University of California Cooperative Extension Fresno County

Vine Lines

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An Assessment of Multiple Approaches for Controlling Gophers in Vineyards

Roger A. Baldwin

Pocket gophers cause extensive damage to many crops including grapes. Many tools are available for controlling gophers including trapping, fumigation with aluminum phosphide, poison baits, and the use of a gas explosive device. Trapping gophers has been a common method for controlling gophers for many years. However, a new trap called the Gophinator (Trapline Products, Menlo Park, CA) is now available that may increase efficiency of trapping. Additionally, combining aluminum phosphide fumigation with trapping may increase effectiveness, as gophers will occasionally spring traps without getting captured. In these situations, gophers often become trap shy and are much more difficult to capture.

Treating these tunnel systems with aluminum phosphide shortly after trapping could remove these individuals from the population thereby increasing gopher control in vineyards. Poison baiting with strychnine, zinc phosphide, and anticoagulant baits (e.g., chlorophacinone and diphacinone) has often been used to control gophers. Efficacy of these treatments has varied widely, although strychnine baits reportedly are most effective. Gas explosive devices have been used to control a number of burrowing animals, although no scientific studies on gophers have been reported. These devices combust a mixture of propane and oxygen within tunnel systems, thereby killing gophers through concussive force while also destroying the burrow system.

All of these methods are currently allowable techniques for controlling gophers in California, although the efficacy and efficiency of these approaches, particularly in comparison to one another, remain unclear.

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Evaluation of Movento™ (spirotetramat) for efficacy against nematodes infesting perennial crops

Michael McKenry, Stephanie Kaku and Tom Buzo

Movento™ (spirotetramat) is a novel active ingredient from the new chemical class of tetramic acids. When applied to foliage, this highly systemic insecticide is converted into an enol form and translocated in an acropetal and basipetal manner within the plant, resulting in effective pest control on roots and shoots. Three years of field evaluations have shown up to a 70% reduction in population levels of *Xiphinema americanum* collected from *Vitis* spp using sieve/mist extraction procedures 18 days after treatment (Fig. 1). Soil extractions of *Xiphinema index* involved a sieve/cheesecloth procedure with impact detectable at 18 days but population declines undetectable until 36 days after treatment. Soil extractions for *Mesocriconema xenoplax* involved sieve/centrifugation methodology, a procedure that provided no indication of reduced population levels until 54 days after treatment (Fig. 2). It is apparent that nematode extraction procedures that necessitate nematode motility are the quickest to show nematicidal impact associated with spirotetramat. Work conducted to date has shown varying degrees of impact with spirotetramat against all plant parasitic

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To better address these issues, I established a replicated trial at Laguna Ranch, Sebastopol, CA, from 6 April – 8 May, 2009, to estimate the efficacy and efficiency of these approaches. Three study blocks were established ranging from 21–31 acres in size. Plots of all three treatment types and a control were established within each block. To assess the impact of treatments on gophers, populations first were indexed by counting fresh gopher mounds and feeder holes in 14–20 index plots per treatment block. This provided both an absolute (presence or absence) and relative (number of mounds and feeder holes) index of activity. Following initial indexing, all treatments were applied. For trapping + baiting, plots were first trapped using Gophinator traps. If a gopher triggered or plugged a trap without getting captured, this tunnel system was flagged. The next day, these flagged tunnel systems were treated with aluminum phosphide (Phostoxin, D & D Holdings, Inc., Weyers Cave, VA). Baiting treatments involved the use of a self-dispensing probe and 1.8% strychnine-treated milo baits (Gopher Getter Restricted Use Bait, Wilco Distributors, Inc., Lompoc, CA). The label directed rate of bait was applied twice per burrow system. The Rodenator® (Meyer Industries, Midvale, ID) was used to treat all gas explosive plots. Following all treatments, new gopher activity was again assessed. This provided an index of gopher control. A second round of treatments was then applied in the same manner as the first round of treatments. A final index of gopher activity was recorded following these final treatments.

In addition to efficacy, I was also interested in assessing how much time and cost was required for each treatment method. Therefore, I recorded average time to apply each treatment, as well as the amount of labor required for each treatment block. The amount of labor was then combined with material costs to estimate the cost of each treatment type. These costs were compared to efficacy to determine which treatment type appeared to be most reasonable for controlling gophers in a vineyard setting.

Based on absolute indices, Rodenator® control ranged from 0–55%, baiting control ranged from 30–56%, and trapping + fumigation ranged from 74–90% (Fig. 1). Relative index values mirrored absolute indices, with substantial reductions in gopher sign for all trapping + fumigation plots (range = 91–96%; Fig. 2); only 2 of 3 baiting (range = 22–81%) and Rodenator® (range = 0–86%) plots indicated substantially reduced gopher sign (Fig. 2). Index values did not differ for control plots for either absolute or relative indices (Figs. 1 and 2). Therefore, observed differences within and across treatments did not appear to be an artifact of natural variation in gopher populations over the sampling period.

