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TRI-CITIES

May 13, 2014 Ref: 2014-6&7-1

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Subject: Thiophanate Methyl & Carbendazim: Registration Review

I am responding to your request for information about the use of thiophanate methyl and carbendazim in Integrated Pest Management (IPM) programs. This response from the Western IPM Center provides input from a seven-state region: Alaska, California, Idaho, Montana, Oregon, Utah, and Washington.

Almond:

Information on the use of thiophanate methyl in almond production has been supplied by the Almond Board of California and is attached to this letter.

Cherry/Peach/Nectarine:

Thiophanate methyl is used in soft stone fruits for the control of blossom blight, brown rot, and also in the control of scab.

Chickpea:

Thiophanate methyl is used on chickpea where it is applied as a foliar treatment when plants are at 10 to 30% bloom. It is used to control gray mold (Botrytis cinerea), white mold (Sclerotinia sclerotiorum), and Anthracnose (Colletotrichum truncatum). Its use is important in IPM programs because this is one of the few low cost and effective products growers can use to manage foliar infections by the above diseases.

Grape:

Thiophanate methyl is used for powdery mildew and botrytis bunch rot in vineyards west of the Rockies. It is not that commonly used in Washington, but because it has a different FRAC Code (1) than other commonly use fungicides (3 and 11) it is an excellent option to have in the toolkit for fungicide resistance management.

Greenhouse:

Thiophanate methyl is used in greenhouses for the control of gray mold and powdery mildew.

Pistachio:
In pistachio production thiophanate methyl is used for the control of Botryosphaeria panicle and shoot blight.

Pome Fruit:
Thiabendazole and thiophanate methyl have key uses in post-harvest disease control in pome fruits. There are now fungicides with a few different modes of action that can be used for post-harvest pest control, but that management is actually started in the field with treatments just before harvest. It is recommended, to prevent resistance problems in the packing house, that growers use one mode of action in the field and follow with a fungicide with another mode of action in the packing house. These materials are both very important from a resistance management standpoint in pome fruit production.

Potato:
The potato industry may be submitting comments separately.

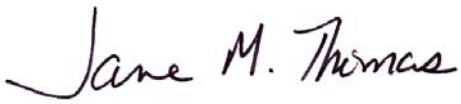
Strawberry:
Thiophanate methyl is used in strawberry production for the control of Botrytis gray mold. Thiophanate methyl and similar materials have also been used to go after leaf spotting diseases (such as common leaf spot and scorch) and Botrytis fruit rot. Resistance to this material is widespread and can be very stable. For leaf spotting problems it is recommended that thiophanate methyl be tank mixed with other fungicides with a different mode of action. It is not currently recommend for use for the control of Botrytis fruit rot due to the resistance issue.

Attached to this letter are:

- Thiophanate methyl use information on almonds provided by the Almond Board of California.
- A contact list should you have further questions, and
- A spreadsheet showing the 2012 California use data

I hope you find this information useful.

Sincerely,



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Thiophanate-Methyl Use in Almond

A range of modes of action for fungicides are critical to avoid resistance development. Thiophanate-methyl has a unique mode of action for currently registered fungicides making it an important treatment option to maintain.

Diseases treated with Thiophanate-Methyl

Thiophanate-methyl is part of IPM programs for the below listed diseases in almond. Restricted Entry Interval (R.E.I.) for Thiophanate-methyl recommended by UC-IPM is 3 days which matches label requirements.

