

IODOMETHANE EFICACY AND FATE IN CALIFORNIA SOILS

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Iodomethane (methyl iodide, MI) is one of the potential alternatives to methyl bromide (MBr) as soil fumigant. It has similar chemical and physical characterizations to MBr and can be applied with existing soil fumigation system equipment. Moreover, in the last decade, studies have shown that MI has a broad-spectrum of pathogen control. Our early research found that MI is less affected by accelerated microbial degradation than chloropicrin (Pic), 1,3-dichloropropene (1,3-D), metam sodium and MBr. Therefore, the objectives of the present study were to confirm the fate of MI in tested soils and to assess its efficacy to control selected soilborne pathogens.

Soils were collected from three different field experimental sites in California (Oxnard, Salinas, and Watsonville), which were previously fumigated with chloropicrin during summer of 2009. The three soils were selected based on differences of soil type, crop and fumigation managements. The MI concentration in soil was monitor during 23 hours following the application under controlled condition. A significant reduction in MI concentration, CxT values, and half-life were found after 23 hours in Oxnard soil compared with Salinas and Watsonville soils. Also, a significant correlation was found between sand, silt and clay percentage and CxT values following MI application in three tested soils. Elimination of biotic agents by soil sterilization prior to MI application did not effect on MI concentration in Oxnard soil, and a higher halt-life and CxT values were found in all treatments. These results indicate that MI dissipation from the tested soils is more affected by abiotic factors than biotic activities.

Dose-response studies were conducted to compare the efficacy of the registered fumigant against soilborne pathogens. The fumigants used in this study were: Pic, Pic-Clor 60 (57% Pic and 37% 1,3-D), Dimethyldisulfide (79% DMDS: 21% Pic), Tri-Con (50% MBr and 50% Pic), MI (97.8%), Midas Bronze (50% MI and 50% Pic), and Midas Gold (33% MI and 62% Pic). The tested pathogens were *Fusarium Oxysporum* f. sp. *Fragariae*, *Macrophomina phaseolina*,

Pythium sp., *Rhizoctonia solani*, *Tylenchulus semipenetrans* (Citrus Nematode) and *Verticillium dahlia*. All soil containers were incubated for 24 hours, reopened and inoculum bags were assessed for pathogens viability.

The MB:Pic (50:50) application was highly effective in controlling nematode and *Pythium* population and less effective in controlling *Rhizoctonia* and *Verticillium*. The effectiveness of MB:Pic (50:50) controlling *Fusarium* was with increasing concentration. All three MI:Pic fumigants were highly effective in controlling nematode and *Pythium* population. Both fumigants, MI:Pic (33:67) and MI:Pic (50:50), were more effective in controlling *Fusarium* and *Rhizoctonia* compare with MI:Pic (98:2). In addition, the MI:Pic fumigants were not effective on *Verticillium* population and results were varied among the MI:Pic fumigants. In comparison, both fumigants, MB:Pic (50:50) and MI:Pic (50:50), were highly effective in controlling nematode, *Pythium* and *Fusarium*, but MI:Pic was more effective in controlling *Rhizoctonia* compared with MB:Pic. Also, an effective mortality of *Fusarium*, nematode, *Pythium* and *Rhizoctonia* population was achieved following of Pic 99 and Pic 60 application. In our study, under controlled conditions, a good mortality efficacy was achieved with reduced fumigant application rates, but more field research is necessary.