Technique for Screening Cowpea Germplasm for Resistance to Root-knot Nematodes

J. R. RICH, H. E. McKINNEY, and I. J. THOMASON[1]

Initial screening of large numbers of plants for nematode resistance is laborious and space-consuming. Because of the inefficiency of our previous technique, we tested and adapted a screening system which reduced testing time, labor, and space, and provided a uniform test environment. The basic technique has been used for several years at the University of California, Riverside, although not in resistance studies.

Materials consist of 7.5 × 3.8-cm polyvinylchloride tubes (PVC), uniformly selected wire-cut red clay bricks, a steamed loamy soil (75% sand, 24% silt, 1% clay), and a large metal pan (0.6 × 1.0 m) with attached automatic watering system. Three to six PVC tubes are placed on each brick and then filled with 70–80 cm^3 soil. One chloroneb-treated cowpea (*Vigna sinensis* L.) seed is planted in each tube, and the bricks are placed in a growth chamber in the metal pan. Distilled water in the pan is adjusted to a height of 0.5–1.0 cm on the bricks, and water moves through the bricks into soil in the PVC tubes. A constant moisture level is maintained in each tube, and the level may be changed by adjusting water height on the bricks. Soil temperature is maintained at 27–28 C, and the growth chamber is set for a 14-h day. The plants are allowed to grow for 7–14 days after planting, and then inoculated with 5,000 *Meloidogyne* eggs (2). Eggs were selected instead of larvae because of the rapidity and ease with which large numbers could be obtained. A few days before inoculation, and about 2 weeks afterward, 15 ml of a complete Hoagland's solution (1) is added to each plant.

Several tests and observations have been made to determine the efficacy of the technique and the conditions under which it is most effective. A 5,000-egg inoculum level provides adequate galling for indexing and for determining reproduction in susceptible 'Grant' cowpea when inoculated with a cannula having several holes along each side. Removal of plants 25–29 days after inoculation yields best gall indices and sufficient final nematode numbers for comparison of cowpea lines. The galling indices

Received for publication 3 January 1978.

[1] Respectively former Graduate Assistant, now Assistant Professor, University of Florida (IFAS), Department of Entomology and Nematology, ARC, P. O. Box 657, Live Oak, Florida 32060; and Research Associate and Professor, Department of Nematology, University of California, Riverside 92521. Contribution from the Department of Nematology, University of California, Riverside 92521.

and final numbers of nematodes obtained are similar to those obtained in tests using 15-cm-diam clay pots. Plant root systems and galls, however, are smaller than those from pots.

With the PVC system, 20–25 lines replicated six times can be tested in a 0.6 × 1.0-m area. If used in a growth chamber, the technique provides for a uniform environment for testing the relative resistance of many lines simultaneously. In the system, daily watering is unnecessary and uniform moisture, temperature, and light levels are maintained. The number of lines tested is usually limited only by the capacity to extract and count the nematodes from roots. With the development of an auto-analyzer for counting root-knot larvae, only nematode extraction should be a problem, and that could be overcome by extracting and counting eggs. The technique measures nematode reproduction and host galling but does not measure plant tolerance to nematode infection.

LITERATURE CITED

1. HOAGLAND, D. R., and D. I. ARNON. 1950. The water culture method for growing plants without soil. Calif. Agr. Exp. Sta. Circ. 347. 32 p.
2. HUSSEY, R. S., and K. R. BARKER. 1973. A comparison of methods of collecting inocula of Meloidogyne spp., including a new technique. Plant Dis. Rep. 57:1025-1028.