The time required to apply each treatment was relatively similar between baiting, trapping, and Rodenator® treatments (90–106 seconds); fumigation treatments were substantially longer (260 seconds). Total costs for each treatment were $7,568, $6,338, and $4,532 for baiting, Rodenator®, and trapping + fumigation, respectively. To be effective, control measures need to result in a minimum of a 70% reduction in plots with gopher activity; values of 80–90% are preferable. Trapping + fumigation met this minimum criterion in all three plots, and met the more rigorous criterion in 2 of 3 plots. Even the one plot that fell short of an 80% reduction in plots with gopher activity yielded a 92% reduction in overall gopher activity. In addition to being more efficacious, trapping + fumigation was also more cost effective. Therefore, trapping + fumigation appears to be an effective method for controlling gophers. Baiting and Rodenator® treatments did somewhat reduce gopher activity in most plots, but these levels of control fell well below the minimum threshold for effectiveness (70%). As such, growers may realize short-term benefits from control, but will have to apply equal effort for control the following year. More effective control measures (80–90%) should reduce the cost of control in subsequent years. Although absolute values were lower than desired for baiting and Rodenator® treatments, relative index values indicated a

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substantial reduction in gopher activity for 2 of 3 plots for both baiting (blocks 12 and 13) and Rodenator® (blocks 13 and 16) treatments (Fig. 2). Therefore, an additional round of treatments could have resulted in greater absolute control values, although additional treatments would add additional costs to control efforts. This is of note, as baiting, and in particular, Rodenator®, treatments have the potential for slowing reinvasion rates due to the destruction of gopher burrow systems by the Rodenator®, and due to residual bait remaining in vacated gopher tunnel systems. However, given that these treatment types were already more costly than trapping + fumigation, a relatively high reduction in reinvasion rates would be required to offset these costs. These reinvasion rates are starting to be assessed. Initial results have hinted that Rodenator® treatments may in fact be reducing gopher populations several months post-treatment, although several more sampling periods will be required to determine if this is in fact the case.

Gophers are a problem for many growers throughout California. As such, effective control options are needed. Trapping can be an effective and efficient method for controlling gophers.

Currently, I am working on a trapping study with several other Farm Advisors throughout California comparing different trap types and trapping strategies. We are currently looking for additional vineyard sites to test these traps and trapping strategies in the fall. If you have a vineyard with a high gopher population and are interested in cooperating with us in this study, please contact me (559-646-6583; rbaldwin@uckac.edu) or Stephen Vasquez (559-456-7285; sjvasquez@ucdavis.edu).

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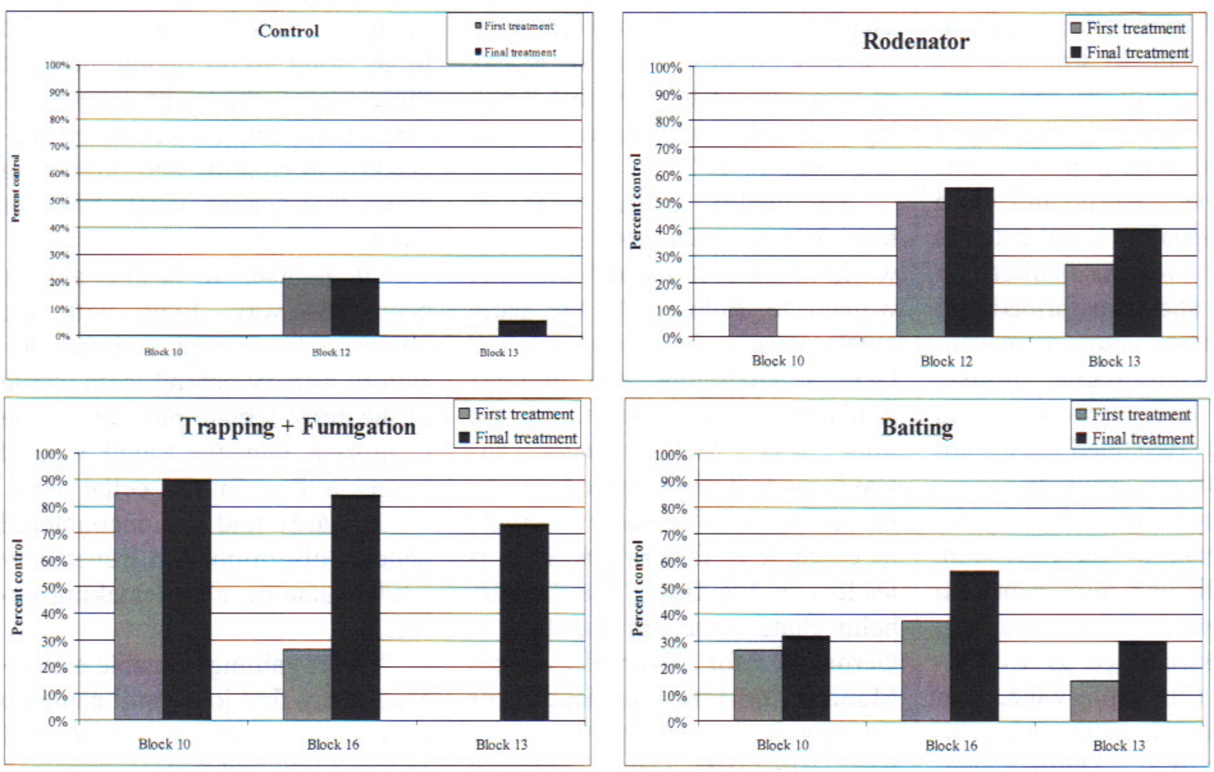

Figure 1. Comparison of percent control ([number of sampling plots with gopher activity after treatment / number of sampling plots with gopher activity before treatment] x 100) across three treatment blocks after the application of the first and final treatment for control, Rodenator, trapping + fumigation, and baiting treatments.

