THE SUCCESSFUL USE OF A METHYL BROMIDE ALTERNATIVE TREATMENT

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The golden nematode is an introduced pest of potatoes that is under state and federal quarantine. A treatment is required to decontaminate equipment and other items when they are moved from golden nematode infested areas to prevent artificial spread. Since regulations were imposed in 1944, methyl bromide has been the treatment of choice to disinfest items to free them of the golden nematode and because methyl bromide was so effective, there were no efforts to develop alternative treatments for this program. Over a period of five years, a treatment was developed to replace methyl bromide in using steam that provides sufficient moisture to sensitize the eggs inside cysts to high temperature and sufficient heat to kill them. The treatment consists of exposing golden nematode infested items to steam heat at 60ºC for one hour.

Once the treatment parameters were established and confirmed, this information and the design of the experimental equipment used in the research was shared with USDA, Animal Plant Health Inspection Service (APHIS) officials. Equipment was designed for future tests to determine if this steam treatment could be effectively implemented on a large scale and operationally replace methyl bromide in the golden nematode program. Using the small-scale equipment used to apply the steam treatment on an experimental basis as a prototype, APHIS Methods Development specialists worked with the Sioux Steam Cleaner Corporation to design steam-generating equipment that would achieve the treatment protocol. This large-scale generator was tested on-site to determine if it was as effective as methyl bromide in decontaminating equipment. Packets of live golden nematode eggs inside cysts were placed on a tractor and an attached soil sampler. The contaminated equipment was placed inside weather resistant canvas or polyethylene and treated with the steam protocol. The steam treatment was 100% effective as no eggs hatched from steam treated cysts and no nematode infection occurred on potato plants inoculated with eggs that did not hatch.

These results were used in a proposal to amend the USDA, APHIS, Plant Protection and Quarantine Golden Nematode Treatment Manual to allow used containers, construction equipment, and farm equipment to be treated with steam heat before being moved interstate from any regulated area. Pending further testing, this treatment was not recommended for equipment or vehicles with cabs due to possible damage to electrical or plastic components. This action provided an alternative to fumigation with methyl bromide for treating used containers, construction equipment, and farm equipment.

On February 25, 2002, APHIS published a direct final rule in the *Federal Register* (see 67 FR 8461-8466). The direct final rule notified the public of the intention to amend the Plant Protection and Quarantine Treatment Manual, which is incorporated by reference into the Code of Federal Regulations, to allow items used in golden nematode-infested areas to be treated with steam heat before being moved interstate from any regulated area. There were no written adverse comments or written notice of intent to submit adverse comments in response to the direct final rule. The effective date of the direct final rule was confirmed as April 26, 2002. Over the past four years an average of 618 pieces of farm equipment per year have been treated with methyl bromide. It is expected that, with this rule, most of these treatments will be steam treatments. However, there may still be some cases in which methyl bromide treatment is the preferred method of treatment.

The steam treatment was officially used for the first time May 24, 2002 to disinfest a vibrashank cultivar in Arkport, NY. The APHIS personnel applying the treatment reported that it presented no problems and the treatment was completed in a total of two hours including set up and take down. They also reported that the grower was impressed with the speed of the treatment compared to using methyl bromide that tied up his shop for 30 hours in the past to disinfest the same size piece of equipment. To date the steam treatment has been used successfully to disinfest an articulated 4-wheel drive tractor, a 4-row potato planter, a set of vibrashanks, a cable-trenching machine, a Lockwood potato harvester, and a pick-up truck with none of the problems associated with methyl bromide fumigation. The pick-up truck was treated with the windows down during the full one-hour treatment. The interior of the truck reached a maximum of 64.2ºC with no adverse effects to the electrical system.

Steam treatment takes less time than fumigation with methyl bromide – 1 hour versus 24 to 48 hours – and commodities can be released to the owner immediately after steam treatment, whereas several hours of aeration are required after methyl bromide fumigation. Steam treatment is not harmful to the environment and is noncorrosive. No special precautions are necessary for the transportation of steam treatment equipment. In addition, steam treatments can be performed at farm or warehouse locations with less stringent safety requirements than those needed for methyl bromide fumigation (e.g., enclosures used for methyl bromide fumigation must be leak proof, and the location must be secured to prevent unauthorized entry and exposure to methyl bromide).

APHIS supports the cost of the golden nematode treatment program to encourage farmers to treat their equipment before moving it from quarantined to non-quarantined areas. As stated in the *Federal Register*, while there are higher initial costs for steam treatment, the marginal cost for each treatment would be lower (Table 1). Because steam treatment has lower marginal costs, in the long run it will be more economical to use steam treatment than methyl bromide fumigation.

Table 1. Marginal cost of steam treatment vs. methyl bromide treatment.

	Steam Treatment	Methyl Bromide
Labor GS-11, step 5	$200 ($25/hr x 8 hrs)	$400 ($25/hr x 16 hrs)
Labor GS-7, step 5	$136 ($17/hr x 8 hrs)	$272 ($17/hr x 16 hrs)
Chemicals	NA	$97.20 ($3.24 x 30 hrs)
Sub-total	$336	$769.20
Treatments per year	600	600
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Total cost	$201,600	$461,520