REDUCTION OF FUSARIUM CROWN AND ROOT ROT OF TOMATO BY COMBINING SOIL SOLARIZATION AND METAM SODIUM

R. J. McGovern, Associate Professor, Plant Pathology, C. S. Vavrina, Associate Professor, Horticultural Sciences, T. A. Obreza, Associate Professor, Soil and Water Sciences and J. C. Capece, Assistant Professor, Agricultural Engineering. University of Florida-IFAS, Southwest Florida Research and Education Center, Immokalee, FL 33934

Over the past 5 years, Fusarium crown and root rot [*Fusarium oxysporum* f.sp. *radicis-lycopersici (FORL)*] has been the most prevalent soilborne disease of tomato in southwest Florida. However, crown rot severity varies widely by site and season and is favored by cool temperatures. Methyl bromide combined with chloropicrin has provided effective control of crown rot and other soilborne pests of tomato. Nevertheless, classification of methyl bromide as an ozone depleter and its impending removal by the year 2001 dictate the development of alternative management strategies for crown rot.

We previously conducted a series of field experiments which suggested that metam sodium could reduce Fusarium crown rot only when thoroughly incorporated in the planting bed, such as through application to the soil prior to bed formation. We also showed that heating the soil by mulching with clear plastic (soil solarization) could reduce FORL populations in the upper 5 cm of soil. Other researchers have amended soil with compost to decrease disease and increase yields. Recently we conducted an experiment to evaluate the use of soil solarization alone and in combination with metam sodium or composted sewage sludge for crown rot reduction.

A commercial tomato field in southwest Florida, naturally infested with FORL was used to compare the effectiveness of methyl bromide:chloropicrin, 67%:33% (Terr-O-Gas 67, 336 kg/ha), metam sodium (Vapam, 935 l/ha), composted sewage sludge (Florida Organix, 5.5 MT/ha), soil solarization and combinations of solarization and Vapam or Florida Organix in reducing Fusarium crown rot. The field was thoroughly wetted and cultivated prior to the start of the experiment on 30 Aug, 1994. Florida Organix was applied to the soil surface before bed formation. Vapam was sprayed on a preformed bed and rotovated to a depth of approximately 23 cm, followed by final bed formation. Terr-O-Gas was injected approximately 23 cm deep at bed formation.

All nonsolarized beds were covered with 1.5 mil, white polyethylene mulch following fumigant and compost application. Soil was solarized by covering beds with 1.5 mil, clear polyethylene mulch which was painted white after 6 wks using Kool Grow (Kool Grow, P.O. Box 2278, Gainesville, FL, 32602). Soil temperatures were recorded during the solarization period at depths of 5, 15 and 23 cm in plots

covered with clear or white mulch and in nonmulched soil using a datalogger (Campbell Scientific, CR-10). A randomized complete block (30.5 m x 81 cm bed) design with six replicates was used. Transplants of the tomato cv. Agriset were planted using an 46 cm in-row spacing on 10 Oct. The marketable fruit from 32 randomly selected plants per block were harvested twice (4 and 23 Jan, 1995) and then uprooted for crown rot evaluation.

Fusarium crown rot incidence was high, and severity (% crown discoloration) low throughout the field. Crown rot incidence was significantly reduced by Vapam, solarization plus Vapam and by Terr-O-Gas, while disease severity was significantly reduced by both the latter two treatments (Table 1). No significant differences in marketable yield were observed among the treatments. It is not surprising that solarization alone failed to decrease crown rot, since the treatment period was unusually rainy, and soil temperatures which cause the rapid death of FORL (50-60°C) were not reached even at a depth of 5 cm (Figure 1). (Cumulative rainfall for September was 51% higher than the 30 year average recorded at SWFREC, Immokalee). Lack of significant yield increases over the control by any of the treatments may be attributed to low disease severity resultant from milder than normal temperatures during the experiment. (Mean air temperatures during October, November and December were 0.5, 1.9 and 1.7°C higher, respectively, than the 30 year means for those months). Reduction of Fusarium crown rot by solarization combined with metam sodium equivalent to that achieved by methyl bromide plus chloropicrin is noteworthy and merits further research.

Effect of Soil Solarization, Fumigants and Compost on the Incidence and Severity of Fusarium Crown and Root Rot (FCRR) and Yield in Tomato 'Agriset'.

Treatment	Mean FCRR Incidence (%)[1]	Mean FCRR Severity (%)[2]	Mean Fruit Yield (MT/ha)[3]
Untreated Control	78.8 ab[4]	11.3 ab	63.5 N.S.[5]
Solarization	77.8 ab	15.6 a	60.2
Florida Organix	64.4 bc	9.3 b	61.5
Vapam	54.4 cd	7.6 b	62.6
Solarization + Florida Organix	84.4 a	15.3 a	63.5
Solarization + Vapam	41.1 de	3.5 c	55.8
Terr-O-Gas 67	37.8 e	3.5 c	65.8

[1]Arcsine transformation of percentage data was performed prior to statistical analysis; untransformed means are presented.
[2]Percentage internal crown and tap root discoloration was evaluated following longitudinally sectioning of plant bases.
[3]Mean yields were based on the marketable fruit from two harvests of 32 plants per block.
[4]Means within columns followed by different letters are significantly different (LSD, p=0.0001).
[5]No significant differences between means were observed (LSD, p=0.05).

Figure 1. Comparison of Maximum Soil Temperatures Under Clear and White Plastic Mulch.