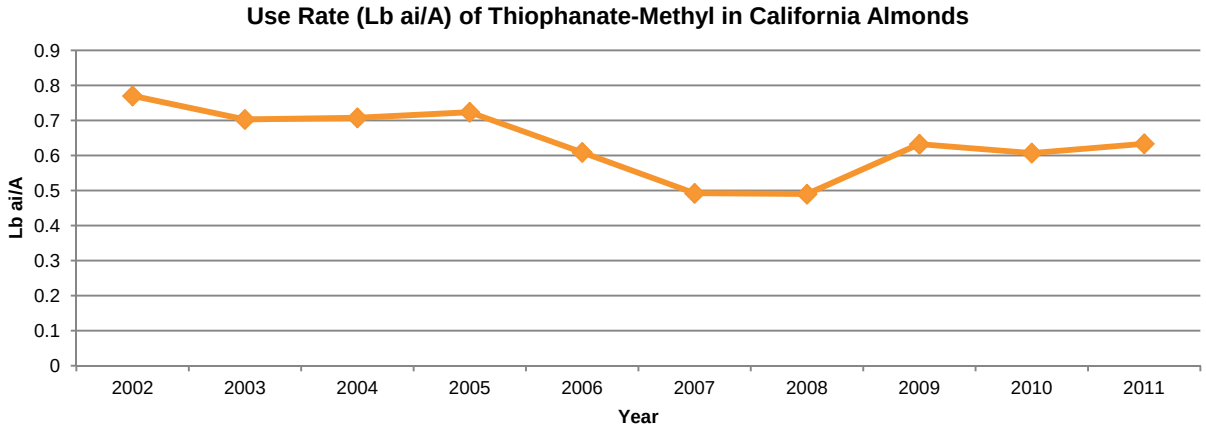
1. Brown Rot Blossom Blight
    a. **Pathogens:** *Monilinia laxa, Monolinia fructicola*
    b. **Disease summary:** Brown Rot is a fungal disease that kills almond flowers by attacking stigma, anthers, and or petals – all of which are very susceptible to infection. Upon killing the flower (and nut which would form from that flower), it can move into and kill woodier tissues of the tree. Once in the woodier tissue, it forms a canker which can enlarge to kill the branch and also serves as the survival structure for the fungus. A severe brown rot infection can take years to clean up from an orchard. Initial infection is favored by rainy weather with temperatures in the mid-70s during bloom. High humidity (fog) also increases infection rates. This makes the Brown Rot a threat for Northern California almond growers.
    c. **When to treat:** Brown Rot treatment at full bloom is most effective, with moderate effectiveness at pinkbud and least effectiveness at petal fall. Dormant and spring sprays are ineffective.
    d. **Treatment Efficacy:** Thiophanate-methyl provides excellent and consistent control for Brown Rot according to UC IPM Fungicide Efficacy for Almond Diseases studies.
    e. **UC-IPM recommended rate:** 1.5 – 2 lb/A

2. Jacket Rot (Green Fruit Rot)
    a. **Pathogens:** *Botrytis cinerea, Sclerotinia schlerotiorum, Monilinia laxa*
    b. **Disease summary:** Jacket Rot begins when the fungus infects senescing petals and anthers. In almond varieties where nuts tend to bunch, this infection will occur at late bloom on mature petals, then on flower jackets, and progress to infect the fruit, which will cause the nutlets to drop. When conditions are cool and wet during bloom, Jacket Rot can cause severe losses.
    c. **When to treat:** Jacket rot treatment is most effective at full bloom. Other treatment timing windows do not provide effective disease control.
    d. **Treatment Efficacy:** Thiophanate-methyl provides excellent and consistent control for Jacket Rot according to UC IPM Fungicide Efficacy for Almond Diseases studies.
    e. **UC-IPM recommended rate:** 1.5 – 2 lb/A

3. Scab
    a. **Pathogen:** *Cladosporium carpophilum*
    b. **Disease summary:** Scab has become more common in almond orchards due to the increased planting density. The fungus survives in twig lesions with spores spread by wind, rain, or sprinkler irrigation where water reaches foliage. Scab is favored by prolonged wet spring weather. Causing defoliation in late summer, this disease can weaken the tree, reducing crop for the coming years. A heavily infected orchard will have persistent scab issues for several years after the disease flare up.
    c. **When to treat:** Scab treatment with TM occurs at petal fall when sporulation of twig infections begins. Most effective treatment occurs 0, 2, and 5 weeks after petal fall with least effective treatment in May sprays. Dormant treatment is a moderately effective treatment with copper/oil or liquid lime sulfur. Other treatment timing windows do not provide effective disease control.
    d. **Treatment Efficacy:** Thiophanate-methyl provides good and reliable control for Jacket Rot according to UC IPM Fungicide Efficacy for Almond Diseases studies.
    e. **UC-IPM recommended rate:** 1.5 lb/A

