PERENNIAL CROP NURSERY SECTOR PROGRESS – PACIFIC AREA-WIDE PROGRAM FOR MB ALTERNATIVES

B.D. Hanson[1]*, S. Gao[1], J. Gerik[1], R. Qin[2], and D. Wang[1]
USDA-ARS, [1]Parlier, CA and [2]UC Davis, Parlier, CA.

The perennial crop nursery sector of the Pacific Area-Wide Pest Management Program for Methyl Bromide (MB) Alternatives has a primary focus on open-field production of garden rose bush and deciduous trees planting stock in California. This industry contributes over $165 million (US$) to the economy of the state and supplies over 60% of the total fruit, nut, and rose plants sold in the USA. Adoption of MB alternatives in California nurseries has been slow primarily due to stringent state regulations related to the Nursery Stock Nematode Certification program. In order to receive nematode-free certification, producers of tree nursery stock for planting into commercial production fields must either use an approved treatment or undertake a comprehensive soil and root sampling program. The current threshold for parasitic nematodes in California nurseries is "detection". Thus, if parasitic nematodes are detected in a nursery block at the end of the growing cycle, the planting stock is non-saleable which can result in complete economic loss of a crop valued at over $75,000 ha^{-1}. Although some nurseries produce plants intended for non-commercial planting, many states and countries use CDFA's certification standard as a part of their import regulations making this an industry-wide issue.

Treatments currently approved (CDFA, 2009) for open-field production of a 26-month nursery crop in California (and treatment limitations) include:

- MB, tarped with HDPE. Sandy soil (336 kg ha^{-1}), clay loam (448 kg ha^{-1}).
- MB, dual applic. At least 7 d after 1st treatment plow to flip soil and retreat with 2nd applic. Sandy (336 + 168 kg ha^{-1}), clay loam (448 + 168 kg ha^{-1}).
- 1,3-D, untarped dual applic. At least 14 d after 1st treatment, plow to flip soil and retreat with 2nd application. Sandy (351 kg ha^{-1} + 159 kg ha^{-1}).
    - *Not approved on clay loam soils.*
- 1,3-D, tarped with HDPE. Sandy to sandy loam soil (372 kg ha^{-1}).
    - *Not approved on fine textured or moist soils.*
- 1,3-D, Sandy to sandy loam soil (372 kg ha^{-1}) followed with 130 kg ha^{-1} MITC generator 7-21 days later.
    - *Not approved on fine textured or moist soils.*
- 1,3-D, Sandy to sandy loam soil (372 kg ha^{-1}) coapplied with 130 kg ha^{-1} MITC generator.
    - *Not approved on fine textured or moist soils.*

The objectives of the perennial crop nursery Area-wide project are complementary to our recent research on alternative fumigants, alternative application techniques, and integrated practices to maintain broad spectrum pest

control in tree and rose nurseries. A partial list of recent research projects included in, or contributing to, the nursery industry sector is presented in Table 1.

Progress to date: In the first two years of this project, we addressed issues related to fostering adoption of the only currently approved non-MB fumigant. First, because air quality regulations are impacting potential uses of 1,3-D, we evaluated several emission reduction techniques including a modified shank design (McKenry 2003) and several surface seal techniques. Second, we evaluated the effects of the modified application shank and surface seals on pest control efficacy in field experiments conducted at research stations and in commercial nurseries. The commercial nursery trials included replicated intermediate-sized plots and allowed collection of pest control and crop productivity in 'real world' situations and also served as field demonstrations of MB alternatives with influential growers. The emission research has been completed and data are being analyzed and prepared for final reports. The commercial-scale research and demonstration trials are currently in the final year of nursery stock production and will be completed in early 2010. In 2009, two large-scale demonstration trials in commercial nurseries were initiated and will continue through the nursery production cycle.

