SITE-SPECIFIC SOIL PEST MANAGEMENT IN THE STRAWBERRY PRODUCTION SYSTEM

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Summary: The objective of this research project is to develop tools for site specific management of soilborne diseases within a field based on the actual pest pressure. Currently, soil fumigation is a one size fits all approach in which a single rate is evenly applied over the field. However, pathogen pressure is rarely uniform throughout a field. We hypothesize that site-specific fumigation can reduce net fumigant pounds applied while disease management will be equal or better than traditional fumigation strategies, enhancing the economic viability of strawberry production. This project should also lead to a more integrated approach for pathogen control across cropping systems as well as providing an evaluation of remote sensing technology as a crop management tool.

In an effort to improve fumigant use efficiency and disease management in strawberry production fields, a precision approach is being used to map the distribution and density of major soilborne pathogens in a field. Soil samples will be collected in a grid pattern, then the levels of *Fusarium oxysporum* f. sp. *fragariae*, *Macrophomina phaseolina*, and *Verticillium dahliae* will be determined by TaqMan real time PCR assays as well as soil plating to confirm the results of the molecular assays. These data will be used to create a prescription map of the fumigant rates necessary to effectively control disease. Soils will also be analyzed for textural class and fertility so these variables can be considered in the final yield data analysis. Calibrated high resolution remote sensing imagery of the current season will be used to guide soil sampling. The field will be divided into zones reflecting disease risk factors with each zone receiving a different rate of fumigant application. An adjacent block will receive a uniform application of the standard rate of fumigant and serve as a control to evaluate the economic effectiveness of the precision fumigation approach. The two treatments were arranged in a RCB design with three replicates. Season long fruit yields will be collected using a GPS enabled bar-code scanner to track each tray of strawberries by bed. High spatial resolution aerial images will be collected weekly during the fruit production season to evaluate plant growth/vigor (which is a reflection of the efficacy of pathogen control). Plant mortality in all plots will be assessed monthly and causes confirmed in lab assays.

Two production fields have been selected for this project, one in Oxnard and the other in Watsonville.

- Oxnard - this field is cropped in back to back strawberries and in prior production seasons had problems with Fusarium wilt. Prior to disking the field in preparation for the fall fumigation, counts of diseased plants in the field were made and data mapped to a bed level for the 10 acre block. Fumigant rates were determined based on these maps as there was not enough time to complete soil assays for pathogens prior to the need to complete fumigation.
- Watsonville - this field is currently in strawberry and showing signs of Verticillium wilt (confirmed by cooperators culturing from plants). Remote sensing aerial images have been collected from the field and will be used to guide a more comprehensive evaluation of disease distribution and soil sampling to evaluate pathogen inoculum density. The field will be in vegetable rotation for the 2017/18 production season and the effect of the soilborne pathogens on vegetable production will be monitored. For the 2018/19 strawberry season a high density sampling of the field will be conducted to develop the risk map that will be used determine treatment zoning (variable rate application rates).