http://ipm.osu.edu/fruit/index.html

THE OHIO STATE UNIVERSITY Newsletter Extension

Fruit ICM News

Volume 8, No. 4
February 5, 2004

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Calendar

February 15-17: Ohio Grape Wine Short Course Area vintners are invited to The Lodge at Sawmill Creek Resort in Huron, Ohio for the Ohio Grape Wine Short Course, offered February 15-17, 2004. There is also a special marketing session for new and potential wineries on Saturday, February 14. The program features six speakers, including Elizabeth Slater, marketing consultant to the California wine industry. The topics to be covered include ice wine production and technical subjects, such as managing the Asian Lady Beetle. Registration cost is $175 for the first attendee and $160 for each additional registrant. The event is sponsored by The Ohio Grape Industries Committee, The Ohio Wine Producers Association, and The Ohio State University. For a brochure or more information, call Terry Beck at Ohio State University Extension, Wayne County (330-264-8722), or visit the OWPA web site at: http://www.ohiowines.org.

February 26, 2004: Ohio Fruit Growers Society Committee Meetings, (Tree Fruit, Small Fruit, Program, Forward Phase, Juice, & Public Affairs), Best Western, Wooster, Ohio. Contact Tom Sachs at 614-246-8292, growohio@ofbf.org, or http://www.ohiofruit.org.

February 26, 2004: Ohio Apple Operating Committee Meeting, Best Western, Wooster, Ohio. Contact Tom Sachs at 614-246-8292, growohio@ofbf.org, or http://www.ohioapples.org.

March 4-5, 2004: Growing Your Business Through Fruit and Vegetable Food Safety Workshop sponsored by the Ohio Specialty Crop Food Safety Initiative, Columbus, Ohio. Contact Jennifer Hungerford at 614-246-8289, maahs@ofbf.org or visit http://www.midamservicves.org and click on "projects." Also, see last week's issue for more information.

Bramble Cold Injury

Contributed by Dr. Richard C. Funt, Horticulture & Crop Science, OSU. Source: Byers, 1997. 1997

This article is being repeated in light of recent low temperatures reported at Ohio locations as shown in the following chart.

Jan. 2004 Low Temperatures for Ohio Locations

Location	Low Temp.(F)	Date
Akron-Canton	-3	1/25
Cincinnati	-12	1/31
Cleveland	-7	1/25
Columbus	-6	1/31
Dayton	-10	1/31
Fremont	-1	1/21
Kingsville	-10	1/25
Mansfield	-3	1/25
Norwalk	-11	1/25
Piketon	-11	1/31
Toledo	-7	1/25
Wooster	-8	1/25
Youngstown	-8	1/25

Cold winter temperatures can cause damage and result in reduced yields in brambles (raspberries and blackberries). Generally, bramble plants acclimate for the winter in late September to early December in Ohio. Acclimation can be noticed by reduced or no terminal growth, change in leaf color, and leaf drop.

The retention of leaves indicates reduced bud survival. However, cold hardiness is complex, with different species and cultivars varying in their response to low temperatures, depending on location; exposure to cold, dry winds; fluctuating cold-to-warm temperatures; and prolonged wet soils or poor soil water drainage.

Red raspberry plants are generally hardier than black raspberry. Early growth cessation in red raspberry plants is positively correlated with winter hardiness. However, a cultivar with a low chilling requirement may begin growing in late January when temperatures rise above 50 degrees F. Temperatures rising above 42 degrees F followed by a period of temperatures dropping below 20 degrees F for several hours can cause severe winter damage to canes. Cold hardiness is generally determined by cultivar, but can be enhanced by different methods of management, such as irrigation, soil fertility, and mulching.

Raspberry plants on raised beds suffer less winter injury than plants on flat beds. This can be an effect of higher soil air (less water) volume and an improved root environment. Fertigation during the growing season can be beneficial in that nitrogen can be increased in the leaf, and more effectively in primocanes, as compared to nitrogen broadcast as dry fertilizer over plants in early spring. Freeze tolerance is negatively correlated with cane growth and leaf nitrogen. With certain red raspberry cultivars, winter dieback was greater as the number of canes (cane density) increased. Therefore, cane thinning can increase cold hardiness. In Ohio, straw mulch improved yields of certain thornless blackberries when mulch was applied around December 15 and removed in early March.

