



Brown Marmorated Stink Bug and Its Effects on Orchard Pest Management Programs

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- Dinotefuran Section 18 update
- Key management considerations
- Product selection and management recommendations



Section 18 Update

- Consultations among entomologists, USDA, and EPA determined that **dinotefuran** is the most suitable candidate for a Section 18 Emergency Exemption request
- Regional petition
- NJ, PA, DE, MD, WV, VA, NC
- Submitted to VDACS April 15, 2011
- Decision anticipated by mid-summer

Dinotefuran

- Neonicotinoid insecticide
- Two US registrants
- Valent: Venom 70SG Insecticide
- Gowan: Scorpion 35SL Insecticide
- Currently labeled for use in vegetables, grapes, and cotton

Gowan[®]
The Go To Company





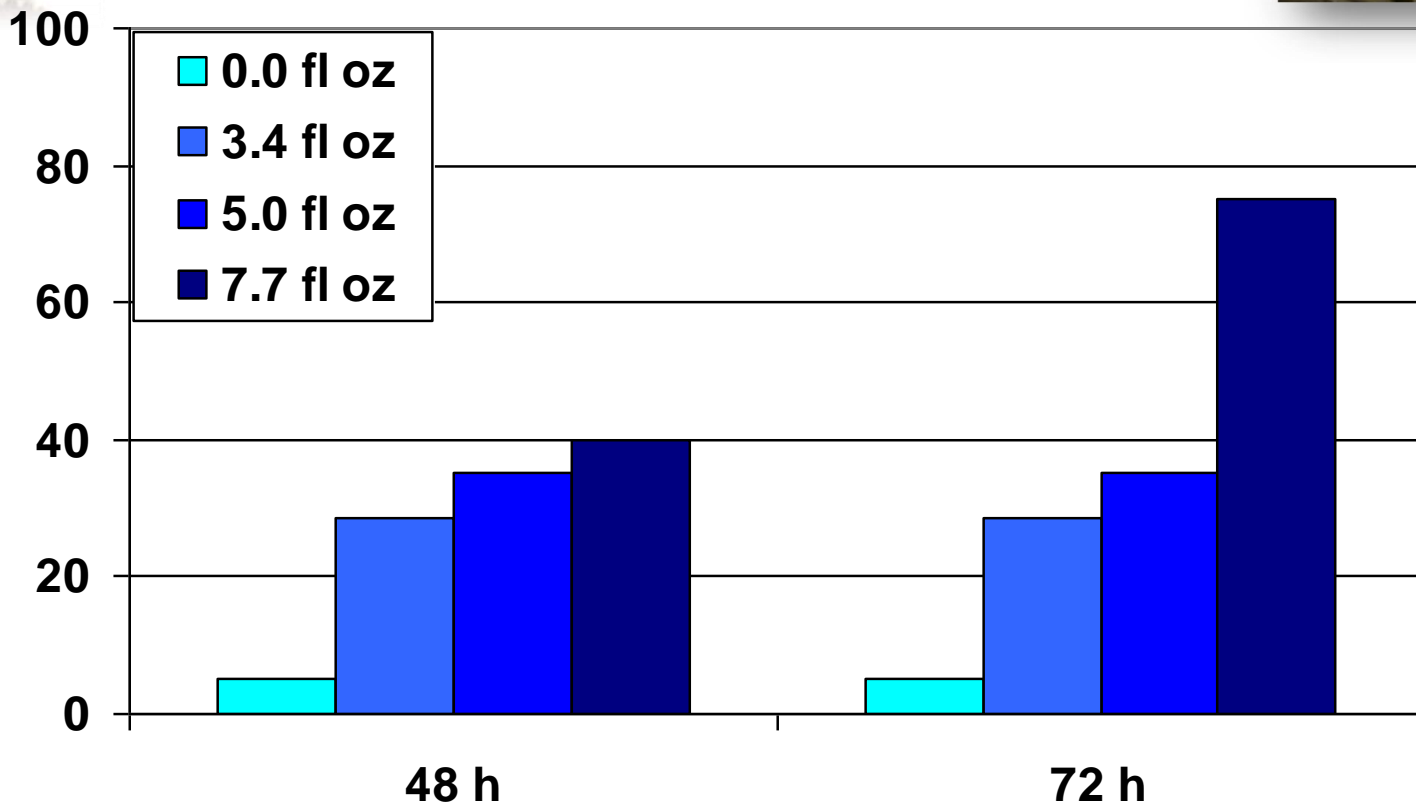
Dinotefuran Use in Asia

- Rotated with other products for BMSB control in Asian orchards (Japan, Korea)
- Maximum label rates in Japan exceed those in USA
- Asian research on BMSB management not yet translated or published
- What rate(s) per acre are used in Japan?

