# FACILITATING ADOPTION OF ALTERNATIVES TO METHYL BROMIDE IN CALIFORNIA STRAWBERRIES

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**Summary.** The goal of this project is to facilitate the adoption of practical alternatives to methyl bromide (MB) for California strawberries. Several approaches to production of strawberry without MB were demonstrated: soilless production, heat disinfestation, solarization, biofumigants and herbicides. The raised bed trough system is a soilless strawberry production method frequently used in Europe. We are demonstrating strawberry production using a soilless non-fumigant production system. Additional work demonstrated non-fumigant methods to control key soil pests by heat (steam, solarization), mustard seed meals and combinations of heat with mustard seed meals or fumigants. The ultimate goal of this research is to develop, assess, and demonstrate alternative fumigant and non-fumigant practices for producing strawberries without MB.

Specific objectives and progress to date:

1. Evaluate methods to produce strawberry using the raised bed trough system. Work here is focused on methods of disinfestation for the soil and substrate including fumigant and nonfumigant methods.

   Substrate production field trials were initiated near Santa Maria, CA, and at MBA near Watsonville, CA in fall 2010. The studies were randomized complete block trials and treatments were replicated 4 times. Treatments included: 1) coir, 2) peat:perlite (70:30), 3) soil + amendments (50:50), 4) fumigated grower standard, 5) non-fumigated grower standard. The amended field soil was disinfested with steam. This study was managed by the California Strawberry Commission, collaborating researchers and growers. The media/soil samples collected from the field sites were analyzed for pH, electrical conductivity (EC), nitrate (N), phosphorous (P) and ammonium ($NH_4$). So far N and P levels are highest in the coir and peat:perlite mixes compared to soil. We also found that pH levels in the amended soil at both sites are low – in the 4.4 to 4.5 range. Fruit yields through late June 2011 in the substrate treatments were not significantly different than the fumigated standard bed at either site. Additionally, we are evaluating substrate production in pillows (substrates in a bag) at Salinas, CA. Fruit yield in the

pillow treatment was lower than yields from strawberries grown in soil. No further work is planned on the pillow system.

2. Evaluate and demonstrate promising non-fumigant alternatives in the conventional raised strawberry beds. Alternatives for strawberry will include mustard seed meal or fungicides used with sequential herbicide applications.

Evaluate and demonstrate pre-plant non-fumigant alternatives for strawberry produced in soil. Field trials were initiated at Salinas, Ventura and Watsonville, CA in Fall 2010 to test: 1) mustard seed meal (MSM) at 3000 lbs/A, 2) steam at 70 ºC for 20 min., 3) MSM + steam as above, 4) Pic-Clor 60 at 300 lbs/A, 5) MBPic at 350 lbs/A, 6) control. Steam and MSM + steam controlled *Verticillium* similar to MBPic and Pic-Clor 60. Weed control in steam and MSM + steam treatments was similar to the fumigated treatments, but mustard seed meal alone did not control weeds. Strawberry fruit yields were higher for MSM + steam than either treatment alone. Chlorine dioxide was tested as a pre-plant soil disinfestant at Salinas, CA. Chlorine dioxide was applied by drip chemigation at 0, 50, 100 and 1000 ppm; compared to Pic-Clor 60 at 300 lbs/A. Weed densities indicate that chlorine dioxide at 100 and 1,000 PPM controlled weeds similar to Pic-Clor 60. Chlorine dioxide did not increase fruit yield relative to the control. No further work on chlorine dioxide is recommended.

3. Evaluation of herbicides for strawberry runner plant nurseries.

Clopyralid herbicide was evaluated at a MacArthur, CA strawberry nursery. Clopyralid did not control filaree, a critical nursery weed not controlled by fumigants. Future plans are to evaluate isoxaben and sulfentrazone in nurseries.

4. Demonstrate to growers the performance of key alternative treatments so that they can make informed decisions during the transition to alternative treatments.

Grower meetings were held Dec. 9, 2010 in Santa Maria, CA, Feb. 1, 2011 in Watsonville, CA and April 22, 2011 in Ventura, CA to discuss and demonstrate alternatives to MB for strawberry. Field days were held at Salinas on July 7, 2011, Watsonville/MBA on Aug. 17, 2011 and one is planned for Santa Maria on Sept. 8, 2011.