PERFORMANCE OF METAM SODIUM DRENCHED TO SIX DIFFERENT REPLANT SITES

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In 1994 this author reported that two full years of nematode control was attainable by uniformly mixing 250 ppm metam sodium (MS) into volumes of water adequate to reach the five-foot soil depth (California Agriculture 48:22-28). Those experiments were conducted with equipment that deployed and retracted multiple drip hoses across field surfaces. Success resulted when one drip emitter was placed on every square foot of field surface and 6 acre-inches of water containing 330 lb/acre MS was uniformly delivered over an 8 hr period. Numerous limitations to the methodology were also identified including the need for greater portability.

We have now tested an improved drencher device in commercial settings involving three sandy soils, two medium-textured soils and a clay loam soil. This new delivery unit provides greater portability and reduced application cost when compared to the handling of drip hoses. Similar to the use of drip hoses, this unit is associated with minimal off-gassing of noxious odors during and after MS applications.

The new unit is a hose reel irrigation system that retrieves a wheeled-cart supporting a 70 to 180 foot-long spray boom. The boom has drop hoses at various intervals with flood nozzles regulated to10 psi for minimal atomization of delivered water. First experiences with this unit involved delivery of MS within 2 acre-inches of water as a pre-plant treatment for sweet potatoes. In this situation nematode control is generally needed to the 30-inch depth. Sandy soils can usually infiltrate these volumes of water without runoff however soil-ripping activities ahead of treatments detracted from uniform delivery of the water into soil. Soil needs to be prepared so that water is infiltrated in one plane of flow (down) with no encouragement of lateral movement. In 2000 we began using this device to deliver 6 to 9 inches of water per acre (photo at www.uckac.edu/nematode). Deep drenching is accomplished by creating soil berms to form basins, thus preventing run-off until the water and biocide have infiltrated. Construction of cross berms also became important in high infiltration settings where soil infiltration rates exceeded rates of water flow. In some sandy soils water infiltration can exceed one gallon per one square foot per minute. Commercial units should be selected which deliver 500 to 600 gallons per minute. Where soil is less than level basins should be smaller but at these flow rates the typical basin size in sandy soil is expected to be 5,000 square feet. At 600 gpm one drencher unit manned by 1.5 operators can profitably treat an acre in five hours at a cost of $240/acre. The additional cost of MS is currently about $1.00 per pound.

Success of a soil treatment can be determined by sampling nematodes at one foot increments down to five feet about 60 days after treatment. Population reductions of 99.9% compared to the untreated check indicate at least two years of nematode relief.

Population reductions of only 98% indicate a rebounding of the nematode problem can occur within one year.

Nematode sampling results summarized from each of four to six replicates are presented in Table 1. In the three soils having highest water infiltration rates (loamy sand soils) plant parasitic nematodes were adequately controlled with 6 acre-inch (250 ppm MS) or 8 acre-inch (190 ppm MS) deliveries whether the formulation was Vapam or Sectagon. The Marysville soil consisted of sandy loam in the surface three feet underlain by a finer clay loam soil. In this soil 8 acre-inches of water was not delivered below the 4.5 foot depth. Near Gridley, CA the nematode population was a recent infestation restricted to the surface three feet of soil. Although our water delivery only reached four feet deep the drenching proved adequate. Complete infiltration of the 7 acre-inches of water required four full days so this would not be a soil where drenching would be recommended. The clay loam soil near Yuba City also exhibited poor water infiltration qualities. Additionally, the sub-angular blocky nature of deep soil clods limited penetration of water within them. A drench of the relatively short-lived MS product was not successful in the Yuba City soil. All Telone treatments, when applied at the current California limit of 332 lb/acre 1,3-dichloropropene, were also unsuccessful in this soil.

Summary

A new portable drenching device has now been tested in six different field settings and has provided excellent nematode control in four locations, limited success in one site and no success in another. Treatment sites must be properly selected and prepared. A soil moisture content slightly less than field capacity throughout the surface five feet will provide best treatment conditions. Those soils having poor structure or those deep-ripped ahead of treatment are not amenable to drenching. This unit can be used to deliver 1 to 2 acre-inches of water and biocide to short-lived annual crops. It can also be used to apply surface treatments of MS in 2 acre-inches water above a deep-shank application of Telone. For deeper soil treatments as reported here, basins must be constructed and then filled with appropriate quantities of water and biocide as the unit is slowly pulled across the field. Deep drenching of MS to well-structured clay loam soils has potential but 400 lb per acre MS in 9-acre-inches will be needed for success (label change needed). The best time to deep drench MS is in spring when soils are closer to field capacity. Pre-treatment irrigation may be necessary where drenches during summer and fall months are planned.

Acknowledgements

This study was partially supported by funds from California Dept. Pesticide Regulation, USEPA, a special cooperative agreement with USDA-ARS, Fresno, and California Dept. of Food and Agriculture. Research was completed with technical assistance of Jim McKenna, Tom Buzo, Stephanie Kaku and Rulon Ashcroft.

Table 1. Performance of a hose-reel drench device in six field settings.

Modesto, CA / loamy sand soil / 2 yr. following peach	
MB, tarped at 350 lb/acre	99.60%
Vapam, 330 lb MS /acre in 8 acre-inches	99.90%
Non-treated check	(244 / 250 cc soil)
Dinuba, CA / loamy sand and sandy loam / following apricot	
MB, tarped at 300 lb/acre	100.00%
Sectagon, 330 lb MS / acre in 8 acre-inches	99.90%
Non-treated check	(1258 / 250 cc soil)
Parlier, CA / loamy sand / 2 yr. following peach	
Vapam, 300 lb MS / acre in 6 acre inches	99.90%
Pre-treatment sampling result	(130 / 250 cc soil)
Marysville, CA / sandy loam / 18 mo following walnut	
MB, tarped at 400 lb / acre	100.00%
Telone II, 500 lb / acre in strips + 165 lb MS in 3 ac-inch	100.00%
Vapam, 330 lb MS /acre in 8 acre-inches	99.40%
Non-treated check	(382 / 250 cc soil)
Gridley, CA / silt soil / following walnut	
Sectagon, 330 lb MS / acre in 7 acre-inches	100.00%
Non-treated check	(50 / 250 cc soil)
Yuba City, CA / clay loam soil / following peach	
Telone II 330 lb/ac then 110 lb MS in 2 acre-inches	98.60%
Telone II 330 lb/ac, tarped	94.00%
Telone II 220 lb/ac, tarped	99.40%
Sectagon, 330 lb MS/ac in 9 acre-inches #1 (4 reps)	89.00%
Sectagon, 330 lb MS/ac in 9 acre-inches #2 (4 reps)	90.00%
Telone-C35, dual applic. 69 gal/acre	99.60%
Telone-C35, tarped, 40 gal/acre	89.20%
Telone-C35, tarped, 55 gal/acre	90.00%
Non-treated check	(186 / 250 cc soil)

Note: Actual nematode counts/ 250 cc soil from the non treated are shown in parenthesis. MS refers to metam sodium, MB refers to methyl bromide.