Scorpion 35SL: Dipped Bean Assay



Percentage of Dead Bugs

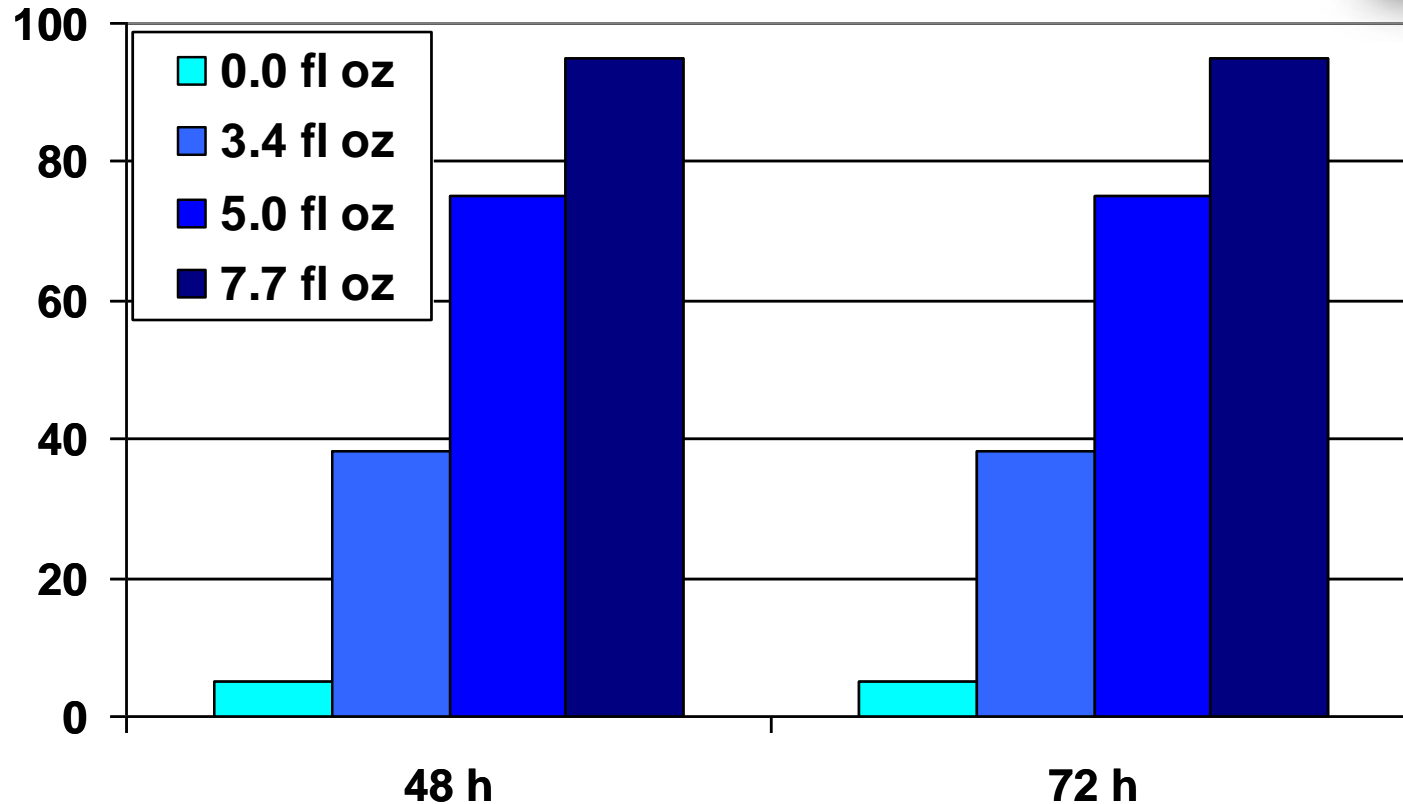


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Scorpion 35SL: Dipped Bean Assay



