Integrated Management of Soilborne Diseases of Field Grown Tomato and Strawberry

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Abstract

Field grown tomatoes and strawberries represent an important component of on-farm income for many growers in the Southeastern USA. However, productivity is limited by the prevalence of soilborne pathogens. The primary tomato diseases include Fusarium wilt (FW), Verticillium wilt, Southern stem blight (SSB; *Sclerotium rolfsii*), Southern bacterial wilt (*Ralstonia solanacearum*; Rs) and root knot nematodes (RKN). In the case of strawberry, the primary soilborne disease is Black Root Rot (BRR) caused by a complex of *Pythium, Rhizoctonia, Fusarium* and nematode species. *Phytophthora cactorum* can also be a serious pathogen in strawberry systems. Historically the industry has relied on the use of methyl bromide (MeBr) combined with chloropicrin to reduce pathogen populations as a pre-plant fumigant injected within raised beds and subsequently covered with a barrier film. However, since 2005 and in compliance with the Montreal Protocol to protect the ozone layer, MeBr has been substantially phased out. Over the last 12 years a multi-state, multi-disciplinary and stakeholder participatory program was implemented to adapt, discover and develop alternative and IPM-based approaches to manage soilborne pathogens in these production systems. The program pursued IPM practices that included tactic substitution, tactic diversification and tactic development. Tactic-substitution activity was conducted as small plot research on research stations and evaluated the efficacy of non-ozone depleting fumigants and other soil-applied products. Phase I experiments evaluated new and emerging products, methods of application or complementary technologies, such as advanced barrier films. Phase II and Phase III experiments and demonstrations translated successful outcomes to on-farm and participatory research projects. Effective disease control was achieved using 1,3-dichloropropene (1,3-D), chloropicrin (Pic), metam sodium, dimethyl

disulphide (DMDS) or combinations of these. Tactic diversification required more knowledge about the diversity and dynamics of the soilborne pathogens. Extensive work characterized the pathogen complex responsible for BRR and work was conducted to understand the population structure of specific pathogens, such as Rs in tomato field soils. An example of tactic diversification was the adoption of tomato grafting to deploy specific host resistance to manage FW, SSB, RKN and Rs. Tactic development comprised systems research approaches that required a matrix of practices and products linked to sound knowledge of biological and cropping systems. An example of tactic development included the use of cover crop, compost and anaerobic soil disinfestation methods to limit BRR problems and enhance strawberry productivity. Research efforts were complimented with economic analysis. and research outcomes were translated to growers and other stakeholders through diverse extension products and local, region-wide and national meetings.