to you as they develop over the coming years.

Based on the results from the current studies, the following charts have been developed to serve as a guide for general rainfastness characteristics and re-application recommendations for certain insect pests (also printed in the 2011 Michigan Fruit Management Guide E-154). Note that these recommendations should not supersede insecticide label restrictions or farm-level knowledge based on site-specific pest scouting, but rather are meant to complement a comprehensive pest management decision-making process.

Rainfastness rating chart: General characteristics for insecticide chemical classes

Insecticide	Rainfastness	≤ 0.5"	Rainfastness	≤ 1.0"	Rainfastness	≤ 2.0"
Class	Fruit	Leaves	Fruit	Leaves	Fruit	Leaves
Organophosphates	L	M	L	M	L	L
Pyrethroids	M	M	L	M	L	L
Carbamates	M	M	L	M	L	L
IGRs	M	H				
Neonicotinoids	M,S	H,S	L,S	L,S	L,S	L,S
Spinosyns	H	H	H	M	M	L
Diamides	H	H	H	M	M	L
Avermectins	M,S	H,S	L,S	M,S	L	L

** H – highly rainfast (≤ 30% residue wash-off), M – moderately rainfast (≤ 50% residue wash-off), L – low rainfast (≤ 70% residue wash-off), S-systemic residues remain within plant tissue*

Grape insecticide precipitation wash-off re-application decision chart: Expected Japanese beetle (JB) control in grapes, based on each compound's inherent toxicity to JB adults, maximum residual and wash-off potential from rainfall.

Insecticides	Rainfall = 0.5 inch		Rainfall = 1.0 inch		Rainfall = 2.0 inches	
	*1 day	*7 days	*1 day	*7 days	*1 day	*7 days
Imidan		X	X	X	X	X
Sevin			X	X	X	X

Capture		X		X	X	X
Actara		X		X	X	X
Avaunt		X		X	X	X

** Number of days after insecticide application that the precipitation event occurred.*
X = Insufficient insecticide residue remains to provide significant activity on the target pest, and thus re-application is recommended.
= An un-marked cell suggests that there is sufficient insecticide residue remaining to provide significant activity on the target pest, although residual activity may be reduced.

Blueberry insecticide precipitation wash-off re-application decision chart: Expected cranberry fruitworm (CBFW) control in blueberries, based on each compound's inherent toxicity to CBFW larvae, maximum residual and wash-off potential from rainfall.

Insecticides	**Rainfall = 0.5 inch**		**Rainfall = 1.0 inch**		**Rainfall = 2.0 inches**	
	***1 day**	***7 days**	***1 day**	***7 days**	***1 day**	***7 days**
Guthion		X	X	X	X	X
Asana		X	X	X	X	X
Intrepid		X	X	X	X	X
Assail		X		X	X	X
Delegate		X		X	X	X

** Number of days after insecticide application that the precipitation event occurred.*
X = Insufficient insecticide residue remains to provide significant activity on the target pest, and thus re-application is recommended.
= An un-marked cell suggests that there is sufficient insecticide residue remaining to provide significant activity on the target pest, although residual activity may be reduced.

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