DISSIPATION OF SOIL FUMIGANTS FOLLOWING REPEATED APPLICATIONS.

Shachaf Triky-Dotan*[1], J. Hunzie[1], and H. Ajwa[1]

*[1] Department of Plant Science, UC Davis [*e-mail: srdotan@ucdavis.edu].*

Chloropicrin, 1,3-dichloropropene (1,3-D), metam sodium and methyl iodide are intensively used in US and worldwide as soil fumigants for preplant treatment, to control wide spectrum of soilborne pests in various annual and perennial crops. The occurrence of accelerated degradation of pesticides in soil following repeated applications of the same pesticide was reported with many pesticides, but much less so with soil fumigants. Usually, a loss of pathogen control is associated with accelerated degradation, results in farmers tendency to increase the frequency of applications or to increase the pesticide dosages. These, unfortunately further intensified the accelerated degradation process and creates an environment for build-up of soilborne pathogens, together with excessive environmental pollution. The objective of the present study was to assess the development of increased fumigant dissipation from soil as following repeated application.

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. Additional soil samples were collected from adjacent field plots, which had not been fumigated in the last 5 years, were collected from each site, and served as control. The laboratory tests were consisted an additional application of 100 ppm (for each soil fumigant) under controlled conditions and followed by determination of dissipation curve for 23 h of incubation. The results are express as percentage of the initial concentration of soil from adjacent fields that was not fumigated (non-history soil).

Concentration of chloropicrin was reduced sharply to 20% of the initial concentration after 23 hours in Oxnard soil. The rate of dissipation in Salinas and

Watsonville soils was slower (50% of the initial chloropicrin concentration after 23 hours of non-history soil). Rapid dissipation of chloropicrin seems to vary among the three tested soils with history of chloropicrin application and probably is dependent on soil type and management practices. In the Oxnard soil, the extended chloropicrin dosage degraded rapidly in soil with history of chloropicrin application (history soil), compared with soil from adjacent fields that was not fumigated (non-history soil). In contrast no differences were found between history and non-history Salinas soils. In the Watsonville soil seems to develop suppressiveness to chloropicrin degradation as the rates of chloropicrin were lower in the non-history soils relative to history soil.

In an additional experiment set, 1,3-D, metam sodium and methyl iodide were applied separately, in same three soils. Although, previous chloropicrin application (history soil) was less affected by other fumigants degradation in soils compare with the first experiment set, different patterns of fumigants degradation were found between the three soils. In general, fumigants degradation was rapid in Oxnard soil compare with Salinas and Watsonville soils after 23 h. furthermore, only in Watsonville soil a higher concentration of fumigants was found in soil with history of chloropicrin application compare with non-history soil and may indicate of development of soil suppressiveness also for those fumigants.

Prediction of the longevity fumigants in various soils may provide tools for optimizing fumigants application and performance in the control of soil-borne pathogens.