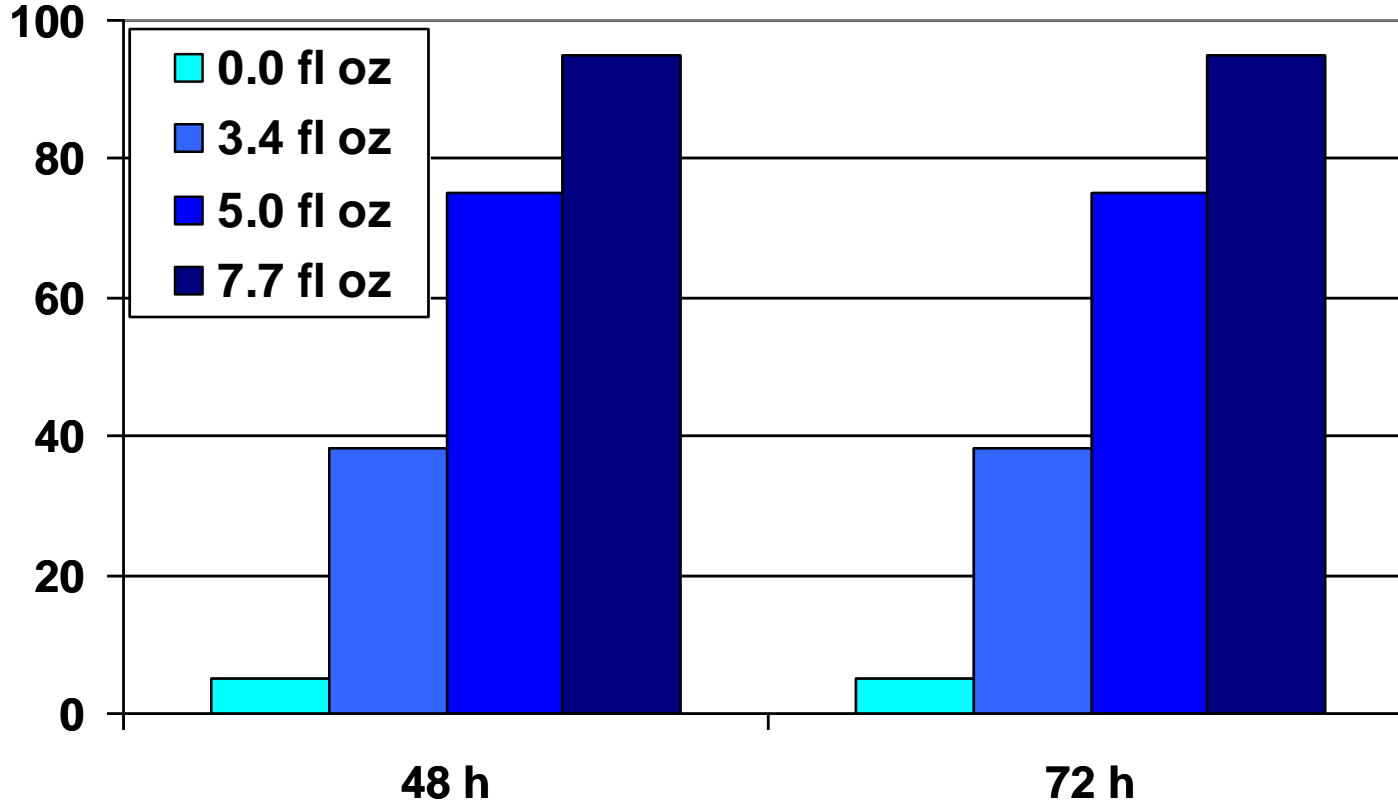
Percentage of Dead & Intoxicated Bugs



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Scorpion 35SL: Dipped Bean Assay

Percentage of Dead & Intoxicated Bugs



Is 7.7 fl oz of Scorpion or an equivalent rate of Venom Sufficient to achieve required efficacy in the field?



Section 18 Perspectives: Registrants

- No field efficacy data against BMSB in US tree fruits
- Unknown relationship between lab bioassay results and field efficacy or residual activity
- Liability concerns
- Venom 70SG: 4 – 6.75 oz/A
- Scorpion 35SL: 8 – 12 fl oz/A
- Maximum 2 applications/season
- 12 hour REI, 3 day PHI



Section 18 Perspectives: Cooperative Extension

- Dinotefuran seems to have good utility
- Short REI and PHI well suited to late season applications
- Rotational product (resistance management)
- **Untested in orchards**
- Efficacy, rate, timing?



