

ROOT-KNOT NEMATODE RESISTANCE

March 1991

Meloidogyne hapla Chitwood, *M. incognita* Chitwood, *M. javonica* (Treub) Chitwood, and *M. chitwoodi* (race 2);

G. D. Griffin, R. N. Peaden and W. J. Knipe

PLANT CULTURE

Greenhouse

Container Bench or flat deep enough to allow root development

Media Steam sterilized sandy loam soil mixture

Seed Prep Scarify, surface sterilize

Row Spacing 3.0 cm x 1.5 cm

Temp/Light 25 to 30°C

No. of Plants 100 per replication

No. of Reps 3 to 5

Other Inoculate with *Rhizobium meliloti* Dang; promote good growth; use proper insect control and fertilize as needed

INOCULUM CULTURE

Source Greenhouse cultured plants (tomato or alfalfa); eggs obtained by NaOCl method⁽⁴⁾

Storage Eggs in sterile or deionized water

Temperature 0 to 5°C

Storage Life Maximum of 7 days

INOCULATION PROCEDURE

Plant Age 4 weeks

Inoc. Type Egg suspension

Concentration 100 eggs per mL water (500 eggs per plant)

Method Add nematode suspension to exposed roots

INCUBATION

Location Greenhouse flat or bench

Culture Maintain vigorous growth

Age to Rate 8 to 10 weeks

RATING

Reproductive Factor

Resistant $P_f/P_i < 1$

Susceptible $P_f/P_i > 1$

P_f/P_i = Final nematode population/ initial nematode population

Root Gall System

1 Resistant No galling

2 Susceptible 1 to 10 galls

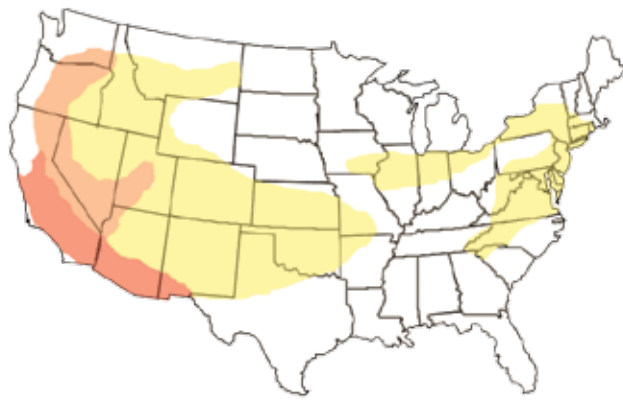
3 Susceptible 11 to 100 galls

4 Susceptible >100 galls

CHECK CULTIVARS

| | Approximate Expected Resistance (%) | Acceptable Range of Reaction (%) |
|---|-------------------------------------|----------------------------------|
| <i>M. hapla</i> | | |
| Resistant | | |
| Nev. Syn XX** | 90 | 75-100 |
| Nev. Syn YY | 90 | 75-100 |
| Susceptible | | |
| Apollo II | 3 | 0-10 |
| Lahontan** | 3 | 0-10 |
| <i>M. incognita</i> and <i>M. javonica</i> | | |
| Resistant | | |
| Moapa 69** | 50 | 40-60 |
| Susceptible | | |
| Lahontan** | 3 | 0-5 |
| Caliverde | 3 | 0-5 |

DISTRIBUTION AND SEVERITY OF *MELOIDOGYNE* SPP



- Not known to occur.
- Occurs but is not considered a problem.
- Occasionally causes significant losses on susceptible cultivars.
- Frequently causes significant losses on susceptible cultivars.

Root-knot nematode, *M. hapla*, *M. incognita*, *M. japonica*, *M. chitwoodi* golden et al.
(Click on the map to the left for a larger version.)

SOURCE OF INOCULUM

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CORRELATION TO FIELD REACTION

Field reaction will be similar but results are more variable unless great care is taken to insure inoculum uniformity and soil moisture is maintained at an optimum level.

RACES

Races are known to occur and geographical differences for virulence have been reported⁽³⁾. Nev. Syn XX is 100% susceptible to one race of *M. hapla*⁽²⁾.

CULTURE OPTIONS

Parasitized field plants can be used as an inoculum source.

PLANT GROWTH OPTIONS

Screening tests can be made under field or microplot conditions if desirable, but uniform soil and inoculum must be ensured. Healthy plant growth is necessary to avoid interaction with other plant pathogens.

INOCULATION OPTIONS AND RANGE OF CONDITIONS

Consistency should be maintained in relation to age of inoculum, plant age, and inoculum concentration between experiments.

HELPFUL INFORMATION

Since geographical races occur, evaluation studies should be made with populations or races from the area in which seed will be used. The root gall system of rating for resistance has generally been used in the past, but is not as desirable as the P_r/P_i reproductive factor method since nematode resistance is determined by the ability of the plant to inhibit reproduction.

M. chitwoodi is a newly identified nematode which may not make galls, therefore the P_r/P_i method is required for this nematode. This nematode has been identified in Washington, Oregon, Utah, and Idaho. There are two races; however alfalfa is a host only for race 2.

M. chitwoodi can be distinguished from *M. hapla* using differential hosts. Bell pepper is a host for *M. hapla*, but not *M. chitwoodi*. Wheat is a host for *M. chitwoodi*, but not *M. hapla*. Nev. Syn XX and Lahontan may be used as susceptible checks for *M. chitwoodi*.

ALTERNATIVE METHODS

Macerated root tissue containing root-knot nematode eggs has been used for inoculum. This is a less desirable method; the inoculum rate is unknown and there are usually other pathogenic nematodes present. The NaOCl method⁽⁴⁾ is a simple and rapid way of obtaining inoculum.

REFERENCES

1. Griffin, G.D. 1984. Nematode parasites of alfalfa, cereals and grasses. Pp. 243-321. In Plant and Insect Nematodes. W.R. Nickle ed. New York: Marcel Dekker.
2. Griffin, G.D., and M.V. McKenry. 1989. Susceptibility of Nevada Synthetic XX germplasm to a California race of *Meloidogyne hapla* populations. J. Nematol. 21 :292-293.
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4. Hussey, R.S., and K.R. Barker. 1973. A comparison of methods of collecting inocula of *Meloidogyne* sp. including a new technique. Plant Dis. Rep. 57: 1025-1028.