DIFFERENCES IN RESISTANT CAPSICUM ANNUUM ATTACKED BY DIFFERENT MELOIDOGYNE SPECIES

BY

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A comparison of the responses of two resistant lines of Capsicum annuum with those of a cultivar “Doux Long des Landes” susceptible to infection by the root-knot nematodes Meloidogyne incognita, M. arenaria, M. javanica and M. sp. “Seville” population, was carried out under greenhouse conditions (max. 30°C). Fewer M. incognita juveniles penetrated the roots of the resistant peppers, especially those of PM 687. In this line the necrotic reaction arose immediately after nematodes penetrated the roots. When PM 217 was infected with M. incognita or some M. arenaria, occasionally imperfect giant cells developed with which a few immature females were sometimes associated. PM 687 is susceptible to the Seville population while 217 is highly resistant. Close correlations were found between these observations and those obtained with five genes previously identified as conferring resistance to root-knot nematodes.

Keywords: Histopathology, resistance gene, pepper, hypersensitivity, giant cell, root-knot nematodes.

Resistance to the root-knot nematode, M. incognita, was associated with a dominant gene N in “Santanka x s” (Hare, 1957) which was transferred to various cultivars that have not been widely used. Di Vito and Saccardo (1978) indicated that Capsicum chinense and C. frutescens were resistant to five Italian populations of M. incognita. Hendy et al. (1983) confirmed their observations and also found that some cultivars like Yolo Wonder or Lamu were resistant to M. javanica and some M. arenaria populations. They also noted two C. annuum lines, PM 217 and PM 687, resistant to a wide range of Meloidogyne populations and at least four main dominant genes were identified (Hendy et al., 1985).

The purpose of this investigation was to analyse the nature of the resistance and the cellular reactions of these two pepper lines with different genes for resistance.

MATERIALS AND METHODS

Juvenile penetration of roots was studied in seedlings of the two resistant peppers, PM 217 and PM 687, and compared with a susceptible cultivar “Doux Long des Landes” (DLL). Two week-old pepper seedlings were

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transplanted individually into glass tubes (50 ml) filled with sterile soil and cultivated for another two weeks in a greenhouse (25-30°C). Subsequently, a water suspension containing 200 *M. incognita* juveniles, was added in each tube: 50 plants of PM 217, 25 of PM 687 and 25 of DLL, were inoculated. One, two, three, four and five days after soil infestation, seedlings were removed from tubes and root systems washed carefully, fixed and stained with lactophenol cotton blue (de Guiran, 1966). The entire root system of each plant was pressed between two glass slides and examined for penetration by juveniles under a stereo microscope.

For histological observations of cellular responses to nematode infection, six- to eight-leaf stage plants were inoculated with 200 juveniles for the susceptible cultivar DLL, and 1000 or more for the resistant lines. *Meloidogyne* species used were: *M. incognita* (from Calissane, France), *M. javanica* (from Abou Dhabi), *M. arenaria* type I (from Monteux, France), *M. arenaria* type II (from Ain Taoujdate, Morocco) and an undescribed species from Seville (Spain). *M. arenaria* type I was characterized by two esterase b bands while *M. arenaria* type II showed three main esterase bands (see Janati et al., 1982). Sections 12.5 μm thick were obtained from infected roots fixed with Navachine, washed and dehydrated before embedding in paraffin. The sections were stained in a solution of safranine (1%) and counterstained with light green at 0.2% (see Berlyn & Miksche, 1976). About 1000 sections were examined in making the observations reported here.

**RESULTS**

Fig. 1 shows that DLL was penetrated by more *M. incognita* juveniles than either PM 217 or PM 687. Penetration also differed between the resistant lines. Fewer *M. incognita* penetrated roots of PM 687 than those of PM 217. Inoculation with *M. javanica* showed very few juveniles penetrating the roots of both resistant lines. PM 687 resistance to *M. incognita* and *M. javanica* is primarily due to its ability to limit nematode penetration. Resistance in PM 217 was also associated with reduced penetration as well as later responses to juveniles which attempted to settle in the vascular cylinder.

The relationships between PM 687 or DLL and *M. incognita* were examined in detail 48 h following inoculation with 200 juveniles. Seedlings were removed from soil and the roots washed in water for 30 min. Then the plants were put into individual containers with their roots dipping in tap water. Every three days escaping juveniles were counted as well as those remaining in the roots at the end of the experiment: 50% of the juveniles to penetrate PM 687 returned to the soil while only 15% did in DLL (Table I).

Histopathological comparisons showed that in the susceptible cultivar “Doux Long des Landes”, the first cellular changes appeared on the fourth day after inoculation. Giant cells were found with several nuclei adjacent to the