PA-136 Cayenne Pepper, an Exceptional Host for Production of Southern Root-knot Nematode Inoculum

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Additional index words. *Capsicum annuum*, inoculum, soilborne pathogen, host resistance, obligate parasite

The southern root-knot nematode [*Meloidogyne incognita* (Kofoid & White) Chitwood] is a serious pest of many cultivated crop species. Adequate levels of resistance are available in many crops, and plant breeders have frequently been successful in developing resistant cultivars. However, the efficient mass evaluation of plant germplasm for resistance and the development of resistant cultivars requires the availability of large amounts of *M. incognita* inoculum. Eggs of *M. incognita* are usually the inocula of choice. However, availability of egg inoculum often is a problem because host plants commonly used to maintain *M. incognita*, e.g., susceptible tomatoes (*Lycopersicon esculentum* Mill.), become so severely parasitized that they succumb to secondary root diseases. The cayenne pepper (*Capsicum annuum* L.) germplasm line PA-136 has been used successfully at the U.S. Vegetable Laboratory for about 15 years as a maintenance and egg production host for *M. incognita* (Dukes and Fery, 1992). Although PA-136 plants are susceptible to *M. incognita*, they do not exhibit the severe decline and early death that are often characteristic of other commonly used host plants.

Origin

PA-136 was developed at the U.S. Vegetable Laboratory, Charleston, S.C. The new germplasm line was derived from a single

plant that was selected in 1981 from a 'Carolina Hot' population that was heterogeneous for many traits, including plant habit, fruit color, and resistance to root-knot nematodes. 'Carolina Hot' is a cayenne pepper that was released in 1954 by the South Carolina Agricultural Experiment Station (Martin and Crawford, 1958). PA-136 has many excellent horticultural characteristics, and it was originally selected as a candidate line for the composite population that was later released as the root-knot nematode resistant cultivar Carolina Cayenne (Fery et al., 1986). Although subsequently rejected for use in the composite because of susceptibility to root-knot nematodes, PA-136 was retained for further evaluation and use because of its unique capacity to withstand massive infection by root-knot nematodes while supporting very high levels of nematode reproduction.

Description

The plant habit and fruit characteristics of PA-136 are similar to those of 'Carolina Cayenne'. The plants are strong and uniformly branched, and reach a height of ~60 cm under field conditions. A typical PA-136 fruit is straight to slightly curved, 1.6 cm in diameter at the calyx end, 10 cm long, and matures to a bright-red [Munsell (1990) rating 7.5 R 4/16]. The fruits are borne well above the soil surface. PA-136 does not exhibit any obvious segregation for horticultural or disease resistance traits. The germplasm line has consistently produced plants that tolerate heavy *M. incognita* infestations without suffering severe plant decline. However, PA-136 should not be classified as either resistant or tolerant to *M. incognita*. PA-136 plants exhibit a susceptible reaction to *M. incognita*, and fruit yields can be severely impacted when plants are grown in heavily infested soils (J.A. Thies, J.D. Mueller, and R.L. Fery, unpublished data).

PA-136 has been used extensively at the U.S. Vegetable Laboratory as a host for producing large numbers of viable *M. incognita* (races 1 and 3) eggs for use as inoculum. Four to 6 weeks after inoculation with *M. incognita* eggs, numerous small galls bearing large egg masses develop on the roots of PA-136. Abundant egg production continues for several months. The eggs are easily extracted using 0.5% NaOCl (Hussey and Barker, 1973). For example, the root system of a single, greenhouse-grown plant inoculated with *M. incognita* race 3 yields an average of 4.4×10^6 (S.E. = 1.2×10^6) eggs. In our experience, PA-136 produces a larger number of *M. incognita* eggs per gram of root tissue than other susceptible hosts. In one greenhouse study, PA-136 roots produced significantly ($P \leq 0.05$) more *M. incognita* race 3 eggs 74 days after inoculation than did 'California Wonder' bell pepper roots (135,800 vs. 64,240 eggs/g root tissue). The root systems of *M. incognita*-infected PA-136 plants do not appear to be as susceptible to root diseases caused by secondary pathogens as other host plants commonly used to produce *M. incognita* inoculum. With adequate care, *M. incognita*-infected PA-136 plants will remain in good condition for extended periods, thereby allowing a long time interval for egg extraction.

PA-136 is recommended as a host for greenhouse cultures of the four races of *M. incognita* when large numbers of eggs are needed for inoculum in resistance evaluation studies. It is also an excellent host crop to increase *M. incognita* populations in experimental field nurseries. Additionally, PA-136 is recommended for trial as a maintenance host for other *Meloidogyne* species.

Availability

Small trial samples of PA-136 breeder's seed are available from R.L.F. All recipients of seed are requested to provide for their own future needs.

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Received for publication 8 May 1996. Accepted for publication 12 Nov. 1996. The authors wish to acknowledge the assistance of Agricultural Research Technicians F.P. Maguire and E.L. Corley, Jr. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked advertisement solely to indicate this fact.

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