

# Root-Knot Nematode Resistance

*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 ..... Pf/Pi < 1  
 Susceptible ..... Pf/Pi > 1  
 Pf/Pi = 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>		
<b>Resistant</b>		
Nev. Syn XX**	90	75-100
Nev. Syn YY	90	75-100
<b>Susceptible</b>		
Apollo II	3	0-10
Lahontan**	3	0-10
<i>M. incognita and M. javonica</i>		
<b>Resistant</b>		
Moapa 69**	50	40-60
<b>Susceptible</b>		
Lahontan**	3	0-5
Caliverde	3	0-5

### DISTRIBUTION AND SEVERITY OF MELOIDOGYNE SPP



Root-knot nematode, *M. hapla*, *M. incognita*, *M. javonica*, *M. chitwoodi* golden et al.

Click on the map above for a larger version. See also the [KEY](#).

### SOURCE OF INOCULUM

Name ..... G.D. Griffin  
 Address ..... USDA/ARS  
 Utah State University  
 Phone ..... 801-750-3073

## SCIENTISTS WITH EXPERTISE

Name ..... G.D. Griffin  
 Address..... USDA/ARS  
                   Utah State University  
 Phone..... 801-750-3073

Name ..... W.J. Knipe  
 Address..... 9180 Edgewood Drive  
                   Northfield, MN  
 Phone..... 507-663-1308

Name ..... R.N. Peaden  
 Address..... USDA-ARS  
                   Prosser, WA  
 Phone..... 509-786-3454

## 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 Pf/Pi 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 Pf/Pi 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 NaOCI method (4) is a simple and rapid way of obtaining inoculum.

## REFERENCES

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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.