Section 18 Perspectives: Cooperative Extension

- Venom & Scorpion **are not “silver bullets”**
- Access to them will not make or break the 2011 growing season
- Dinotefuran (and other products) will need to be evaluated against BMSB in 2011
- Product recommendations are based on the best information currently available



Key Decisions for 2011

- What blocks may be at most risk?
- When to time pesticide applications?
- What products, rate and application type to use?
- How to ensure control of other pests?
- How to scout/monitor?



Key Considerations: BMSB Biology

- Feeds on **many** plants/crops
- Present throughout the season
- Reproduction can occur in orchards
- Nymphs also feed on fruit
- Adults are strong fliers, routinely moving between habitats
- Anecdotal reports of large numbers of bugs in orchards at night

Key Considerations: Injury and Scouting

- More injury on border rows
- Reports of more injury in tree tops
- Gummosis and dimpling in peach starting end of May
- Peaches show internal injury not visible on surface



Key Considerations: Injury and Scouting

- Depressions in apples by mid-June
- Discolored depressions by late June
- Likely variety dependent
- Extensive injury possible in Sept-Oct
- Some injury not detected at harvest, but expressed in cold storage





Key Considerations: Management

- Assume season-long vulnerability
- Nymphs more susceptible than adults
- Adults are the primary target
- Proximity to other hosts may be elevate risk, especially along adjacent borders
- Potential for re-invasion of treated orchards



Key Considerations: Management

- Some products for BMSB are highly disruptive to biocontrol agents/IPM
- Some have short residual activity
- Some of the strongest products not registered for apples or peaches or have significant use restrictions
- Some products for BMSB do not necessarily have the best fit for other key pests



Main unresolved questions

- Relative effectiveness of complete versus ARM sprays?
- Required rates of strongest products?
- Managing BMSB without flaring other pests? (e.g. mites, SJS, WAA)
- Will some varieties/blocks require more aggressive intervention?
- Relationship between BMSB numbers and injury?



Strategies/tactics to consider

- Pre-bloom mite and SJS management
- Mating disruption for CM and OFM
- Killing/repelling adults will be paramount
- ARM vs complete spray applications?
- Regular injury and bug scouting
- Monitor with traps?
- Spray in the evening or at night?
- Surround as a repellent?

Bioassay results limit product selection for apples & peaches

Active Ingredient	Lethality Index
Dimethoate	93.3
Malathion	92.5
Bifenthrin	91.5
Methidathion	90.4
Endosulfan	90.4
Methomyl	90.1
Chlorpyrifos	89.0
Acephate	87.5
Permethrin	77.1
Azinphosmethyl	71.3
Dinotefuran	67.3
Fenpropathrin	66.7
Kaolin Clay + Thiamethoxam	66.7
Formetanate HCl	63.5
Thiamethoxam	56.3
Clothianidin	55.6
Beta-cyfluthrin	54.8
Gamma-cyhalothrin	53.8
Lambda-cyhalothrin	52.9
Zeta-Cypermethrin	52.1
Cyfluthrin	49.0
Esfenvalerate	43.3
Imidacloprid	40.0
Tolfenpyrad (SC)	36.5
Oxamyl	34.2
Tolfenpyrad (EC)	33.3
Pyrifluquinazon	28.3
Kaolin Clay	23.1
Diazinon	20.4
Phosmet	20.0
Acetamiprid	18.8
Thiacloprid	18.3
Abamectin	16.3
Indoxacarb	11.3
Spirotetramat	9.8
Carbaryl	9.2
Flonicamid	7.7
Water (Control)	5.8
Cyantraniliprole	1.7

**20 products with
a Lethality Index
of >50**

Bioassay results limit product selection for apples & peaches

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Dimethoate	93.3
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Bifenthrin	91.5
Methidathion	90.4
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Acephate	87.5
Permethrin	77.1
Azinphosmethyl	71.3
Dinotefuran	67.3
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Beta-cyfluthrin	54.8
Gamma-cyhalothrin	53.8
Lambda-cyhalothrin	52.9
Zeta-Cypermethrin	52.1
Cyfluthrin	49.0
Esfenvalerate	43.3
Imidacloprid	40.0
Tolfenpyrad (SC)	36.5
Oxamyl	34.2
Tolfenpyrad (EC)	33.3
Pyriproxyfen	28.3
Kaolin Clay	23.1
Diazinon	20.4
Phosmet	20.0
Acetamiprid	18.8
Thiacloprid	18.3
Abamectin	16.3
Indoxacarb	11.3
Spirotetramat	9.8
Carbaryl	9.2
Fonicamid	7.7
Water (Control)	5.8
Cyantraniliprole	1.7

