PRELIMINARY INVESTIGATION OF ETHANEDINITRILE FOR CONTROL OF WEEDS AND NEMATODES IMPORTANT TO FLORIDA PRODUCTION SYSTEMS

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Previous experiments conducted in Australia with ethandinitrile have demonstrated control of weeds and diseases of importance to the production of a variety of crops (Ren et al., 2002). Pests included seed and soilborne fungi (Smith et al., 2003) as well as plant-parasitic nematodes. Weed control in these trials was most effective when plots were tarped and was dependent upon species (Mattner et al, 2003; Ren et al., 2003).

A preliminary in vitro experiment was conducted with seeds of several weed species of importance in vegetable and ornamental production systems in Florida, and with root-knot nematode (*Meloidogyne incognita*) infested soil. The prepared weed and nematode inoculum were placed in open desiccators of measured volume, allowed to equilibrate to the test relative humidity, sealed, and injected with a test amount of EDN through a gas septum port, having first withdrawn an equivalent volume of air. The EDN was generated in the laboratory by injecting concentrated KCN into hot $CuSO_4$ and collected into a Tedlar bag. Percent purity was analysed using a Thermal Conductivity Detector (TCD) fitted to an SRI model 8610C gas chromatograph using a 3 foot 1/8 inch column packed with Porapak Q 80/100 mesh, run at 100^{o}C with a carrier gas (He) 20 mL^{-1}. The quantity of EDN needed to achieve target concentrations was calculated based on percent purity and desiccator volumes. Actual concentrations were measured during exposure by taking samples and analysing them with a Flame Ionisation Detector (FID) using the same column and GC.

Treatments consisted of an untreated control, 20, 50, and 100 mg ethanedinitrile/L. Sample bags were maintained in chambers for five hours and weed seeds were removed from the bags and allowed to germinate on moistened filter paper in Petri plates within 48 hours of treatment. Each treatment was replicated three times and a replicate consisted of three test bags containing the following number of seeds or tubers per bag: pigweed (*Amaranthus hybridus*)-10, portulaca (*Portulaca oleracea*)-20; sicklepod (*Senna obtusifolia*)-5; yellow nutsedge (*Cyperus esculentus*)-5; purple nutsedge (*Cyperus rotundus*)-5; and large crabgrass (*Digitaria sanguinalis*)-10.

In addition, 10-g of nematode-infested soil was placed into three 20-um mesh bags per treatment, replicated three times. Following fumigation, the contents of each packet was added to a four-inch pot containing clean sand and peat 3:1. A small depression was made in the sand and contents of the packet were added. One tomato ('Tiny Tim') was planted directly into the inoculum from the bag and clean sand:peat was used to fill in the plant hole. Plants were maintained in the greenhouse for 12 weeks, after which plant

growth parameters were taken, nematodes were extracted from roots and soil, and root disease and gall ratings were performed. Plant growth measurements included top weight, root weight, and stem caliper at crown. The roots were rated for galling and root condition. Root condition was used as a general indicator of root disease and was assessed using a subjective scale of 1 to 5 with 1 = 0% to 20% discolored roots, 2 = 21% to 40%, 3 = 41% to 60%, 4 = 61% to 80%, and 5 = 81% to 100%. Root galling was assessed using a root gall index based on a scale of 1 to 10, with one representing no galls and 10 representing severe (100%) galling. Nematodes were also extracted from plant root tissue, counted, and identified.

Yellow (Figure 1) and purple nutsedge tuber and pigweed, portulaca (Figure 2), and crabgrass seed germination was significantly reduced by the lowest concentration of EDN tested. Sicklepod germination was reduced with the highest concentration tested (Figure 3). Root-knot nematode control, reflected by the gall ratings (Figure 4), was significantly reduced with all concentrations of EDN tested. The numbers of nonpathogenic nematodes increased with the concentration of EDN tested, but the increase was not statistically significant. These results are similar to those obtained in Australia, where the number of free-living nematodes increased with the application of EDN (Mattner et al., 2003).

