

USE OF SODIUM ACETATE TO INCREASE NEMATICIDE EFFICACY *IN VITRO*[†]

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RESUMEN

Duncan, L. W. y M. M. Abou-Setta. 1995. Uso del acetato de sodio para aumentar la eficiencia de Nematicidas *in vitro*. *Nematropica* 25:173-175.

El acetato de sodio, una sal que atrae a *Tylenchulus semipenetrans*, fue probada para saber su capacidad de aumentar la eficiencia de compuestos con actividad nematicida, como avermectin B, fenamifos, y ABG 9008, contra *Tylenchulus semipenetrans in vitro*. Agua conteniendo varias concentraciones de cada nematicida con y sin acetato de sodio, fue puesta a 4 cm de distancia de los nematodos, en placas petri de 90 mm conteniendo arena humeda. Despues de 48 hrs, los nematodos fueron extraídos de la arena con embudos Baermann. El acetato de sodio aumentó la eficiencia de cada compuesto. La dosis de fenamifos y avermectin necesitada para reducir la recuperación de los nematodos en un 50% fue apoximadamente 4 veces menor, cuando el acetato de sodio fue agregado a las soluciones prueba.

Palabras clave: compuestos atrayentes, control quimico, *Tylenchulus semipenetrans*.

Chemical attractants are widely used to increase the efficacy of insecticides. Dusenbury (4) suggested that chemical baits might also be used for nematode management. However, only a few chemically defined attractants have been reported for plant-parasitic or free-living nematodes (1,2,3,5,6,7), and we are unaware of reports dealing with the effects of combining chemical baits with nematicidal chemicals. *Tylenchulus semipenetrans* Cobb was shown to aggregate in response to the application of 0.1-M solutions of sodium acetate to sand within petri dishes (1). The objective of the present work was to determine whether sodium acetate with nematicidal compounds would increase the efficacy of nematicides against *T. semipenetrans*.

Plastic petri dishes (90 mm-diam) were filled with washed sand moistened with distilled water to 8.0% by weight. Three hundred μ l of a given test solution was pipetted onto the sand at three equidistant points (total of 900 μ l solution), 5 mm from the edge of the dish. An additional 300 μ l of either distilled water or 0.3 M sodium acetate was pipetted onto the sand at the same three points. Approximately 3 000 juvenile and male *T. semipenetrans* in 300 μ l water were then pipetted onto the sand at the center of the dish. Treatments were replicated 6 times, and dishes were stacked in the dark at 25°C. After 48 hrs, 1.5-cm-diam cores of sand encompassing the points at which the chemicals were applied were removed from the dishes to

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remove excess toxin. Plates were inverted onto modified Baermann funnels for 24 hrs and nematodes were counted.

Three types of nematicidal chemicals were tested: fenamiphos (Nemacur 3E, Miles, Inc.), an organophosphate nematicide, at 64, 32, 16, 8.0, 4.0, and 0.0 ppm (active ingredient in the applied solution); avermectin B₁ (Agrimec 0.15 EC, Merck and Co., Inc.) at 160, 40, 10, 4.0, 2.0, 1.0, and 0.0 ppm (a.i.); and an experimental biological control material, ABG 9008 (Abbott Laboratories, Inc.), derived from a fungal culture filtrate at concentrations of 0.2, 0.1, 0.05, and 0.0 g/dish.

Sodium acetate alone had no effect on the number of nematodes recovered from Baermann funnels compared with untreated controls (Fig. 1). However, based on nematodes recovered from Baermann funnels, application of sodium acetate increased the efficacy of all materials tested. This suggests that the salt functioned by increasing the proximity of the nematodes to high concentrations of the toxins. Sodium-acetate reduced the threshold dosages at which toxicants affected nematode recovery, but did not affect efficacy at the highest dosages. The dosages of fenamiphos and avermectin B, required to reduce nematode recovery by half was reduced by approximately four-fold when sodium acetate was added to the test solutions.

It is unknown whether sodium acetate attracts *T. semipenetrans* from a significant distance or whether randomly moving nematodes merely accumulate in sectors of the plate in response to sodium acetate concentration. The question is important, since the most useful attractant baits likely will be compounds that can attract nematodes from long distances.

Results of these experiments support the feasibility of using chemical baits for nematode control. *Tylenchulus semipene-*

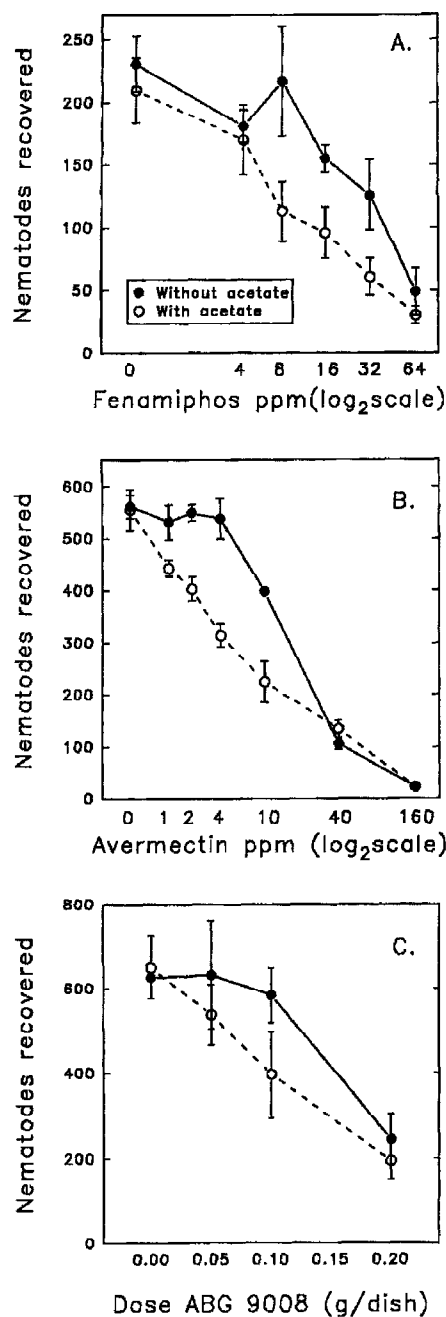


Fig. 1. Numbers of nematodes recovered following 24 hrs on Baermann funnels after 48 hrs exposure to various doses of nematicidal chemicals (A. Fenamiphos, B. Avermectin B₁, C. ABG 9008) that were spotted onto assay plates alone or in combination with 0.3 M sodium acetate.

trans was found to aggregate preferentially in response to several acetate salts (1), and consequently, the agronomic properties of these salts can be considered when choosing materials for formulation. Chemical baits may make it possible to use compounds such as avermectin which have desirable safety and environmental characteristics, but which are ineffective plant-parasitic nematicides due to low mobility in soil. Chemical baits also have the potential to reduce the necessary rates of currently registered compounds. Slow release formulations of nematicides in combination with chemical baits might be particularly effective to achieve nematode control at minimum dosages. The use of baits could also result in greater selectivity of toxicant activity because many chemical attractants appear to be species specific (1,3,6).

The assay system used in these experiments was adequate for preliminary investigation of the use of attractants for nematode control. Nevertheless, additional evaluation of assay conditions for other nematode species is likely to prove worthwhile. The maximum difference between dose response curves should be attained when the distance between toxicant and nematode inoculant is far enough to minimize exposure of randomly

moving nematodes but near enough to obtain a strong response to the chemical bait.

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