MICROBIAL ASPECTS OF ACCELERATED DEGREDATION OF METAM-SODIUM IN SOIL.

Shachaf Triky-Dotan*[1,3], Miriam Austerweil[1], Bracha Steiner[1], D. Minz[2], J. Katan[3] and A. Gamliel[1]

*[1]Laboratory for Pest Management Research, Institute of Agricultural Engineering, ARO, the Volcani Center, Bet Dagan, Israel [*e-mail: agamliel@volcani.agri.gov.il]; [2]Laboratory for Microbiology in Soil, Institute of Soil Water and Environment, ARO, the Volcani Center, Bet Dagan, Israel; and [3]Department of Plant Pathology and Microbiology, the Hebrew University of Jerusalem, the Robert H. Smith Faculty of Agricultural, Food and Environment, Rehovot, Israel.*

Preplant soil fumigation with metam-sodium (MS) (sodium *N*-methyl dithiocarbamate) is used worldwide to control soilborne pathogens. In moist soil, MS rapidly undergoes decomposition to its active ingredient, methyl isothiocyanate (MITC), which is diffused in the liquid and vapor phase of the soil. Evidence of inconsistent efficacy of MS in controlling Verticillium wilt and Pythium pod rot were recorded in agricultural fields in southern Israel since 2000. Hence, the possible development of accelerated degradation (AD) of MITC in these soils is critical in achieving healthy crops and economical yield. AD of a pesticide in soil occurs when its active ingredient undergoes rapid decomposition, thereby losing its efficacy against the target pests. The phenomenon is usually associated with repeated applications of the pesticides or closely related derivatives or homologues compounds. The objectives of the present study were to isolate and to characterize the soil microorganisms which are involved in AD of MITC. Repeated applications of MS to different soils led to AD of MITC. The microbial activity in the tested soils indicates that AD of MITC results from increased activity of naturally occurring microorganisms which can degrade MITC in soil. Two bacterial strains which

rapidly degrade MITC were isolated from Rehovot soil and were identified by DNA sequence and fatty acid profile analysis as Oxalobacteraceae members. This is the first time that these bacteria were reported to be involved in the AD process. PCR-DGGE analysis of bacterial community composition showed that an extensive shift in total bacterial community composition in soils occurred already following single application of MS. Response of resident Oxalobacteraceae members to MS application differed between soils. Although, AD of MITC is usually induced by repeated applications of MS, the signal of its development can be triggers even after a single application of the fumigant. The signal to AD indicates the potential of a soil to develop AD; however its appearance depends upon other soil factors. Management of AD can be accomplished by the appropriate application of different methods such as combining fumigants and combining MS with solarization.