METHYL IODIDE AN EFFECTIVE REPLACEMENT FOR METHYL BROMIDE FOR PREPLANT FUMIGATION OF SOIL FUNGI.

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Methyl iodide was tested alone or compared to methyl bromide in laboratory and limited field trials for effectiveness in controlling five soil borne plant pathogenic fungi. Perforated plastic vials or muslin bags filled with soil mixed with millet seed cultures of test fungi were used. In laboratory fumigations the inoculum vials were placed in 1.9 L horizontal jars. Methyl iodide or chilled methyl bromide (-56 C) was pipetted into chilled evaporation dishes inside the jars which were immediately sealed and incubated at ambient temperatures for 1 to 4 days. The inoculum was removed and aired 1 hour after fumigation then 10 or 25 seeds from each replicate were placed on the appropriate solid culture media and incubated at laboratory temperatures.

In the field bucket trials the inoculum vials or bags were placed onto a 10 cm layer of soil in 22.3 L plastic buckets with 4 bottom holes and covered with 20 cm of the same soil. Gas tight vials of methyl iodide or chilled methyl bromide were placed on the soil surface and opened. The buckets were immediately covered with a 0.1mm black plastic tarp held in place by a large rubber band. Soil moisture was between 5-8 %. After 4 days the tarps were removed. One day later the inoculum was removed and and placed on culture medium.

In field fumigations the plots were 3 X 3 m with the inoculum buried at depths of 2.5, 15 and 30 cm half way between the center and one randomly chosen corner of each plot. Soil moisture averaged 9.5 % between 15 and 30 cm. The chemicals, in opened containers prepared as above, were placed on the soil surface. The plots were covered with 0.1mm polyethylene tarp for 4 days then aerated 1 day before the inoculum was checked for viability.

Laboratory trials utilized *Phytophthora citricola* Sawada, *Phytophthora cinnamomi* Rands, *Phytophthora parasitica* Dastur, *Rhizoctonia solani* Kuhn or *Verticillium dahliae* Kleb as the test organisms. Field bucket trials utilized *Rhizoctonia solani* or *Phytophthora parasitica* and in the field trial *Phytophthora parasitica* was used.

All fumigation concentrations were based on a methyl bromide application rate of 0.454 kg/2.8 m^3 (1 lb/100 ft^3) equal to 1.69 µM/ml for laboratory trials and 4.8 moles/2.8 m^3 for field trials.
Using methyl iodide alone, *Phytophthora citricola* was eliminated in one trial after 3 days at 0.21 µM/ml and in 2 other trials after 2 or 3 days at 0.42 µM/ml. In two trials, methyl iodide did not eliminate *Phytophthora cinnamomi* after 3 days at 0.42 µM/ml but did so in 1 to 2 days at 0.84 µM/ml. *Phytophthora parasitica* was eliminated in one trial after 1 day exposure at 0.84 µM/ml with an escape in one replication after 2 days at 1.69 µM/ml. In the second trial the fungus was eliminated after 3 days at 0.21 µM/ml and after 1 day at all higher concentrations. In one trial *Verticillium* was eliminated after 2 days at 0.84 µM/ml. In two trials comparing methyl iodide and methyl bromide, *Rhizoctonia solani* was eliminated by methyl iodide at concentrations of 0.21 µM/ml or higher while methyl bromide achieved a complete kill only at concentrations of 0.42 µM/ml or higher.

In two bucket trials, *Rhizoctonia solani* was completely eliminated by methyl iodide in both trials at 355.6 mM/m^2 (the highest rate) while methyl bromide did so in only one trial. In the second trial of this series, *Phytophthora parasitica* was eliminated by methyl iodide at this same concentration but not by methyl bromide.

In two field trials, methyl iodide and methyl bromide were similar in performance with significant reductions in *Phytophthora* populations occurring at all 3 concentrations and depths. All non-fumigated controls were recovered at 99 to 100 %.

In laboratory or field trials using 5 species of plant pathogenic fungi methyl iodide has proven to be an effective fumigant capable of killing soil borne fungi. Methyl iodide can be mixed with chemicals, such as chloropicrin, that are currently mixed with methyl bromide and can be applied using the same equipment now used for methyl bromide with little or no modification.

While methyl iodide appears to be a chemical that can directly replace methyl bromide in most, if not all, of its uses there are still many questions to be answered. These questions include cost of the chemical; the most economical and effective rates; study of breakdown products in the soil and ground water; toxicity; etc. However, given the imminent loss of methyl bromide and the effectiveness of methyl iodide, we feel that methyl iodide should be considered as a leading contender as a single chemical replacement of methyl bromide as a soil fumigant.