In Missouri, in a test with five black raspberry cultivars, Bristol was best for fluctuating seasonal temperatures. Jewel performed equal to Bristol. Similar observations have proven Bristol and Jewel to be preferred in Ohio. Researchers also indicate that control of the disease anthracnose is an important practice for cane survival.

Conclusions:

- Select a well-drained soil type; use raised beds.
- Select a site with wind breaks or establish wind breaks so that plants are not subjected to cold, dry winds.
- Select cold hardy cultivars and those which have shown resistance to fluctuating mid-winter temperatures.
- Maintain good cane density and vigorous, disease-free plants.
- Use irrigation and fertilizer wisely for primocane growth.

Insecticide Resistance Action Committee (IRAC) Mode of Action (MoA)

Source: http://www.irac-online.org/documents/moa/moa.doc

Reviewed and re-issued annually, the IRAC Mode of Action (MoA) classification provides farmers, growers, advisors, extension staff, consultants, and crop protection professionals with a guide to the selection of insecticides or acaricides in an effective and sustainable insecticide or acaricide resistance management (IRM) strategy. In addition to presenting the MoA classification, this document outlines the background to and purpose of the classification list and provides guidance on how it is used for IRM purposes.

What is resistance?

Resistance to insecticides is defined as *a heritable change in the sensitivity of a pest population that is reflected in the repeated failure of a product to achieve the expected level of control when used according to the label recommendation for that pest species* (IRAC). It arises through the over-use or mis-use of an insecticide or acaricide against a pest species and results in the selection of resistant forms of the pest and the consequent evolution of populations that are resistant to that insecticide or acaricide.

MoA, target-site resistance, and cross-resistance

In the majority of cases, not only does this resistance render the selecting compound ineffective, but it often also confers cross-resistance to other chemically related compounds. This is because compounds within a specific chemical group usually share a common target site within the pest and thus share a common mode of action (MoA). It is common for resistance to develop that is based on a genetic modification of this target site. When this happens, the interaction of the selecting compound with its target site is impaired, and the compound loses its pesticidal efficacy. Because all compounds within the chemical sub-group share a common MoA, there is a high risk that the resistance that has developed will automatically confer cross-resistance to all the compounds in the same sub-group.

Effective IRM strategies use alternations or sequences of MoA

Experience has shown that all effective insecticide (and acaricide) resistance management (IRM) strategies seek to minimize the selection for resistance from any one type of insecticide or acaricide. In practice, alternations, sequences, or rotations of compounds from different MoA groups provide a sustainable and effective approach to IRM. This ensures that selection from compounds in the same MoA group is minimized. Applications are often arranged into MoA spray windows or blocks that are defined by the stage of crop development and the biology of the pest(s) of concern. Local expert advice should always be followed with regard to spray windows and timings. Several sprays of a compound may be possible within each spray window, but it is generally essential to ensure that successive generations of the pest are not treated with compounds from the same MoA group.

Non-target site resistance mechanisms

It is recognized that resistance of insects and mites to insecticides and acaricides can also result from enhanced metabolism by enzymes within the pest, reduced penetration of the pesticide into the pest, or behavioral changes of the pest that are not linked to any site of action classification, but are specific for individual compounds or chemical groupings. Despite this, alternation of compounds from different chemical classes remains an entirely viable resistance management technique, since such a practice will always minimize selection pressures.

The MoA classification

The following classification scheme developed and endorsed by IRAC is based on mode of action. It is our aim to ensure that insecticide and acaricide users are aware of mode of action groups and that they have a sound basis on which to implement season-long, sustainable resistance management through the effective use of sequences of insecticides with different modes of action. To delay resistance, it is strongly recommended that growers also integrate other control methods into insect or mite control programs.