Future direction: In the final three years of the Area-wide project, we plan to complete the ongoing nursery sector projects and shift our focus to development and demonstration of integrated approaches to soil-borne pest management. Fumigant options in perennial crop nurseries are severely limited by nematode certification, thus short-term solutions are likely to include chemical fumigants. However, as alternative fumigants and techniques are phased in for nematode control, other pest control issues are likely to emerge. After nematode certification requirements, weed control remains one of the largest management issues and economic considerations in nursery pest control. Soil fumigation alone (even with MB) often does not provide and maintain a consistently high level of weed control over a 1- to 3-yr crop cycle because of weed species' biology, ecology, and response to environmental conditions (Hanson and Shrestha, 2006). Most California nurseries rely on preplant fumigation followed by extensive tillage and hand weeding to maintain acceptable weed control during the growing season. Some growers also utilize herbicide applications; however, herbicide options are very limited in nurseries and many growers are not comfortable with the risk of crop injury. As alternative fumigants are phased in and labor and fuel costs continue to rise, herbicides are likely to become a more important weed management tool in perennial crop nurseries. In the next phase of the perennial crop nursery sector's Area-wide project, we plan to continue technology transfer efforts and will develop and demonstrate integrated approaches which combine available and emerging fumigant alternatives with effective herbicides for management of the broad soil-borne pest spectrum found in open-field nurseries.

Literature Cited:

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Table 1. Perennial crop field nursery research and demonstration projects contributing to the goals of the Pacific Area-Wide Program for Methyl Bromide Alternatives.

			Data collected				
Year(s)	Nursery crop	Location	emission	weed	nematode	crop safety	reference
Alternative fumigants, rates, or techniques.							
2001-03	tree, vine, berry	Visalia, CA	-	x	x	x	Schneider. 2009. HortTechnol. 19:331-339.
2001-03	garden rose	Wasco, CA	-	x	x	x	Schneider. 2009. HortTechnol. 19:526-532.
2004-06	stonefruit tree	Yuba City, CA	-	x	x	x	Schneider. 2009. HortTechnol. 19:526-532.
2005-08	garden rose	Wasco, CA	-	x	x	x	Hanson. 2006. MBAO proc. p.126.
2006	none	Parlier, CA	x	x	x	-	Gao. 2008. Sci. Tot. Environ. 405:206-214
2006-07	none	Parlier, CA	x	x	x	-	Hanson, Qin. 2007. MBAO proc. p. 42 & 43.
2006-07	stonefruit tree	Visalia, CA	-	x	x	x	Hanson. 2009. MBAO proc. (in press)
2008	stonefruit tree	Visalia, CA	-	-		x	-
2009	stonefruit tree	Parlier, CA	-	-	x	x	-
Herbicides plus fumigants							
2006-07	stonefruit tree	Yuba City and Hickman, CA	-	x	-	x	Hanson. 2008. Weed Technol. 22:493-498.
2006-07	garden rose	Wasco, CA	-	x	-	x	Hanson. 2007. Abstr. WSSA. 47:47
2006	nut tree nursery	Visalia, CA	-	x	-	x	Hanson. 2007. Proc. CWSS. 59.
2007	stonefruit tree	Newcastle, CA	-	x	-	x	Hanson. 2008. Proc: WSWS. 61:13.
2008	10 tree nursery trials	several	-	x	-	x	-
2008	2 rose nursery trials	Wasco, CA	-	x	-	x	-
2009	8 tree nursery trials	several	-	x	-	x	-
Areawide nursery research and demonstration							
2007	none	Parlier, CA	x	x	x	-	Qin. 2008. MBAO proc. p. 31.
2007-09	garden rose	Wasco, CA	-	x	x	x	Hanson. 2008. MBAO proc. p. 25.
2008	none	Parlier, CA	x	x	x	-	-
2008-10	stonefruit tree	Hickman, CA	-	x	x	x	-
2009-10	stonefruit tree	Oakdale, CA	-	x	x	x	-
2009-10	stonefruit tree	Hickman, CA	x	x	x	x	-