ALTERNATIVE TREATMENTS FOR DECONTAMINATING EQUIPMENT INFESTED WITH THE GOLDEN NEMATODE

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The use of methyl bromide (MBr) fumigation is currently the only treatment available to decontaminate equipment and other articles to free them of the golden nematode. Because of the impending phase-out of MBr, alternative procedures to decontaminate items infested with the golden nematode must be developed and tested in a relatively short period of time to ensure the integrity of the golden nematode quarantine.

There are a limited number of methods for disinfesting equipment contaminated with the golden nematode. High temperature probably holds the greatest promise for developing an alternative procedure. Small items that can be placed inside steam sterilization chambers do not present a problem. Large items such as tractors, farm vehicles, and tillage equipment will have to be accommodated in some way other than in sterilization chambers.

It has been demonstrated that in intense sunlight the temperature increases dramatically under clear polyethylene. However, laboratory studies have shown that golden nematode eggs that are desiccated and in a state of arrested development can tolerate temperatures as high as 75C for brief periods. In contrast, eggs that are hydrated are very sensitive to high temperature and are killed when exposed to 55C for as little as 30 seconds. Preliminary experiments indicate that temperatures lethal to golden nematode eggs can be achieved and maintained under clear polyethylene that is air tight and exposed to intense sunlight for 6-8 hours.

Steam heat is commonly used to sterilize soil and other items. Although high-pressure steam has often been used to clean equipment infested with the golden nematode, its direct effect on golden nematode survival is not known. Also, the use of contained steam has not been tested for decontaminating equipment infested with the golden nematode. Contained steam would not only serve to achieve temperatures that are lethal to golden nematode eggs but would also hydrate cysts sufficiently to make the eggs more vulnerable to high temperatures.

Our experiments were concerned with the possible use of high temperature to decontaminate equipment infested with the golden nematode. The source of heat used consisted of direct sunlight (solarization), dry heat, and steam. The experimental procedure consisted of placing 4 small nylon sackettes containing 20 golden nematode cysts each in small crevices of each of 4 pieces of tillage equipment. For the solarization

treatment, a 16-inch, 2-bottom plow was drenched with water to hydrate the cysts then sealed in clear polyethylene for 24 hours. For the steam heat treatment, a disc harrow was sealed in clear polyethylene for 27 hours and steam was applied for 6 hours on each of 2 days with a small household steamer used to remove wallpaper. For the dry heat treatment, a 2-row cultivator was sealed in clear polyethylene for 27 hours and dry heat was applied for 6 hours on each of 2 days with a household space heater. The MBr treatment was used as a control. This treatment consisted of sealing a 16-inch, 2 bottom plow in black polyethylene for 24 hours to which MBr was immediately applied at 15 lbs/1000 ft^3. The check consisted of cysts contained in nylon sackettes that were not subjected to treatment. The temperature was recorded under the polyethylene of all treatments except the MBr treatment.

After the treatments were completed, the sackettes containing the cysts were retrieved and the cysts were extracted and subjected to a hatching test. The hatching test consisted of soaking the cysts in water for 5 days then placing them in potato root diffusate for 3 weeks. The number of juveniles that emerge were counted weekly and fresh diffusate was added.

The temperature under the polyethylene of the solarization treatment reached 58C and was maintained for 30 minutes on each of the 2 days. Temperatures under the polyethylene of the steam heat treatment reached 55C which was maintained for 2 hours on each of the 2 days. The temperature under the polyethylene of the dry heat treatment reached 60C which was maintained for 2.5 hours on each of 2 days.

The number of juveniles that hatched from the nontreated cysts averaged 234/replication. The average number juveniles that hatched from cysts in the MBr control averaged 6/replication. The number of juveniles that hatched from cysts that were subjected to steam heat averaged 0.75/replication. There were no viable nematode eggs following the solarization treatment. The number of juveniles that hatched from cysts subjected to dry heat averaged 61/replication.

These data indicate that treatments involving temperatures of 55C or higher combined with the proper moisture levels will effectively decontaminate equipment infested with the golden nematode. Such procedures provide environmentally safe treatments for use in the golden nematode quarantine and regulatory programs and will ensure the integrity of these programs.