The IRAC Mode Of Action Classification V 3.3, October 2003
Source: http://www.irac-online.org/documents/moa/moa.doc

Group	Sub-group	Primary Target Site of Action	Chemical Sub-group or Exemplifying Active Ingredient
1*	A	Acetycholine esterase inhibitors	Carbamates
	B		Organophosphates
2*	A	GABA-gated chloride channel antagonists	Cyclodiene organochlorines
	B		Fipronil (or Phenylpyrazoles?)
3		Sodium channel modulators	Pyrethroids, Pyrethrins, DDT
4*	A	Nicotinic Acetylcholine receptor agonist/ antagonists	Neonicotinoids
	B		Nicotine
	C		Cartap, Bensultap
5		Nicotinic Acetylcholine receptor agonists (not group 4)	Spinosyns

6		Chloride channel activators	Avermectins, Milbemycins
7*	A	Juvenile hormone mimics	Juvenile hormone analogues
	B		Fenoxycarb
	C		Pyriproxyfen
8*	A	Compounds of unknown or non-specific mode of action (fumigants)	Methyl bromide
	B		Aluminium phosphide
	C		Sulfuryl floride
9*	A	Compounds of unknown or non-specific mode of action (selective feeding blockers)	Cryolite
	B		Pymetrozine
	C		Flonicamid
10*	A	Compounds of unknown or non-specific mode of action (mite growth inhibitors)	Clofentezine, Hexythiazox
	B		Etoxazole
11*	A1	Microbial disruptors of insect midgut membranes (including transgenic crops expressing *Bacillus thuringiensis* toxins)	*Bacillus thuringiensis* var. *israelensis*
	A2		*Bacillus thuringiensis* var. *sphaericus*
	B1		*Bacillus thuringiensis* var. *aizawai*
	B2		*Bacillus thuringiensis* var. *kurstaki*
	C		*Bacillus thuringiensis* var. *tenebrionsis*
12*	A	Inhibitors of oxidative phosphorylation, disruptors of ATP formation	Diafenthiuron
	B		Organotin miticides
13		Uncoupler of oxidative phosphorylation via disruption of H proton gradient	Chlorfenapyr, DNOC
14		Inhibition of magnesium-stimulated ATPase	Propargite
15		Inhibitors of chitin biosynthesis, type 0, Lepidopteran	Benzoylureas
16		Inhibitors of chitin biosynthesis, type 1, Homopteran	Buprofezin
17		Inhibitors of chitin biosynthesis, type 2, Dipteran	Cyromazine
18		Ecdysone agonist / disruptor	Diacylhydrazines
19		Octopaminergic agonist	Amitraz
20		Site II electron transport inhibitors	Hydramethylnon, Dicofol
21		Site I electron transport inhibitors	METI acaricides, Rotenone
22		Voltage-dependent sodium channel blocker	Indoxacarb
23		Inhibitors of lipid synthesis	Tetronic acid derivatives

24		Site III electron transport inhibitors	Acequinocyl, Fluacrypyrim
25		Neuroactive (unknown mode of action)	Bifenazate
26		Unknown mode of action	Azadirachtin

Notes:

* Not all members of this class have been shown to be cross-resistant. Different resistance mechanisms that are not linked to the target site of action, such as enhanced metabolism, may be common for this group of chemicals. Alternation of compounds from different sub-groups within this class may be an acceptable part of an IRM strategy

Products containing multiple or stacked toxins will be differentiated from those containing single toxins only. This will be done by adding a suffix of "m" for multiple toxin products and "s" for single toxin products. Products containing spores will be differentiated from those without spores by adding "+" for spore-containing products and "-" for those which do not contain spores. For example, Bacillus thuringiensis var. kurstaki products containing multiple toxins and spores may be designated as 11Dm+, while the same product without spores and expressing only one toxin would be designated as Group 11Ds-

Pesticide Groups for Tree Fruits

Created by Ted W. Gastier, Ohio State University Extension, from the 2004 Commercial Tree Fruit Spray Guide, 2004 Vegetable Production Guide, and the 2004-2005 Pennsylvania Tree Fruit Production Guide

