EFFECT OF CONTINUOUS GROWING OF RESISTANT SOYBEAN GENOTYPES ON *Meloidogyne arenaria* RACE 1 REPRODUCTION

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ABSTRACT

Even though resistance is the most promising tactic for root-knot nematode management on soybean (*Glycine max*), virulent biotypes may occur and be selected on specific resistant plant genotypes. In the present study, reproduction rate of *Meloidogyne arenaria* race 1 increased after four sequences of continuous culture of the parasite on resistant soybean genotypes.

Key words: *Glycine max*, resistance, root-knot nematode, virulence.

RESUMO

Efeito do plantio contínuo de genótipos resistentes de soja na reprodução de *Meloidogyne arenaria* raça 1

Muito embora o uso de cultivares resistentes seja a tática de controle mais promissora para o manejo da meloidoginose em soja (*Glycine max*), biótipos virulentos podem ocorrer no campo e serem selecionados por genótipos resistentes específicos. No presente estudo, a taxa de reprodução de um isolado de *Meloidogyne arenaria* raça 1 aumentou após quatro cultivos contínuos em genótipos de soja resistentes.

Resistance is described as the ability of a plant to suppress reproduction of a nematode (Barker, 1993; Cook, 1991; Truggill, 1991). Despite races 1 and 2 of *Meloidogyne arenaria* (Neal) Chitwood being able to reproduce on soybean [*Glycine max* (L.) Merr.] they can differ greatly in their reproductive potential on this crop (Carpenter & Lewis, 1991; Pedrosa *et al*., 1994, 1996). Microplot (Pedrosa *et al*., 1994) and greenhouse (Pedrosa *et al*., 1996) studies indicated that both races of *M. arenaria* were capable of reproducing on susceptible (CNS) and to a lesser extent on resistant (Jackson and PI 200538) soybean. However, race 1 developed slower and produced fewer eggs than race 2 on all genotypes. The extent of differences between races is critical for management strategies because it may affect crop rotation sequences, as well as the inherent tolerance of the crop to the damage potential of the nematode. On the other hand, continuous use of resistant cultivars should be avoided since reproduction does occur on the resistant genotypes and virulent biotypes may occur in the field and might be selected on specific resistant plant genotypes (Roberts, 1989).

In the present study, a population of *M. arenaria* race 1 (GA-7 isolate from Georgia, Noe, 1991) was successively cultured on either resistant soybean genotype CNS (R1-CNS) or Jackson (R1-Jac) under greenhouse conditions (temperature range 21-35 ^{0}C) with supplemental light from 400-watt multi-vapor phosphor coated lamps to provide a 16-hour photoperiod. After four cycles of inoculations on the soybean genotypes, eggs from infected roots were collected with 0.5% NaOCl (Hussey & Barker, 1973) and increased on greenhouse-grown tomato (*Lycopersicon esculentum* L.) cv. Rutgers. The original isolate of race 1 and race 2 (Govan isolate from South Carolina, Carpenter & Lewis, 1991) were increased on greenhouse-grown tomato, and were included as controls. Inoculum was obtained by hatching second stage juveniles (J2) from eggs for a 48-hour period, after discarding J2 emerging during the first 24 hours.

Four seeds of each soybean genotype, CNS, Jackson, and PI 200538, were planted in 474-cm^3 Styrofoam cups filled with 420 cm^3 soil mix (80% sand, 12% silt, 8% clay), previously fumigated with methyl bromide. After seven days seedlings were thinned to one plant per cup, and eight days later were inoculated with a 4-ml suspension of 5,000 J2 per cup. The experimental design was a randomized complete block with six replications and the treatment design consisted of 12 treatments (four *M. arenaria* isolates × three soybean genotypes) factorially arranged. Forty-five days after inoculation, eggs were collected from whole root systems with 1% NaOCl (Hussey and Barker, 1973), counted with a stereomicroscope, and subjected to analysis of variance by the SAS GLM procedure (SAS institute, 1985). Data (x) of reproduction were transformed to $\log_{10}$ (x+1) values, and are

reported as antilogs. A preliminary experiment was carried out to compare reproduction of *M. arenaria* race 2 isolate to those race 1 isolates cultured on resistant soybean genotypes after two inoculations cycles. Although the number of eggs per root system of race 2 differed from the race 1 isolate cultured on Jackson, race 2 did not differ from the isolate cultured on CNS.

Egg productions per root system and per gram of root were affected by *M. arenaria* isolate, but only the number of eggs per root system was affected by soybean genotype. Reproduction of *M. arenaria* race 2 and isolate R1-CNS was greater on CNS and Jackson than on PI 200538 (Table 1). Indeed, four cycles of CNS inoculation with the race 1 isolate increased its virulence to such degree that its reproduction did not differ ($P > 0.05$) from race 2. Increase in virulence of R1-Jac was also observed but to a lesser degree. *Meloidogyne arenaria* race 1 cultured exclusively on tomato produced fewer ($P < 0.05$) eggs per root system and per gram of root on all soybean genotypes than either *M.arenaria* race 2 or the selected virulent race 1 isolates. Significant interactions between soybean genotypes and *M. arenaria* isolates were not detected. These preliminary results indicate the effect of alternating soybean cultivars within a cropping system on root-knot nematode virulence merits future studies. R1-CNS and R1-Jac should be compared in peanut cultured with *M.arenaria* race 1 cultured exclusively on tomato. Furthermore, the cellular responses in CNS and Jackson induced by R1-CNS and R1-Jac need to be compared to the responses induced by races 1 and 2.

TABELA 1 - Reproduction of *Meloidogyne arenaria* races 1 and 2 and two *M. arenaria* race 1 isolates on the soybean genotypes CNS, Jackson and PI 200538*

Isolate**	CNS			Jackson			PI 200538		
				Eggs per root system					
R1-CNS[1]	95,251	ab	A	92,575	a	A	49,535	a	B
R1-Jac	61,659	b	A	47,039	b	A	42,524	a	A
Race 1	2,504	c	A	3,334	c	A	1,974	b	A
Race 2	159,022	a	A	114,414	a	A	59,293	a	B
				Eggs per gram of root					
R1-CNS	1,972	a	A	1,279	ab	A	714	b	A
R1-Jac	826	b	A	897	b	A	777	b	A
Race 1	35	c	A	54	c	A	42	c	A
Race 2	1,847	a	A	2,134	a	A	1,849	a	A

* Data are means of six replications. Means within columns followed by different lower case letters and means within rows followed by different capital letters indicate significant differences based on Fisher's (protected) LSD ($P < 0.05$) for comparison between *M. arenaria* isolates and soybean genotypes, respectively. Data were log-transformed and are reported as antilogs.

**R1-CNS = *M. arenaria* isolate established after four inoculation cycles in CNS. R1-Jac = *M. arenaria* isolate established after four inoculation cycles in Jackson.

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