CONTROL OF SOILBORNE DISEASES BY COMBINED SOIL AND THE POST-HARVEST TREATMENTS

*A. Gamliel[1], A. Grinstein[1], V. Zilberg[1], M. Benihes[1], O. Ucko[2], L, Klein[3], E, Uriely[4], M. E. Stanghellini[5], J. Katan[6]

[1]Laboratory for Pest Management Research, Institute of Agricultural Engineering, Bet Dagan 50250 Israel, [2]Extension Service, Ministry of Agriculture, Beer Sheva, [3]Bromine Compounds P.O. B 180, Beer Sheva 84101, [4]Agan-Makhteshim, Ltd Chemicals Ashdod 77102, [5]University of California, Riverside, CA 92521, and [6]THe Hebrew University Rehovot.

Sudden wilt of melon vines (caused by *Monosporoascus cannonballus)* and crown rot of tomatoes (caused by *Fusarium oxysporum* f.sp. *radicis lycopersici*) are severe diseases in the southern area of Israel, as well as in other regions. The fungi attack the roots resulting in root rot, and vine wilt at harvest. Control of the disease is usually carried out by pre-plant soil fumigation. The most common soil treatment is methyl bromide fumigation in strips. The phase-out of methyl bromide requires alternatives to control this disease. Solarization alone is not effective against these pathogens which are heat tolerant. Combining fumigant at reduced dosage with solarization is a potential approach to improve pest control. Several benefits are expected from such combination: capturing the fumigant under the plastic tarp; increased toxic activity of the fumigants under in the heated soil and increased susceptibility of propagules. Combination of solarization with fumigants at very low dosage gave effective control of soilborne pathogens in greenhouse and in the open field. Combining solarization with a fumigant can improve pest control and extend its use against wider spectrum of pests. Trapping fumigants under the plastic film may also enable dosage reduction

The effect of sublethal dosage of fumigants and heating for a short period on killing of fungal propagules was tested in controlled environment containers. Sublethal heating of fungal propagules followed by their exposure to sublethal dosage of methyl bromide, resulted in effective killing of these propagules. Incubation of the treated propagules in natural soil for seven days further decreases their viability. Apparently, soil microflora contributed to the killing of fungal propagules, which were weakened by the heat and MB.

The effect of sublethal dosage of metam sodium and short solarization on killing of fungal propagules was tested in the field. Fumigation with metam sodium at 15 ml/m^2 combined with solarization for 8 days resulted in effective killing of propagules of *Fusarium oxysporum* f.sp. *radicis lycopersici.* The sequence of applying the fumigants and solarization is important. Pathogen control was further improved by first wakening the pathogen by short solarization (8 days), followed by application of metam sodium.

Solarization combined with metam sodium at 30 ml/m^2 was tested to control sudden wilt of melons and crown rot of tomatoes. Metham sodium (Edigan, Agan-Makhteshim, Chemicals Ltd Israel), was applied through drip lines under strip plastic mulch which were placed on the soil for solarizaiton 3 weeks before application. This treatment was effective in controlling sudden wilt of melons and crown rot of tomatoes similar to fumigation with methyl bromide at standard dosage (50-70 g/m^2). These results were verified in open field and greenhouse production.

Control of sudden wilt of melons is effective only for one season following soil fumigation. Perithecia are resting structures produced in the infected melon roots at the end of the crop Therefore, the effect of disinfestation lasts only one season, due to inoculum buildup at the end of the crop. Additional sanitation and post-season treatment was tested to prevent the formation of perithecia in the roots. Metam sodium at 30 ml/m^2 was dripped to each plant at the end of harvest. This treatment resulted in rapid killing of the vine roots and the fungus mycelium inside them. No perithecia were observed on the treated roots and disease incidence in the treated plots was significantly reduced by this treatments in successive two melon crops without additional pre-plant soil disinfestation.

Conclusions:

1. Combining solarization with fumigants can improve pathogen control and extend it to more pests and in less favorable climate conditions.
2. Combination of solarization with reduced rates of fumigant can shorten the solarization period and minimize environmental risks.
3. The sequence of first applying solarization followed by fumigation further improves pest control.
4. Combining soil disinfestation treatments with post-season sanitation prevents inoculum build up on the roots, extends the effectiveness of the treatments and minimizes the need for frequent soil disinfestation.