Trade Name	**Common Name**	**IRAC Group**	**Impact***	**Impact****	**Impact*****	**Labeled Species**
Acramite	bifenazate	25		**1** to 2		Apple, Pear, Peach, Plum, Nectarine
Actara	thiamethoxam	4A	low/moderate	1 to 2	**L** to M	Pear
Agri-Mek	abamectin	6	low/moderate	2	L to **M**	Apple, Pear
Ambush	permethrin	3	disruptive		L to **H**	Apple, Pear, Peach, Cherry
Apollo	clofentezine	10A		**0** to 1		Apple, Pear, Peach, Cherry, Nectarine, Apricot
Asana	esfenvalerate	3	disruptive	2 to **3**	L to **H**	Apple, Pear, Peach, Cherry, Plum, Nectarine, Apricot
Assail	acetamiprid	4A	low/moderate	1 to **2**		Apple, Pear
Avaunt	indoxacarb	22	low/moderate	1 to 2	**L** to M	Apple, Pear
Calypso	thiacloprid	4A		2		Apple, Pear
Capture	bifenthrin	3	disruptive			Pear

Carzol	formetanate HCL	1A		1 to 3	M to H	Apple, Pear, Peach, Nectarine
Confirm	tebufenozide	18	low	0	L	Apple, Pear
Danitol	fenpropathrin	3	disruptive	2 to **3**	H	Apple, Pear
Diazinon	diazinon	1B	moderate	1 to 3	M to **H**	Apple, Pear, Peach, Cherry, Plum
Dimethoate	dimethoate	1B	disruptive	1 to 3	M to **H**	Apple, Pear
Dipel	*Bacillus thuringiensis*	11B2	very low		L	Apple, Pear, Peach, Cherry, Plum
Entrust	spinosad	5	low			Apple, Pear, Peach, Cherry, Plum, Nectarine, Apricot
Esteem	pyriproxyfen	7C		1 to **2**	L	Apple, Pear, Peach, Cherry, Plum, Nectarine, Apricot
Guthion	azinphos-methyl	1B	disruptive	**1** to 2	**L** to H	Apple, Pear, Peach, Cherry, Plum, Nectarine
Imidan	phosmet	1B	moderate	1	**L** to H	Apple, Peach
Intrepid	methoxyfenoxide	18	low	0		Apple, Pear, Peach, Cherry, Plum, Nectarine
Kelthane	dicofol	20	low/moderate	**1** to 2	**L** to M	Apple, Pear
Lannate	methomyl	1A	disruptive	2 to 3	M to **H**	Apple, Pear, Peach
Lorsban	chlorpyrifos	1B	moderate	1 to **2**	L to H	Apple, Pear, Peach, Cherry, Nectarine
Malathion	malathion	1B	low/moderat	1	**L** to H	Peach, Cherry
Marlate	methoxychlor	2A				Apple, Pear, Peach, Cherry, Plum
Metasystox-R	oxydemeton-methyl	1B	moderate			Apple, Pear, Cherry, Plum, Nectarine, Apricot
Mitac	amitraz	19			L to **H**	Pear
M-Pede	potassium salts of fatty acids	-	low		L	Apple, Pear, Peach, Cherry, Plum
Neemix	azadirachtin	26	low/moderate		**L** to M	Apple, Pear, Peach, Cherry, Plum, Nectarine, Apricot
Pounce	permethrin	3	disruptive	1 to **3**	L to **H**	Apple, Pear, Peach, Cherry, Nectarine (3.2EC only)

