

# Pathogenicity of the Columbia Root-knot Nematode (*Meloidogyne chitwoodi*) on Wheat, Corn, Oat, and Barley<sup>1</sup>

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The Columbia root-knot nematode, *Meloidogyne chitwoodi* Golden et al., is a serious pest of potato (*Solanum tuberosum* L.) in the Pacific Northwest (2). Host range studies have shown that in addition to potato, *M. chitwoodi* reproduced well on wheat (*Triticum aestivum* L.) and corn (*Zea mays* L.) (2). Wheat and corn are commonly grown in rotation with potato, there-

fore this cultural practice favors the buildup of the nematode populations in infested soils. This study was conducted to determine the effect of *M. chitwoodi* on the growth of some of the more common varieties of wheat, corn, oat, and barley grown in the Pacific Northwest.

*Meloidogyne chitwoodi* was isolated from potato tubers and increased on tomato (*Lycopersicon esculentum* Mill. 'Rutgers') in a greenhouse maintained at 20-26 C. Nematode eggs for inocula were extracted from tomato roots using the method reported by Hussey and Barker (1). Three pregerminated seeds of wheat cvs. Produx,

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Wanser, and Nugaines; barley (*Hordeum vulgare* L. cv. Boyer); and oat (*Avena sativa* L. cv. Park), and one of field corn cv. PX 46 (Northrup King) and sweet corn cv. Jubilee were planted into 13-cm-d plastic pots containing 1 l methyl bromide fumigated sandy loam soil. At planting, 500 or 5,000 eggs suspended in 25 ml of water were poured around the exposed root of the germinating seed. Control pots received only water. The pots were arranged in 10 randomized blocks on benches in a greenhouse maintained between 20 and 26 C. Plants were watered daily and fertilized weekly with Hoagland's nutrient solution. The experiment was terminated 60 d after inoculation at which time plant tops were cut at the ground line, oven dried, and weighed. Eggs and second stage juveniles of *M. chitwoodi* were extracted from roots using the method previously described; the extracted roots were then oven dried and weighed. Uninoculated control plants were treated in a similar manner. The reproductive index (RI) determined from the final number of eggs

and juveniles/g dry wt root ( $P_2$ ) divided by the initial population ( $P_1$ ) was calculated for each host and  $P_1$ .

Roots of all hosts parasitized by *M. chitwoodi* weighed less ( $P = 0.01$ ) than noninoculated controls (Table 1). However, no differences in top growth were observed. In terms of total plant dry weights only Wanser wheat, Boyer barley and PX 46 corn weighed less ( $P = 0.01$ ) than controls at both inoculum levels. Park oat was affected only at the 5,000 eggs/pot inoculum level ( $P = 0.05$ ). None of the other nematode infected hosts showed significant growth reduction in comparison to their respective controls.

The RI's of *M. chitwoodi* varied among the different hosts (Table 2). *Meloidogyne chitwoodi* reproduced best ( $P = 0.01$ ) on Prodax wheat and least on PX 46 and Jubilee corn.

Galls were observed on the roots of all infested hosts and were more evident on wheat and oat, as compared to barley and corn. On other hosts such as Russet Bur-

Table 1. Effect of *Meloidogyne chitwoodi* on growth of wheat, oat, barley, and corn, determined 60 d after inoculation with 500 or 5,000 eggs/liter of soil.

Host	Inoculum (eggs/liter soil)	Dry weights (gm)*		
		Top	Root	Plant
Wheat 'Prodax'	0	1.1 a	0.2 a	1.4 a
	500	1.1 a	0.1 b	1.2 a
	5,000	1.0 a	0.1 b	1.1 a
Wheat 'Wanser'	0	1.2 a	2.8 a	4.0 a
	500	1.2 a	0.9 b	2.1 b
	5,000	1.1 a	0.9 b	1.9 b
Wheat 'Nugaines'	0	1.1 a	2.2 a	3.3 a
	500	1.2 a	0.9 b	2.1 a
	5,000	1.1 a	0.9 b	2.0 a
Oat 'Park'	0	1.9 a	0.5 a	2.4 a†
	500	2.2 a	0.2 b	2.4 a
	5,000	1.9 a	0.2 b	2.1 b
Barley 'Boyer'	0	1.6 a	1.8 a	3.4 a
	500	1.6 a	1.0 b	2.5 b
	5,000	1.6 a	1.0 b	2.6 b
Corn 'Jubilee'	0	4.0 a	2.0 a	6.0 a
	500	4.0 a	1.2 b	5.1 a
	5,000	3.8 a	1.1 b	5.0 a
Corn 'PX 46'	0	3.7 a	3.6 a	7.3 a
	500	4.0 a	1.9 b	6.0 b
	5,000	3.8 a	1.6 b	5.4 b

\*Values are means of 10 replicates. Values in each column of a host not followed by the same letter differ significantly at  $P = 0.01$  according to Duncan's multiple-range test.

†Significant at  $P = 0.05$ .

Table 2. Reproduction index\* of *Meloidogyne chitwoodi* on wheat, oat, barley, and corn determined 60 d after inoculation with 500 or 5,000 eggs/liter of soil.

Host	Inoculum	
	P <sub>i</sub> = 500	P <sub>i</sub> = 5,000
Wheat 'Prodax'	65.8 a†	58.2 a†
Wheat 'Wanser'	13.0 b	20.2 b
Wheat 'Nugaines'	11.4 b	13.3 b
Oat 'Park'	8.4 b	11.8 b
Barley 'Boyer'	2.2 c	4.6 c
Corn 'Jubilee'	1.4 c	1.4 d
Corn 'PX 46'	1.0 c	1.0 d

\*Reproduction index (RI) determined from the final number of eggs and juveniles recovered/g dry wt root (P<sub>f</sub>) divided by the initial inoculum concentration (P<sub>i</sub>); RI = P<sub>f</sub>/P<sub>i</sub>.

†Values are means of 10 replicates. Values in each column not followed by the same letter differ significantly at P = 0.01 according to Duncan's multiple range test.

bank potato and some tomato cultivars, the nematode attack does not induce gall symptoms (2).

Our results indicate that *M. chitwoodi* may reduce the productivity of wheat, corn, barley, and oat in the Pacific Northwest, especially when these crops are grown in rotation with susceptible crops such as potatoes. Of the hosts selected, corn appeared to be the most amenable for rotation purposes.

#### LITERATURE CITED

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