Most tree fruit pest management programs are based on products from this group



USDA bioassay results:

Top 10 list for BMSB

1. Dimethoate
2. Malathion
3. Bifenthrin
4. Methidathion
5. Endosulfan
6. Methomyl
7. Chlorpyrifos
8. Acephate
9. Permethrin
10. Azinphosmethyl

Products labeled for use in apples

Methidathion

Endosulfan

Methomyl

Chlorpyrifos

Permethrin

Azinphosmethyl





Label restrictions limit product utility in apples

(assuming critical BMSB control after petal-fall)

Endosulfan

Methomyl

Azinphosmethyl



Other label restrictions further limit product utility in apples

Endosulfan (Thionex WP and EC)

- Both formulations in phase-out
- Peach: July 31, 2012
- Apple: July 31, 2015
- EC formulation has caused fruit finish issues in apples in the past
- WP formulation has 20-day REI under phase-out agreement
- Highly impractical option!



Other label restrictions further limit product utility in apples

Azinphosmethyl (Guthion 50WP)


- In phase-out
- Apple: September 30, 2012
- Seasonal limit of 3 lb/A in 2011



Inherent properties of some products may limit their performance

Methomyl (Lannate WP and LV)

- Residual activity only several days



USDA bioassay results:

Products 11- 20

Dinotefuran

Fenpropathrin

Kaolin clay + thiamethoxam

Formetanate hydrochloride

Thiamethoxam


Clothianidin

Beta-cyfluthrin

Gamma-cyhalothrin

Lambda-cyhalothrin

Zeta-cypermethrin



USDA bioassay results:

Products 11- 20

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Gamma-cyhalothrin

Lambda-cyhalothrin

Zeta-cypermethrin




Surround (kaolin clay)

- Mined near Macon, GA
- Processed to fine, white clay particles
- Inert, non-toxic
- FDA approved for use in foods, cosmetics
- Used for fruit sunburn protection, but also has interesting insect repellent properties
- May have promise against BMSB
- Not rain-fast under heavy rain
- Opposition from processors if residue at harvest, due to potential effects on juice filtration equipment

Surround-treated apples in Hawkes Bay, New Zealand, 2010




The Apple Toolbox



Trade Name	Active Ingredient	Lethality Index	Rank
Lannate	methomyl	90.1	6
Guthion	azinphosmethyl	71.3	10
Danitol	fenpropathrin	66.7	12
Actara	thiamethoxam	56.3	15
Belay	clothianidin	55.6	16
Baythroid	beta-cyfluthrin	54.8	17
Proaxis, Declare	gamma-cyhalothrin	53.8	18
Warrior, Lambda-Cy	lambda-cyhalothrin	52.9	19
Mustang Max	zeta-Cypermethrin	52.1	20

Products in RED are highly disruptive to biological control and IPM!

The Peach Toolbox



Trade Name	Active Ingredient	Lethality Index	Rank
Malathion	malathion	92.5	2
Thionex EC	endosulfan	90.4	5
Lannate	methomyl	90.1	6
Guthion	azinphosmethyl	71.3	10
Danitol	fenpropathrin	66.7	12
Actara	thiamethoxam	56.3	15
Belay	clothianidin	55.6	16
Baythroid	beta-cyfluthrin	54.8	17
Proaxis, Declare	gamma-cyhalothrin	53.8	17
Warrior, Lambda-Cy	lambda-cyhalothrin	52.9	18
Mustang Max	zeta-Cypermethrin	52.1	19

Fewer secondary pest problems in peaches following **RED products, but still a concern**

Disclaimer

The information and suggested management options presented here are not intended to be considered definitive. Suggestions are offered based on the best information currently available and on consultation with tree fruit entomologists in the eastern US. The management suggestions offered are based primarily on the relative effectiveness of products evaluated and compared against BMSB in recent laboratory bioassays conducted at the USDA ARS facility at Kearneysville, WV. The results of on-going laboratory evaluations of insecticide efficacy against BMSB, using other bioassay approaches, may validate or contradict earlier results. The relative performance of individual products, application rates or timings of these products against BMSB under field conditions have not yet been validated. The programs suggested were developed for situations in which large BMSB populations in 2010 might be expected to require intervention throughout most or all of the fruiting period of apples and peaches in 2011. Products are suggested at timings considered reasonable, while also managing other key pests using the same or additional products. Use of these suggested programs may or may not prove to provide acceptable management of BMSB. Other program options may prove to provide equal or superior control of BMSB.