Provado	imidacloprid	4A	low/moderate	1 to **2**	**L** to H	Apple, Pear, Peach, Cherry, Plum, Nectarine, Apricot
Pyramite	pyridaben	21		2	**M** to H	Apple, Pear, Peach, Cherry, Plum, Nectarine, Apricot
Savey	hexythiazox	10A		0 to **1**	L	Apple, Pear, Peach, Cherry, Plum, Nectarine, Apricot
Sevin	carbaryl	1A	disruptive	2 to 3	L to **H**	Apple, Pear, Peach, Cherry, Plum
SpinTor	spinosad	5	low	0	L	Apple, Pear, Peach, Cherry, Plum, Nectarine, Apricot
Supracide	methidathion	1B			H	Apple, Pear, Peach, Cherry, Plum, Nectarine, Apricot
Sunspray	Oil		low	1 to **2**	L to M	Apple, Pear, Peach, Cherry, Plum
Thiodan	endosulfan	2A	moderate	1 to **2**	L to **M**	Apple, Pear, Peach, Cherry, Plum, Nectarine, Apricot
Vendex	fenbutatin oxide	oa*	moderate	**1** to 3	L	Apple, Pear, Peach, Cherry, Plum, Nectarine
Vydate	oxamyl	1A	disruptive	**2** to 3	L to **H**	Apple, Pear
Warrior	lambda-cyhalothrin	3	disruptive	2 to **3**		Apple, Pear, Peach, Cherry, Plum, Nectarine, Apricot
Zeal	extoxazole	uca*				Apple, Pear, Peach, Cherry

Impact* 2004 Ohio Vegetable Production Guide (Impact on beneficial insects)

Impact** 2004-2005 Pennsylvania Tree Fruit Production Guide (toxicity to *Stethorus* adults & larvae, *Amblyseius fallacis, Zetzellia mali, Aphidoletes,* and general aphid preditors) **Bolding** indicates weighting toward that factor: 0 = nontoxic, 1 = slightly toxic, 2 = moderately toxic, 3 = highly toxic

Impact*** 2003 Cornell Pest Management Guidelines for Commercial Tree-Fruit Production (relative toxicity to bees, *Amblyseius fallacis*, *Typhlodromus pyri, Stethorus punctum,* and *Aphidoletes aphidimyza)* **Bolding** indicates weighting toward that factor L = low impact, M = moderate impact, H = High impact
oa* organotin acaricide
uca* unclassified acaricide

Preliminary Monthly Climatological Data for Selected Ohio Locations, January, 2004

Weather Station Location	Monthly Precip	Normal Monthly Precip	Avg High	Normal High	Avg Low	Normal Low	Mean Temp.	Normal Mean
Akron-Canton	3.07	2.49	27.9	32.8	13.1	17.4	20.5	25.1
Cincinnati	4.55	2.92	35.9	38	19.5	21.3	27.7	29.6
Cleveland	2.69	2.48	28.9	32.6	14.3	18.8	21.6	25.7
Columbus	5.08	2.53	30.9	36.2	17.5	20.3	24.2	28.2
Dayton	4.62	2.6	30.9	33.6	16	19	23.5	26.3
Fremont	1.67	1.79	29.2	32	11.5	16.2	20.4	24.1
Kingsville	2.63	2	27.3	31.8	13.7	17.1	20.5	24.5
Mansfield	3.78	2.63	27.7	32.4	12.5	16.2	20.1	24.3
Norwalk	2.58	1.9	28.4	32.5	13.5	16.7	21	24.6
Piketon	3.42	3.4	36.1	39.5	19.3	20.8	27.7	30.1
Toledo	1.29	1.93	27.8	31.4	13.1	16.4	20.5	23.9
Wooster	3.43	1.95	29.5	34.9	13.7	18.6	21.6	26.7
Youngstown	3.6	2.34	26.4	32.4	12	17.4	19.2	24.9

Temperatures in degrees F, Precipitation in inches

Record highs set: 2nd - Mansfield 56; 3rd - Fremont 61, Mansfield 59, Piketon 69, Wooster 62

Record highs tied: 2nd - Youngstown 52; 3rd - Akron-Canton 60, Cincinnati 67

Record lows set: 25th - Kingsville -10; 31st - Cincinnati -12, Columbus -6, Dayton -10

Table Created by Ted W. Gastier, OSU Extension from National Weather Service, OARDC and local data

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