STRAWBERRY PRODUCTION IN SOILLESS SUBSTRATE TROUGHS – WATER MANAGEMENT

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Most strawberry growers in California fumigate the field to control soil-borne plant pathogens before planting a new crop. However, methyl bromide and its alternative fumigants such as 1,3-dichloropropine and chloropicrin are strictly regulated for volatile organic compound (VOC) emissions to protect air quality. There is a need to develop non fumigation-based production system for strawberries. There are a number of approaches, including breeding for disease-resistant cultivars, crop rotation, or cover crops, for producing strawberry fruit on a commercial scale without fumigants. Strawberry fruit can also be commercially produced with disease-free substrate materials. Commercial production of strawberry fruit in soilless media has been used in Europe using peat moss, coconut coir, perlite, rockwool, pine bar, or a mixture of these materials in different types of containers or troughs. Because of the much reduced rhizosphere, growing strawberry plants in the soilless media will require high frequency irrigation with water and/or nutrient solutions. The overall goal of the multi-disciplinary collaborative project was to develop a new raised-bed trough system for managing soil-borne diseases and pathogens in open field production of strawberry fruit. Specific objective of this paper was to design, test, and deploy an irrigation and fertigation system capable of high-precision water and nutrient management for strawberry production in soilless substrate media.

Field trials were carried out during the 2008-2009 season at an experimental plot at the Monterey Bay Academy (MBA) located near Watsonville, CA and a grower's field located next to Santa Maria, CA. Two inverted triangular troughs were used at the MBA site and half moon shaped troughs were used at the Santa Maria site. Different ratios of peat, perlite, coir, rice hull, a redwood soil conditioner, and field soil were used as the substrate media to fill the troughs. To accommodate potential high demand on irrigation and nutrient requirements when strawberry plants were grown in the substrate troughs, a custom-designed automated irrigation system was installed at both the MBA and Santa Maria sites. Each system consisted of a weather station for computing potential evapotranspiration (ET), a flow control and monitoring system that consisted of solenoid valves and electronic flow meters, a field water and nutrient delivery and sensing network consisted of time domain reflectometry (TDR) soil moisture and soil temperature sensors and fertilizer injection systems connected to the irrigation lines, and a computer program written for each site to operate autonomously to irrigate respective field plots when cumulative ET exceeded a threshold value at set times of the day.

Preliminary data clearly showed that the irrigation systems worked as expected where multiple irrigations per day were accomplished and the cumulative amount of water application tracked closely with the seasonal ET. TDR sensors also clearly showed variations in substrate water content responding to each irrigation event. Differences in water retention and strawberry growth among different substrate media were also observed. Overall, the field trials indicated a strong potential for commercially growing strawberries using non soil based substrate materials in raised-bed troughs.