DECONTAMINATION OF GOLDEN NEMATODE INFESTED EQUIPMENT WITH STEAM HEAT

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Since the establishment of the golden nematode quarantine, methyl bromide has been the treatment of choice for decontaminating equipment and other articles infested with the golden nematode. Treatment with methyl bromide at 240 g/m^3 for 24 hours under polyethylene is used routinely to decontaminate farm equipment and other articles when they are moved from golden nematode regulated areas to nonregulated areas. Because of the effectiveness of this treatment, there has been essentially no effort to develop other types of treatments. The phase-out of methyl bromide will create a need to develop more environmentally compatible means of decontaminating items that are infested with the golden nematode to ensure the integrity of the golden nematode quarantine.

In previous studies we found that golden nematode eggs in cysts that were presoaked in water are killed when exposed to 55°C for as little as 30 seconds. In contrast, eggs in desiccated cysts tolerated temperatures as high as 75°C for brief periods.

Further studies indicated that solarization with supplement heat where temperatures of 55°C or greater were achieved had potential for decontaminating items infested with the golden nematode. We found that if cysts were soaked in water prior to solarization, a temperature as low as 55°C achieved by solarization was lethal to golden nematode eggs. Although some eggs appeared to survive the treatment, the resultant juveniles did not infect plants.

We then tested the influence of moisture on the effectiveness of heat treatment in killing golden nematode eggs. The heat treatments consisted of solarization (sealed in dear polyethylene for 28 hours and exposed to direct sunlight), solarization plus supplement steam heat, and solarization plus supplement dry heat. The treatments were applied either before or after the equipment to be treated had been prewashed with high pressure water to wet the cysts. The supplemental dry heat was applied with a household space heater and the source of steam heat was from a household wall paper remover.

These experiments revealed that solar heat alone in the Northeastern USA is not sufficient to disinfest equipment contaminated with the golden nematode. The use of supplemental dry heat under polyethylene was not effective even though lethal

temperatures were achieved. The use of supplement steam heat was as effective as methyl bromide in disinfesting equipment contaminated with the golden nematode. Prewashing equipment with high pressure water did not wet the cyst sufficiently to increase the sensitivity of the eggs to high temperatures suggesting that sufficient moisture to sensitize the eggs to heat may be provided during steam heating

Experiments in 1997 concentrated on the effectiveness of steam beat in decontaminating equipment infested with the golden nematode. The source of steam was a steambath generator model SM-12 manufactured by the Steamiest Company, Rutherfored, NJ (Fig. 1). This generator was equipped with a Model 4004-71 Paragon Electric timer and a Johnson Control thermostat Model A319 with a range of 40-100°C To adequately distribute the steam, the generator was plumbed with one-inch steel piping that extended in a U-shape for 6 feet from the generator. The pipe was drilled with 1/16 inch holes at 8-inch intervals.

The equipment used for treating was a two-wheel army trader (4 x 6 ft, Fig 1.). Nylon sackettes containing 20 golden nematode cysts each in 2 grams of soil were placed in four locations underneath and one location on top of the trader. The trader was then sealed in dear polyethylene (6 mil) to which the steam heat was applied. Stem was applied for 1, 2, and 4 hours under the polyethylene. The temperature under the polyethylene was maintained at 61-65°C and recorded with a thermocouple recorder model KTX with a range of 0-100°C manufactured by the Dickson Company.

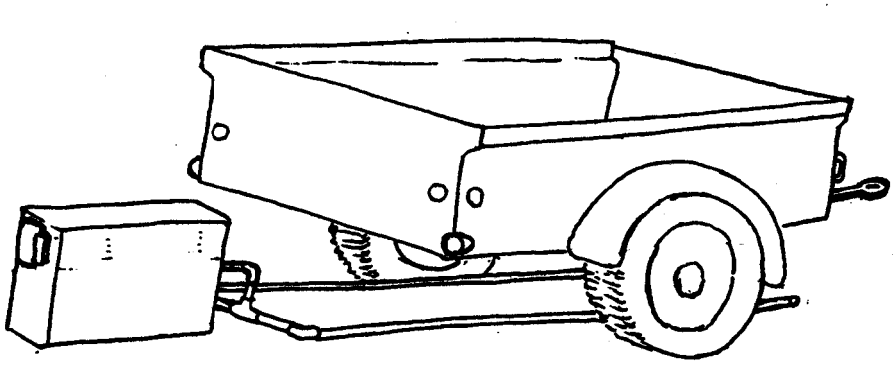

Figure 1. Sketch of the Steamist® steam generator with added plumbing and trader used in the experiments

Methyl bromide treatment served as a control which consisted of covering the trailer in black polyethylene, applying methyl bromide at 240 g/m^3, and sealing for 28 hours. The check consisted of cyst contained in soil-filled nylon sackettes that were not subjected to treatment After the treatments were completed, the sackettes containing the cysts were retrieved 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 exudate for 3 weeks. The number of juveniles that emerge were counted weekly and fresh exudate was added.

An average of 698 juveniles/replicate hatched from the nontreated cysts. No juveniles hatched from cysts that were subjected for two or four hours to steam heat or from the methyl bromide treatment Hatching of Juveniles was detected in one sackette of cysts that was subjected to one hour of steam heat Examination of this sackette revealed that it was located in the bed of the trailer and was not subjected to enough steam to physically moisten the soil in the sackette.

These data indicate that a treatment of 1-2 hours at 60°C is sufficient to kill 100% of the nematode eggs. Therefore, we concluded that steam heat is a suitable replacement for methyl bromide for decontaminating items that are infested with the golden nematode.