Sodium-Containing Detergents Enhance the Extraction of Nematodes[1]

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The extraction of nematodes from clay soil is difficult using flotation-sieving methods of soil-water suspensions. Aggregated soil particles trap nematodes and prevent them from passing through the top coarse sieves during decanting. Also, the soil aggregates clog the sieves which slows the decanting operation. In addition, clay particles are difficult to clean from centrifuge tubes that are used in the centrifugal-flotation extraction process (4).

Soaking, stirring and agitating soil in water have been used to aid in extraction (2, 3, 5, 6), but these manipulations, although reasonably effective, are time-consuming and do not solve the problem of cleaning the clay residue from centrifuge tubes.

The replacement of exchangeable calcium with sodium on soil particles causes deflocculation (dispersal) of the soil (7). The use of Calgon®, a commercial detergent containing sodium metaphosphate and sodium carbonate, to disperse soil samples for particle size analysis has recently replaced the use of sodium hexametaphosphate or sodium silicate which were previously used for this purpose. Seinhorst (5) used sodium oxalate to aid dispersal of clay soil during elutriation. Wallace (8) suggested using Calgon to aid in the recovery of cysts of *Heterodera* spp. from the soil.

Many soils of middle Georgia are high in clay content and are difficult to process for nematode assays. Soaking is required to disperse these soils so that they can be washed through a 9-mesh (1.98 mm openings) screen. A particularly difficult soil to process is the Greenville fine sandy loam (Greenville FSL), which has 37-44% clay and a cation exchange capacity of 7.4 mb/100 g (10).

In preliminary trials, Calgon and Electrasol®, a detergent which contains sodium metasilicate, sodium carbonate and sodium tripolyphosphate satisfactorily dispersed Greenville FSL. Recovery of nematodes was slightly better using Electrasol.

The purpose of this research was to determine whether dispersion of Greenville FSL by Electrasol was better for extraction of nematodes than were soaking and agitation.

Greenville FSL soil, collected from the top 20 cm from one tree site in a peach orchard, was passed twice through a screen with 1.3-mm openings to mix and remove large clods and roots. The soil was divided into 150-ml subsamples, and the following treatments imposed: (i) a soaking in 150 ml water for 2, 12 and 24 hr; (ii) a shaking in 150 ml water at three reciprocations/sec on a wrist action shaker for 2, 12 and 24 hr; (iii) a soaking in 20-ml Electrasol solution (454 g in 3 liters water) plus 150 ml water for 5 min, 30 min and 8 hr; (iv) a soaking in 150 ml water for 24 hr plus Electrasol solution for 8 hr; and (v) a shaking in 150 ml water for 24 hr plus Electrasol solution for 8 hr. The experimental design was a randomized complete block with four replications. Four untreated samples were processed with each treatment unit as controls. All samples were processed through the centrifugal-flotation procedure after treatment. The nematodes *Criconemoides xenoplax* Raski and *Pratylenchus vulnus* Allen and Jensen were identified and counted. Nematode counts were statistically analyzed.

Average numbers of *P. vulnus* and *C. xenoplax* extracted from 150-ml soil samples subjected to the various treatments are given in Table 1. The 5-min Electrasol and the 12-hr water-soaking treatments were significantly better than the untreated control in extraction of nematodes. However, the differences between the 2-, 12- and 24-hr water soak, the 12-hr shaker treatment and the 5-min Electrasol treatments were not significant in extraction of *P. vulnus*. For extraction of *C. xenoplax*, the 5-min Electrasol and the 12-hr water soaking

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TABLE 1. Effect of pre-extraction treatment of clay soil on recovery of *Pratylenchus* and *Criconemoides*.

Treatment	Nematodes in 150 cc soil	
	Praty-lenchus	*Crico-nemoides*
Control	102	165
Water soaking, 2 hr	242	250
Water soaking, 12 hr	300	442
Water soaking, 24 hr	242	375
Shaker, 2 hr	132	135
Shaker, 12 hr	225	190
Shaker, 24 hr	162	250
Electrasol, 5 min	378	525
Electrasol, 30 min	130	125
Electrasol, 8 hr	152	192
Water soaking, 24 hr + Electrasol, 8 hr	90	140
Shaker, 24 hr + Electrasol, 8 hr	182	152
LSD, P=.01	170	105

were significantly better than all other treatments. Although the differences were not significant, the 24-hr water soaking + 8-hr Electrasol treatment was inferior to the control in extraction of both nematodes.

Electrasol had no apparent effect on *C. xenoplax* and *P. vulnus* extracted from clay soils by the centrifugal-flotation method.

Electrasol treatment of clay soil is suggested for nematode assays in surveys and studies of population behavior. However, the use of nematodes extracted by this method for other studies should be done with caution since its effect on the infectivity of nematodes has not been determined. Feder et al. (1) reported that prolonged treatment with detergents renders nematodes more susceptible to plasmolysis by sugar. Wallace (9) reported that surfactants reduced the rate of hatch, movement, infection and reproduction of *Meloidogyne javanica*. There are possible effects of the Electrasol treatment that could affect the nematode infectivity and pathogenicity.

The only disadvantage encountered so far in this method is the reduction of numbers of nematodes recovered from samples allowed to soak for prolonged periods in the Electrasol solution. This is easily overcome by proper planning of sample processing.

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