Use of plug plants and ozone safe chemical fumigants as alternatives to methyl bromide on California strawberries and other coastal high-cash crops.

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These data present the eighth year of field tests of greenhouse grown strawberry plug plants, alternative chemical fumigation, an organically acceptable strawberry production program, and tomato, turf and ornamental crop fumigation studies on the California Coast. Previous programs compared three strawberry production systems: **Conventional** – MBr/CP, **Alternative**- Telone/CP and Iodomethane/CP, and **Organic** - using CCOF/OMRI acceptable soil amendments and VAM inoculation. Results from these studies were presented by this author in previous MBAO meetings and a chronology of experimental results from these successive seasons studies are presented herein.

Current 2004 studies focus on alternative strawberry transplants (plug plants) in non-fumigated soil compared to bare root transplants in fumigated soil, and testing of alternative fumigants on strawberry and other crops such as fresh market tomatoes, turf and ornamentals. Alternative fumigants tested in both drip and raised bed shank applications include iodomethane, chloropicrin, Telone, metham sodium, and several newer compounds with promise as methyl bromide replacements.

Results

1. Alternative Strawberry transplants

Past season demonstration plug plantings totaled over 5 million plants in California with cooperating growers. Greenhouse plantings in our program for the 2003-2004 production period became contaminated with antracnose disease, *Colletotrichum acutatum*, from a commercial grower in Ontario Canada from which the tip material was obtained. In greenhouse conditions, *C. acutatum* is particularly difficult to manage, since plants are continually misted and grown in high-density populations. This event has had widespread impacts to strawberry plug plant culture nationwide. Numerous commercial strawberry plug growers in New Jersey, North and South Carolina, Florida and California lost entire crops in the fall of 2003 from contaminated tips produced by this Ontario grower. In 2004, this has event, in effect, arrested the further expansion of this alternative technology, and caused plug growers to rethink their source of tip material in the future. In our case, all research material for the 2003 fall greenhouse season was lost to this disease event.

Currently, the 2004 season's strawberry plugs are widely planted throughout Southern California, and there are no disease issues or other limiting factors with these plants to date. This was the result from selection of improved tip material grown in arid California valleys and specific Canadian plantings that were pre-selected for cleanliness with respect to disease and nutritional disorders. From this tip material, the earliness of both Camerosa and Ventana plugs is clearly evident from commercial fields with both methyl bromide fumigated and non-fumigated plantings. In addition, certified organic plugs have been set out with organic growers at two sites with biologically fortified (VAM and strains of *Bacillus subtilis*) plug plants. At the time of this abstract writing, data are not completed from replicated trials of plugs and alternative fumigants on strawberries. However, a review of this data will be presented for review.

2. Strawberry soil fumigation studies. Several experiments have been completed in 2004 that add to the base of information on fumigant efficacy from differing soil types and climatic growing regions. Two trails of importance were in the Santa Maria Valley and Salinas Valley of California. Both studies used Diamante variety strawberry and compared raised bed shank applications of alternative fumigants with VIF and conventional HDPE plastic, against drip applied fumigants similarly contrasting VIF and HDPE mulches. In both studies, Midas/Midas EC and Telone C35/Inline performed as well as the methyl bromide standards both with disease incidence and fruit yields. Numerically the VIF mulches improved fruit yields on a season average for both application methodologies. The importance of accuracy in application is discussed in light of field performance studies with fumigants.

3. Fresh Market Tomatoes. Two tomato studies were conducted in 2004 comparing various alternative fumigants with methyl bromide/chloropicrin. The diseases of common occurrence in field trials included *Fusarium oxysporum*, *Verticillium daliae*, Corky Root (*Pyrenochaeta lycopersici*), and both *Sclerotinia minor* and *sclerotiorum*. While none of the fumigants were effective against all diseases present at the trial sites, some generalities can be stated with respect to efficacy against these pathogens. Generally, fumigants were ineffective against *Sclerotinia* across all studies, perhaps due to the very high incidence in the Greenfield California site. As with previous data presented, yields were only slightly affected by disease incidence, and most of the differences in treatments were evident with weed control and incidence and severity of disease among the plants in treated plots. While yields were lower in untreated plots, they were not catastrophically affected by non-fumigation, as is commonplace in southeastern US studies where nematodes and diseases are more severe that in California.

4. Turf and ornamentals
Three studies in 2003 and two in 2004 were conducted near Monterey and Patterson, California, testing the effectiveness of Iodomethane, Chloropicrin, Telone, and metham sodium for control of pathogens, weeds and soil borne disease. In turf studies, trimming weights, weed emergence and stand counts were used to evaluate differences among fumigants. In the case of ornamentals, bacterial soft rot incidence, weed emergence, and bloom production were evaluated on Calla. On Larkspur, *Fusarium* incidence and severity was evaluated in addition to plant development and bloom production. In all cases, fumigants significantly increased plant productivity and gave economic control of most weed species. Data from these trials are presented for review.