J. Christopher Bergh
April 18, 2011

VA Commercial Peach Orchard Trials: 2011

Timing	Target Pest(s)	Product(s)	Rate/A	Notes
PB	SJS*	oil	4 gal	* If issue in 2010
PF	TPB, SB, OFM, GPA	Permethrin 3.2EC + Provado 1.6F	12 fl oz 4 fl oz	
Shuck-split	PC, TPB, SB, OFM	Thionex EC	1.67 qt	
Shuck-fall	TPB, SB	Permethrin 3.2 EC	12 fl oz	
1C	TPB, SB	Permethrin 3.2 EC + Actara 25WG	12 fl oz 2.5 oz	
2C	SB, OFM	Thionex EC* + Altacor 35WDG**	1.67 qt 3 oz	* 7 d REI, 30 d PHI ** If OFM counts exceed threshold
3C	SB, OFM	Lannate SP	1 lb	4 d REI
4C	SB, OFM, JB	Permethrin 3.2EC	12 fl oz	12 h REI, 14 d PHI
5C	SB, OFM	Lannate SP	1 lb	4 d REI, 4 d PHI
5C	SB, OFM, JB	Danitol 2.4EC	18 fl oz	24 h REI, 3 d PHI
6C	SB, OFM (JB)	Danitol 2.4EC	18 fl oz	24 h, REI, 3 d PHI

VA Commercial Apple Orchard Trials: 2011

(For varieties harvested after Sept 1; based on applications at about 10-d intervals starting ~ May 20)

Timing	Target Pest(s)	Product(s)	Rate/A	Notes
DD	SJS, ERM, RAA, WAA	Oil + Lorsban 3.8	4 gal 2.5 pt	
TC - pink	RAA, TPB	Assail 30SG	3 oz	
PF	PC, TPB, SB, OFM, ERM	Assail 30SG + Abba + oil	6 oz 10 fl oz 1 gal	
1C	CM, SB	??? (+ Altacor 35WDG)*	1lb 3 oz	* If CM counts exceed threshold
2C	SB, CM	Lannate SP	1 lb	
3C	SB, CM, TABM	Lannate SP + Altacor 35WDG	1 lb 3 oz	
4C	SB, TABM	Guthion 50WP	2 lb	14-d REI
5C	SB, CM, OFM	Lannate SP	1 lb	

VA Commercial Apple Orchard Trials: 2011

Timing	Target Pest(s)	Product(s)	Rate/A	Notes
6C	SB	Bely 2.13SC	6 oz	
7C	SB, TABM, CM, OFM, AM	Guthion 50WP + Lannate SP	1 lb 1 lb	14-d REI
8C	SB, CM, OFM	Danitol 2.4EC	18 fl oz	
9C	SB, OFM	Lannate SP	1 lb	
10C	SB	???		
11C	SB, OFM	Danitol 2.4EC + OFM sprayable*	18 fl oz 2.9 fl oz	* If OFM trap counts exceed threshold
12C	SB	Leverage 360SC	2.8 fl oz	12 h REI, 7 d PHI
13C	SB	Belay 2.13SC	6 oz	12 h REI, 7 d PHI

May have access to Venom and Scorpion for late season applications

BMSB Trapping



60+ traps deployed in commercial apple and peach orchards in VA and at the Virginia Tech AHS-AREC



Buyer beware!

- Be wary of claims that traps can be used to “prevent the migration” of BMSB into orchards!
- The BMSB invasion is the kind of issue that attracts profiteers!



1

STINK BUG CONTROL



**Stink
Bugs**

SECRETS REVEALED

[HTTP://WWW.GETRIDOFSTINKBUGSNOW.COM](http://www.getridofstinkbugsnow.com)

A Resource Guide compiled by William Campbell

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We're all in this together!

- The BMSB issue will not be resolved by any one laboratory, agency, institution or other interested party
- This will require a sustained, cooperative effort among researchers and others
- By the end of the 2011 season we know **much more** than we do now
- Future discussions toward resolving this issue should involve researchers, growers, fruit processors, regulators and chemical companies



**Thank you and
best wishes for
the 2011 season!**

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