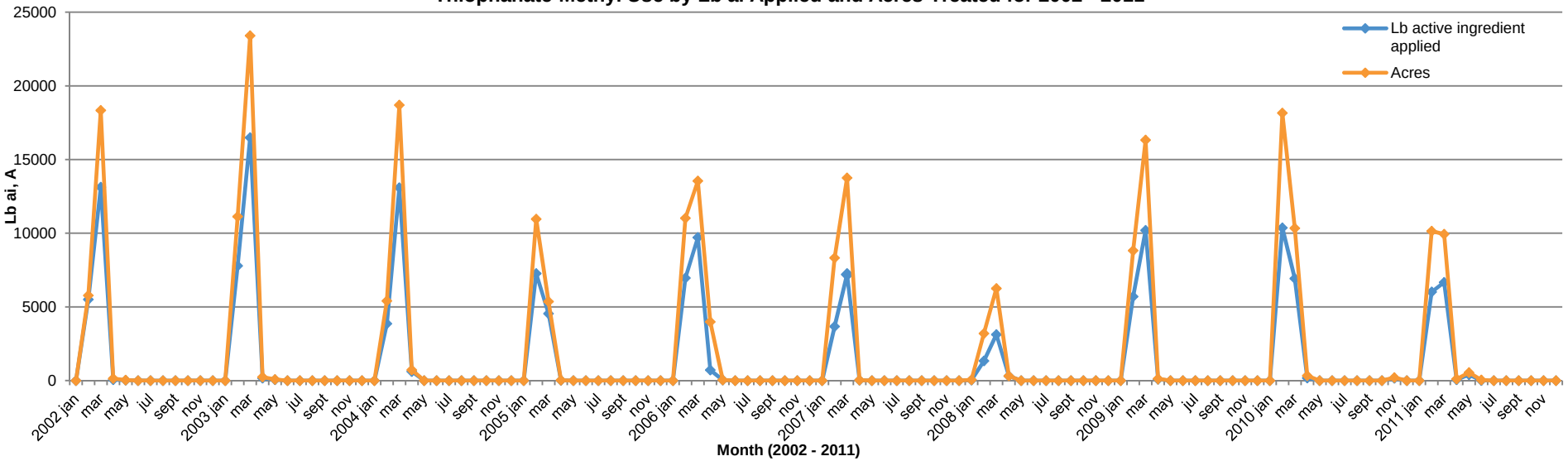
4. Anthracnose
    a. **Pathogen:** *Colletotrichum acutatum*
    b. **Disease summary:** Anthracnose is a damaging fungal disease that attacks blossoms, leaves, fruit, and limbs in almonds. Infected leaves tend to develop water-soaked lesions that eventually fade in color. Defoliation can occur, but leaves often remain attached to the branches. Often, the fruit may gum profusely as the fungus is able to penetrate into the kernel, killing the embryo. Affected nuts often remained attached to the spur. Shoots and spurs that bear infected nuts often become infected and die. Anthracnose affects the current year's crop as well as affecting the future crop by damaging and weakening the affected scaffolds. Anthracnose is most severe in wet, warm springs (> 60F).
    c. **When to treat:** Most effective treatment for Anthracnose occurs from full bloom through May spray (includes petal fall, 2 weeks after petal fall, 5 weeks after petal fall). Moderately effective treatment can occur in a June spray but spring applications are only be necessary if late spring rains occur.
    d. **Treatment Efficacy:** Thiophanate-methyl provides effective treatment when mixed with captan or maneb.
    e. **UC-IPM recommended rate:** 1 – 1.5 lb/A

Thiophanate-Methyl Use Analysis (Source: CA DRP, USDA-NASS)

