FACTORS INFLUENCING INTEGRATED METHODS FOR CONTROL OF SOILBORNE DISEASES OF STRAWBERRY.

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Research on the alternatives to methyl bromide for strawberry production is currently being conducted at a hectic pace as the 2001 and 2005 deadlines approach. The tact taken by the vast majority of scientists is to test and optimize conditions for application of alternative chemical fumigants. Many of the agents being tested as alternatives are not ideal replacements; telone and chloropicrin are effective but levels needed for control may exceed allowable limits (Larson, 1998); methyl iodide is not registered for use (Sims *et al*., 1998); and Vapam gives variable results (Larson, 1998). Although there are many scientists trying to optimize the use and application of these chemical replacements (Ajwa and Trout, 1998), few research programs are taking a systems approach to producing strawberries in biologically integrated systems in the absence of fumigation.

Organic strawberry production as a replacement for methyl bromide, has received little attention even though the EPA suggested that "*Organic strawberry production is considered to be an effective integrated alternative to conventional strawberry production,"* (Anonymous, 1996). The limitations for organic production as a replacement for methyl bromide have been clearly outlined (Anonymous, 1998). Currently, only 1% of California strawberry acreage is in organic production but interest among growers and consumers is increasing. Although, organic strawberry production is the state-of-the-art production method in the absence of chemical fumigation, there is little research aimed at optimizing this alternative. The main objective of this research is to optimize organic strawberry production methods and organic soil management practices in order to increase their viability as replacements for fumigation.

To date our work in organic systems has concentrated on the effect of microbial inoculants on yield in organic production. Microbial inoculants may be used by organic farmers to increase yield and mitigate disease. Mycorrhizal fungi are found in organic strawberry production fields. It is unknown what value inoculation with commercially available inoculants might have to organic strawberry growers. Inoculation with a commercially available mycorrhizal inoculant was evaluated under organic growing conditions. Initial results indicate that inoculation with a commercially available inoculant increases early season mycorrhizal colonization and yield in organic production fields. Preliminary results and future experiments will be discussed.

The use of biological approaches as fumigation alternatives in conventional production fields is the area in which my program is concentrating. An integrated approach for disease and weed management in strawberries is being evaluated at several sites on the central coast region of California. Components of the system are; a)bacterial biological control agents; b) mycorrhizal fungi; c) organic acids; d) activated compost. Additionally work is being conducted to optimize the use of each of the components. Our industry partner is seeking OMRI registration for many of the products. Preliminary results from our first year of research will be described.

Additionally I am managing, Biological Agricultural Systems in Strawberries (BASIS) and Organic Agricultural Systems in Strawberries (OASIS), a BIFS project funded through the University of California Sustainable Agricultural Research and Education Program (UC-SAREP). This project is designed to bring scientists, farmers, PCAs, and outreach specialists together to design and test biological tools for strawberry management. We are using tools which are currently available and those which are being developed in an integrated approach to pest management. Our farmer members have helped us to identify factors limiting their ability to use some of the biological methods.

The advantages of this research include:

- Tools and concepts developed for production of organic strawberries in the absence of fumigation can be adapted for conventional production once there is an understanding of the differences in these systems.
- This research emphasizes integrated systems which addresses not only the loss of methyl bromide but also the potential loss of FQPA chemicals and potential loss of other fumigants that are considered alternatives to methyl bromide.
- There is direct farmer involvement in implementation and design of the research.
- Potential pitfalls are identified as the work is occurring.

The main disadvantage to this approach is the long term nature of the research.

- Ajwa, H., and Trout, T. 1998. Soil Distribution of alternative fumigants to methyl bromide applied to strawberry beds by drip irrigation systems. Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions, Orlando, FL. (abs).
- Anonymous, 1996. Organic strawberry production as an alternative to methyl bromide. EPA Case Study, Methyl Bromide Alternatives. EPA430-R-96-021.
- Anonymous, 1998. Organic strawberry production as an alternative to methyl bromide fumigation. In, Evaluation of US-EPA Case Studies: Alternatives to Methyl bromide volume 1 and 2. (eds) S. M. Schneider, R. E. Gingery, and K. W. Vick. USDA-ARS.
- Larson, K. D. 1998. Strawberry yield performance in response to ten preplant soil treatments. Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions, Orlando, FL. (abs).
- Sims, J. J., Ohr, H., Becker, J. O. Hutchinson, C., Stanghellini, M., McGiffen, M. E., Jr., Karlik, J. F., and Eayre, C. 1998. Methyl iodide- recent field results. Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions, Orlando, FL. (abs).