COMPARISON OF EFFICACY BETWEEN METHYL BROMIDE AND METHYL IODIDE AGAINST PLANT PARASITIC NEMATODES

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Our laboratory studies (Ohr et al., 1996) demonstrated that soil fumigation with methyl iodide is as effective or better as methyl bromide against a wide range of plant pathogens, weeds and the plant parasitic nematode *Heterodera schachtii*. These preliminary efficacy data combined with methyl iodide's insignificant ozone-depletion potential (Solomon et. al., 1994) has made it a major contender as a replacement of methyl bromide.

In this study we have expanded our efficacy comparison studies of methyl bromide and methyl iodide against plant parasitic nematodes. We tested three different plant parasitic nematodes, *Meloidogyne incognita*, *Heterodera schachtii* and *Tylenchulus semipenetrans*, which are all of major importance in California agriculture.

Materials and Methods

All trials were conducted on the Agricultural Operations Experimental Station near the University of California, Riverside. Round plastic containers (22.3 L) with drainage holes at the bottom were used as experimental units. The trial was designed as a randomized complete block with four replicates per treatment and was repeated once. The containers were filled with sandy soil. Muslin bags were filled with 50 cc of the same soil infested with one of the following test organisms. *M. incognita* was obtained by extracting eggs from greenhouse-grown tomato plants. Mature cysts of *H. schachtii* were extracted from greenhouse-grown sugar beets. Citrus roots from a citrus nematode-infested orchard were used as an inoculum for *T. semipenetrans*. The muslin bags were buried at a depth of 20 cm. Soil moisture at the time of fumigation was 5-8%. The temperature throughout the fumigation period varied between 24°C during the day and 15°C at night. Methyl bromide was cooled

to -56°C for easier handling and pipetted into small gas-tight vials. These were kept on dry ice for transport to the plot. Methyl iodide was pipetted into similar vials and transported on regular ice. After placing a vial onto the soil surface in the container and removing the vial caps, the containers were immediately covered with 4 mil (0.1 mm) black polyethylene tarp. The tarps were secured to the containers by rubber bands. Application rates for both fumigants were 0, 5.9, 11.8, 17.8, 23.6 and 29.5 mM m^{-2}. The tarps remained on the container for four days. After the tarps were removed the container were left for another day before the muslin bags were recovered. The bag contents were placed on Baermann funnels to facilitate nematode recovery and enumeration. Cyst nematode hatch was supported by 3 mM ZnCl solution.

Results and Discussion

At equal molar rates methyl iodide was consistently more effective than methyl bromide against all of the tested nematode species. At 5.9 mM m^{-2}, the lowest rate tested, methyl iodide reduced the populations of all three nematode species significantly. In contrast, at the same low rate methyl bromide fumigation had very little effect on the three nematode populations. At 11.8 mM m^{-2}, methyl iodide eliminated virtually all nematodes while substantial parts of the nematode populations survived the methyl bromide treatment. At the highest tested rate of 29.5 mM m^{-2}, about 5% of the sugar beet cyst nematodes were recovered alive from methyl bromide treated soil.

In summary, the data presented confirm the results from our previous investigations about the excellent efficacy of methyl iodide as a soil fumigant. In comparison to methyl bromide the efficacy of methyl iodide was consistently superior at equal molar rates.

Ohr, H.D., J.J.Sims, N.M. Grech, J.O. Becker, and M.E. McGiffin, Jr. 1996. Methyl iodide, an ozone-safe alternative for methyl bromide as a soil fumigant. Plant Disease 80, 731-735.

Solomon, S., J.B. Burkholder, A.R. Ravishankara, and R.R. Garcia 1994. On the role of iodine in ozone depletion. J. Geophys. Res. 99, 20, 491-20, 499.