EFFICACY OF METHYL IODIDE AGAINST NEMATODES AND PLANT PATHOGENS

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The purpose of these experiments was to determine the sensitivity of multiple nematode and phytopathogen species to methyl iodide and methyl bromide fumigation. With the required phase-out of methyl bromide in the United States, growers are in need of another multi-spectrum fumigant for control of crop pests. Methyl iodide has been shown to be at least as effective and in many cases more effective than methyl bromide against crop pests without having the same environmental concerns associated with methyl bromide. In this study, comparisons of the efficacy of methyl iodide with methyl bromide in laboratory trials were made with the phytopathogens *Rhizoctonia solani, Phytopthora citrophthora, Phytopthora citricola,* and the nematodes *Meloidogyne incognita* and *Tylenchus semipenetrans.*

Fungal samples were grown separately on sterilized millet seed supplemented with 1/4 strength V8 broth. After seven days growth, millet seed medium was dried for three days prior to incorporation into soil at a rate of five ml of inoculum to 50 ml of soil (UC mix #2, 14% moisture). Each sample was placed in an individual paper, cone-shaped, coffee filter (Melitta USA Inc, No. 2). The open end of each filter was folded over and stapled closed prior to placement into separate fumigation chambers (1.9 L jars). Fumigation concentrations were based on a methyl bromide application rate of 0.454 kg/2.8 m^3 (1 lb/100 ft^3). Methyl bromide (-56 ^oC) and methyl iodide (ambient temperature) were pipetted into chilled fumigation chambers at either 0.0, 50, 100, 200, 400, or 800 µM. Chambers were immediately sealed and incubated at ambient temperature at each fumigant concentration for either 6, 12, 24, or 48 hours. After fumigation, 20 inoculated millet seeds from each sample were plated on selective media. To determine the efficacy of the fumigant, viability of fungal cultures were measured four days after placement on the media.

M. incognita eggs and *T. semipenetrans* stage two juveniles were pipetted onto soil samples in individual filters and fumigated in 1.9 L fumigation chambers as described above. The concentrations of fumigants used were 0.0, 1.6, 3.1, 6.2, and 12.5 µM. Samples were fumigated for either 3, 6, 12, or 24 hours. After fumigation, samples were placed directly on Baermann funnels without removing samples from the filters. Four days after placement on the funnels, surviving stage two juveniles were counted for each treatment combination to determine the efficacy of the fumigant.

Methyl iodide provided better control of all the organisms tested compared to methyl bromide when tested at the same molar concentration. Of the fungal species tested, *P. citricola* and *P. citrophthora* were more easily controlled than *R. solani* at all fumigation periods. After fumigation for 48 hrs, *P. citrophthora* was controlled completely by 50 and 100 µM methyl iodide and methyl bromide, respectively. Complete control of *R. solani* after fumigation for 48 hours required 200 µM concentration of each fumigant. Incubation of *R. solani* for 48 hrs with 100 µM fumigant reduced fungal viability by 12 and 80% compared to non-fumigated controls for methyl bromide and methyl iodide, respectively.

Methyl iodide provided better control of the nematode species tested compared to methyl bromide. Fumigation for 3 hrs at a methyl iodide or methyl bromide concentration of 12.5 µM reduced *M. incognita* viability by 40% and 0%, respectively, compared to non-fumigated controls. After 24 hrs fumigation at 1.56 µM fumigant concentration, *M. incognita* viability was reduced by 100 and 50% by methyl iodide and methyl bromide, respectively. *T. semipenetrans* control was similar to that obtained with *M. incognita*.

In conclusion, methyl iodide provided similar or better control of the organisms tested compared to methyl bromide. The similar application technology required for both fumigants, increased efficacy of methyl iodide compared to methyl bromide, and the reduced concern for ozone layer damage from the use of methyl iodide all combine to make methyl iodide a natural replacement for methyl bromide.