HEAT STABILITY OF ROOT-KNOT NEMATODE RESISTANCE IN BELL PEPPER

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The southern root-knot nematode is a major pest of pepper (*Capsicum annuum*)in the United States. Pre-plant fumigation with methyl bromide is the principal control method used at present, but the removal of this fumigant from the U.S. market in 2001 has focused significant interest on host plant resistance. Efforts to develop bell peppers with resistance to the southern root-knot nematode, *Meloidogyne incognita*, were recently completed by USDA scientists, Charleston, SC. Two root-knot resistant, open-pollinated cultivars, Charleston Belle and Carolina Wonder, were released in April 1997. Both of these cultivars are homozygous for the *N* root-knot nematode resistance gene.

Expression of resistance to root-knot nematodes is heat sensitive in tomato, bean, and sweetpotato (Dropkin, 1969; Jatala, 1972; Mullin *et al*., 1991). Because a major portion of U.S. pepper production is located in hot climates where southern root-knot nematodes are severe pests, knowledge about the expression of resistance under high temperature is essential for resistance breeding programs and for recommendations of pepper cultivars to be grown in such areas.

We compared the response of resistant (R) Charleston Belle and Carolina Wonder and their respective susceptible (S) backcross parental cultivars, Keystone Resistant Giant and Yolo Wonder, to *M. incognita* in controlled environment tests. The experimental design was a split-plot with 3 replications in time. Main plots were 3 temperatures: 24°C, 28°C, and 32°C; sub-plots were 4 cultivars: Charleston Belle (R), Keystone Resistant Giant (S), Carolina Wonder (R), and Yolo Wonder (S). Single twenty-one-day-old plants of each cultivar were transplanted into 10 x 10 cm pots containing 2 sandy loam soil : 1 fine washed river sand and inoculated with ca. 5000 eggs of *M. incognita* per plant. After approximately 8 weeks, plants were removed from pots, roots were washed and rated for severity of root galling using a 1 to 9 scale (1 = no galling; 9 = greater than 80% root system galled). A 1 to 4 rating is considered resistant, and 5 to 9 is susceptible. Eggs were extracted from the roots using 1.0% sodium hypochlorite.

Root galling and *M. incognita* egg production increased ($P < 0.01$)for all four cultivars as temperature increased. The temperature x cultivar interaction was significant ($P < 0.01$). For example, root gall severity scores for resistant Charleston Belle were 1.6, 2.6, and 3.8 at 24°C, 28°C, and 32°C, respectively. In contrast, root gall scores for the susceptible backcross parent, Keystone Resistant Giant, were 4.5, 7.8, and 8.7 at 24°C, 28°C, and 32°C, respectively. Numbers of *M. incognita* eggs per g fresh root for Charleston Belle were 250, 3900, and 19300 at 24°C, 28°C, and 32°C, respectively. Numbers of eggs per g fresh root for Keystone Resistant Giant were 4025, 28450, and 97580, at 24°C, 28°C, and 32°C, respectively.

These results indicate that susceptibility of both the resistant and susceptible cultivars increases as temperature increases. However, root gall scores of the resistant cultivars at 32°C were within the range considered resistant. Although nematode reproduction on the resistant cultivars was greater ($P<0.05$) at 32°C than at lower temperatures, reproduction was only 20% that of the susceptible cultivars. Although Charleston Belle and Carolina Wonder become more susceptible under continuously high soil temperatures, these cultivars appear to offer a suitable alternative to fumigation with methyl bromide for the management of southern root-knot nematodes in many bell pepper production systems. However, further characterization of these cultivars under field conditions will be necessary to determine their usefulness under high temperature conditions.

Literature Citations

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