Evaluation of Movento™

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nematode species have been reduced by 50% for up to three months, provided that irrigation was delayed for two weeks following treatment. Late fall treatments to *Juglans* spp. reduced population levels of *Pratylenchus vulnus* by 45% for 4 months, whereas populations of *Tylenchulus semipenetrans* infecting *Vitis* spp were reduced for only 6 weeks. Spring treatments involving *Meloidogyne* spp, as well as those listed above, have provided 50% population reductions for 3 months (Fig. 3). Infection percentages of *T. semipenetrans* by an un-described *Pasteuria* species were not impacted after three years of spirotetramat applications. First-year yield improvements of 10% from treated vines were common but seldom significant. One data set involving a 2-year test provided significantly improved yield as a result of treatment. Phloem transport of molecules having relatively subtle effects on nematodes will require a greater understanding of application timing relative to nematode development, as well as environmental and prevailing field conditions (Fig. 4). Currently, spring/fall treatment timings are associated with avoidance of post-treatment irrigations rather than toward date of root flush.

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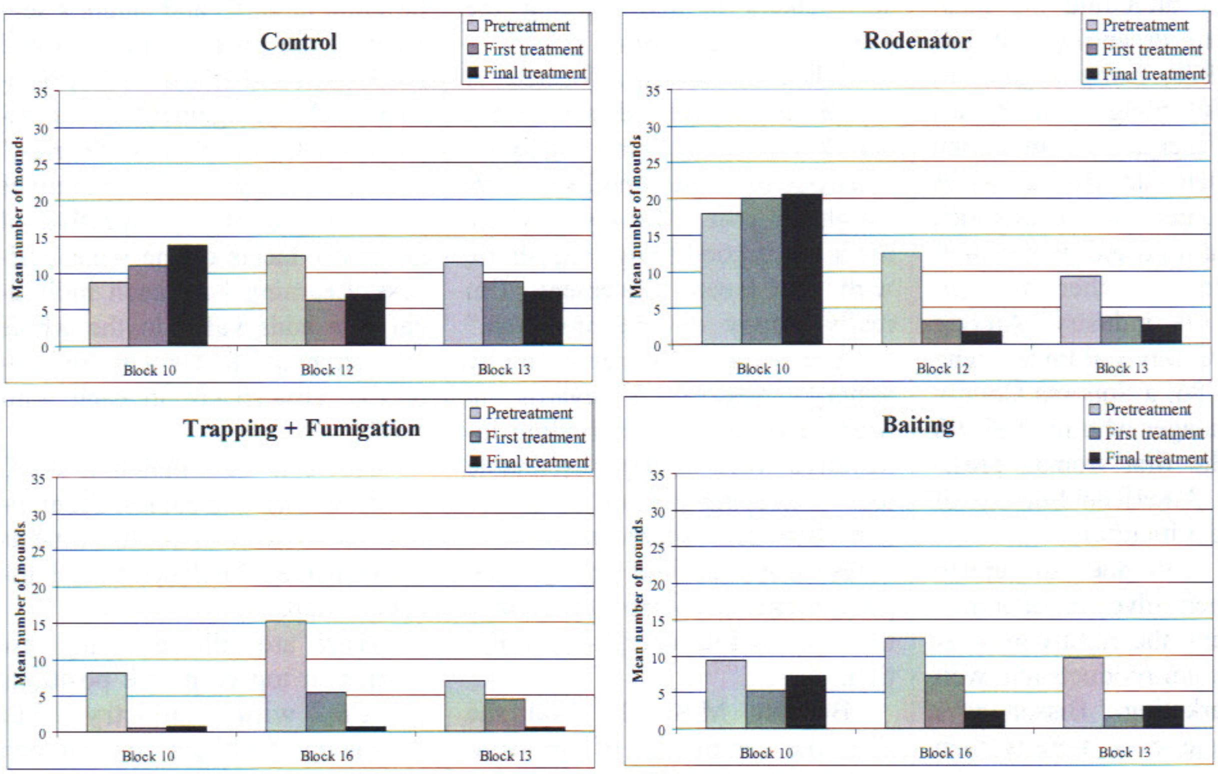

Figure 2. Comparison of the mean number of gopher mounds for three treatment blocks before treatment (pretreatment), after the first treatment, and after the final treatment for control, Rodenator, trapping + fumigation, and baiting plots.