ALTERNATIVE FUMIGANTS FOR CONTROL OF SOIL PESTS: STRAWBERRY AS A MODEL SYSTEM

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Strawberry production is dependent upon methyl bromide for soil fumigation to control soilborne diseases, nematodes and weeds in strawberry nursery and fruit production fields. In addition, because a significant fraction of California strawberry nursery transplants are exported to other states and countries, soil fumigation with methyl bromide provides effective nematode control that is essential to meet export standards. Therefore, alternatives are needed to replace methyl bromide in every step of the production system. A team of plant pathologists, a soil chemist, a weed scientist and an economist is conducting this research. This team is evaluating the impacts of alternative fumigants on soilborne pests, alternative methods for fumigant application, fumigant distribution in the soil, dissipation in the environment, as well as economic factors of crop production. The primary objective is to evaluate the efficacy of alternative fumigants for controlling soil borne pests in the field. Trials were set up to follow the effects of alternative fumigants through all phases of production, beginning with the low elevation transplant nursery, followed by the high elevation nursery and finally the fruit production field. Strawberry production is being used as a model system to evaluate the efficacy of alternative soil disinfestation treatments, but the results are applicable to many other crops such as ornamentals and trees and vines.

Vegetatively propagated crops such as strawberry are especially vulnerable to the phase out of methyl bromide. Strawberry nursery plants are grown in fields fumigated with methyl bromide over the course of 2 to 3 years prior to transplanting into fruit production fields. Previous research has shown that the effects of poor fumigant performance in the nursery accumulate and result in poor performance of plants in the fruiting field. To further evaluate this we have conducted trials with alternative fumigants applied as broadcast treatments in the nursery. Iodomethane:chloropicrin 50:50 (IM:Pic) was evaluated at 350 lb/A through two consecutive cycles of nursery production (at low followed by high elevation nurseries). We found this rate of IM:Pic to be an effective soil fumigant with characteristics similar to methyl bromide:chloropicrin (MB:Pic). Other soil fumigants tested in the high elevation nurseries have been Telone C35 at 386 lb/A followed by (FB) dazomet at 250 lb/A and chloropicrin at 300 lb/A FB dazomet at 250 lb/A. Dazomet was included specifically to provide weed control. At low and high elevation nurseries we found that the number of plants produced in the IM:Pic fumigated plots were equivalent to MB:Pic. Production of marketable transplants at the high elevation nurseries in the chloropicrin FB dazomet and Telone C35 FB dazomet treatments were not different than the MB:Pic and IM:Pic fumigation treatments.

High elevation nursery stock produced on soils fumigated with alternative fumigants were transplanted into commercial strawberry fruit production fields on the California coast. Nursery stock produced at Susanville, CA in 2000 on soil fumigated with MI:Pic and MB:Pic, produced fruit yields at Watsonville (central coastal California) in 2000-01 that were the same. Nursery plants produced using Telone C35 FB dazomet, Pic FB dazomet, MB:Pic and MI:Pic in 2001 at MacDoel, CA were transplanted into two fruit production fields on the California coast, where fruit yields were monitored. Fruit production at Oxnard (southern California) and Watsonville (preliminary results) in the 2001-02 season was not affected by the previous fumigation treatment in the high elevation nursery (although anthracnose in the Oxnard trial may have influenced results).

Alternative fumigants and methods for their application were evaluated in fruit production fields in the Oxnard and Watsonville areas in the 2000-01 and 2001-02 seasons. Rather than using the standard shanked-in broadcast application method, fumigants were applied through the drip lines (with the exception of MB:Pic, which was applied as a shanked-in bed fumigation). Drip-applied treatments included Pic at 300 lb/A, Inline at 400 lb/A, IM:Pic at 400 lb/A, propargyl bromide at 180 lb/A, and MB:Pic at 275 to 375 lb/A. Propargyl bromide and IM:Pic provided pest control that did not differ from MB:Pic. Inline and Pic generally were less efficacious on soilborne diseases and weeds than MB:Pic. Pic was particularly weak on nematodes and weeds. Yield data is currently being analyzed and will be discussed in the poster.

Weeding times were recorded for several alternative fumigants to estimate weeding costs with Inline, Pic, and Telone C35 with and without sequential applications of metam sodium. Weed control was generally improved by sequential applications of metam sodium one week after application of the first fumigant. Cost benefits associated with the use of metam sodium were variable and dependent upon the weed pressure.

Data on fumigant distribution through the soil and efficacy of controlling soilborne pests at different depths in the profile (*Verticillium dahliae, Phytophthora cactorum, Pythium ultimum*, citrus nematode, and several weed species) was collected in all trials and will be presented on the poster.