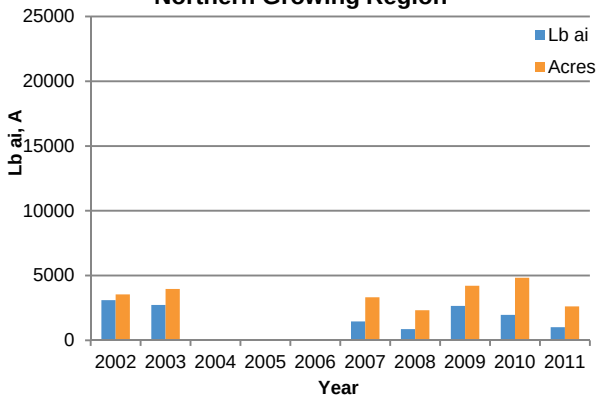


california almonds
Almond Board of California

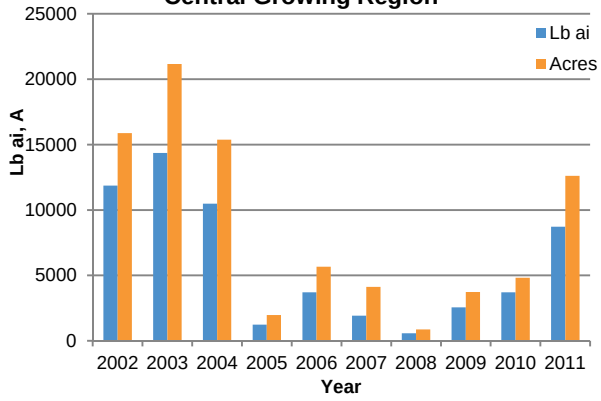
Thiophanate-Methyl Use by Lb ai Applied and Acres Treated for 2002 - 2011



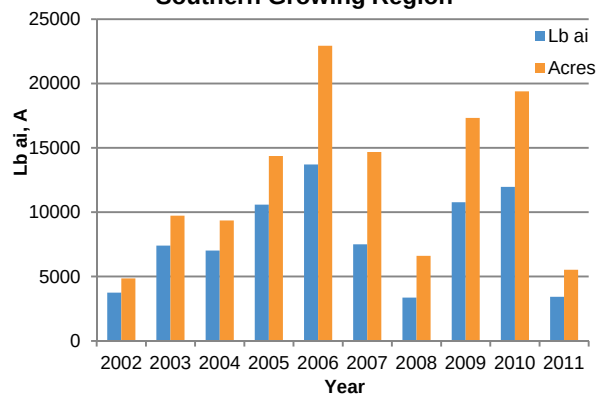
Annual Thiophanate-Methyl Use Northern Growing Region



Annual Thiophanate-Methyl Use Central Growing Region



Annual Thiophanate-Methyl Use Southern Growing Region



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AlmondBoard.com

california almonds
Almond Board of California

Annual Thiophanate-Methyl Usage in Almond Contrasted with Bearing Acreage				
	Total Lb ai Applied	Total Acres Treated	Bearing Acres	% Bearing Acreage Treated
2002	18,711.88	24,285	545,000	4.46%
2003	24,505.53	34,856	550,000	6.34%
2004	17,566.09	24,824	570,000	4.36%
2005	11,829.33	16,347	590,000	2.77%
2006	17,417.84	28,599	610,000	4.69%
2007	10,888.56	22,123	640,000	3.46%
2008	4,806.53	9,811	680,000	1.44%
2009	15,982.66	25,274	720,000	3.51%
2010	17,627.62	29,033	740,000	3.92%
2011	13,157.54	20,766	760,000	2.73%

Source: USDA-NASS, California DPR-PUR

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AlmondBoard.com

Thiophanate Methyl Contact List

Crop	First Name	Last Name	Phone	Email	Orgnaization	Title	State
almond	Danielle	Veenstra	(209) 343-3257	dveenstra@almondboard.com	Almond Board of California	Specialist, Agricultural and Environmental Affairs	California
cherry	Jim	Farrar	(530) 750-1271	jjfarrar@ucdavis.edu	University of California	Director, Western IPM Center	California
chickpea	Lyndon	Porter		lporter@pars.ars.usda.gov	USDA/ARS	Research Plant Pathologist	Washington
grape	Jim	Farrar	(530) 750-1271	jjfarrar@ucdavis.edu	University of California	Director, Western IPM Center	California
grape	Michelle	Moyer	(509) 786-9234	michelle.moyer@wsu.edu	Washington State University	Assistant Professor/Extension Viticulturist	Washington
greenhouse	Jim	Farrar	(530) 750-1271	jjfarrar@ucdavis.edu	University of California	Director, Western IPM Center	California
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pistachio	Jim	Farrar	(530) 750-1271	jjfarrar@ucdavis.edu	University of California	Director, Western IPM Center	California
strawberry	Jim	Farrar	(530) 750-1271	jjfarrar@ucdavis.edu	University of California	Director, Western IPM Center	California
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