References:

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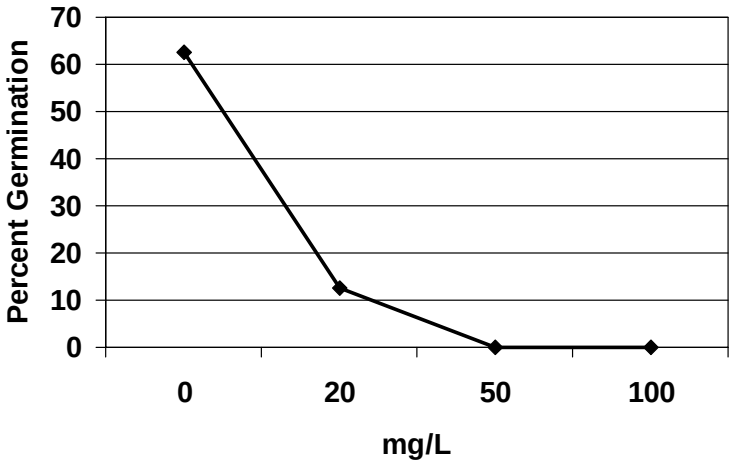

Figure 1. Yellow nutsedge tuber germination after treatment with various rates of ethanedinitrile.

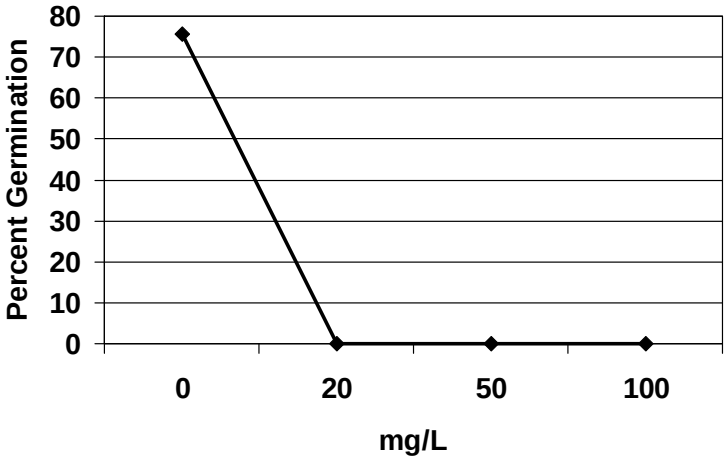

Figure 2. Portulaca seed germination after treatment with various rates of ethanedinitrile.

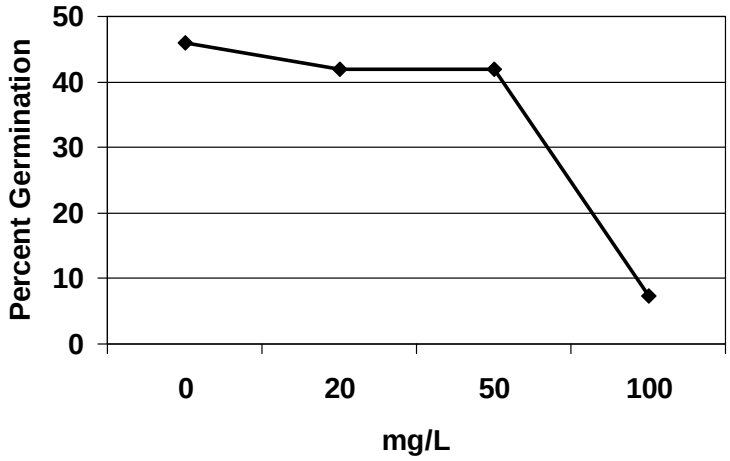

Figure 3. Sicklepod seed germination after treatment with various rates of ethanedinitrile.

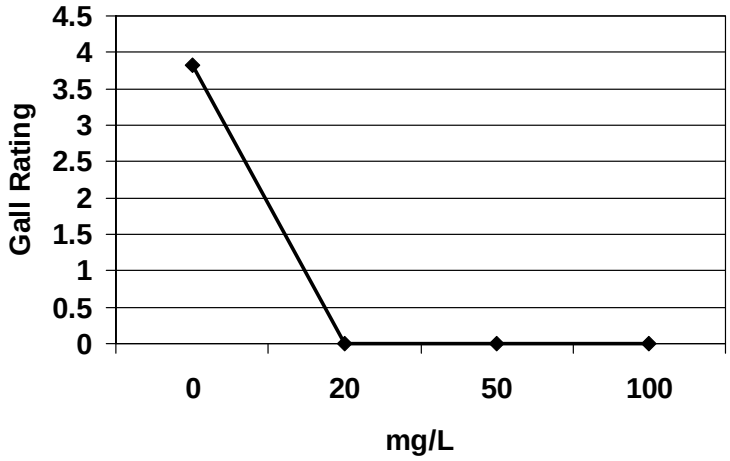

Figure 4. Root galling resulting from root-knot nematode on tomato after treatment with various rates of ethanedinitrile. Zeck's scale (0-10) used for gall rating.