Original Article

IDENTIFYING RESISTANCE TO ROOT-KNOT NEMATODES IN *Capsicum* GENOTYPES

IDENTIFICAÇÃO DE GENÓTIPOS DE Capsicum *RESISTENTES A NEMATOIDES DE GALHA*

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ABSTRACT: The present study aimed to evaluate *Capsicum* accessions for resistance to *Meloidogyne incognita* race 3, *Meloidogyne javanica* and *Meloidogyne enterolobii*. Two experiments with different genotypes of hot and sweet peppers were carried out in a completely randomized design. The first experiment was conducted in a 31 x 3 factorial scheme with 27 genotypes of *Capsicum annuum*, two cultivars of hot pepper, one line of *Capsicum frutescens* and tomato 'Santa Cruz Kada', and three species of nematodes (*M. incognita* race 3, *M. javanica* and *M. enterolobii*). In the second experiment, we used a factorial scheme 39 x 3 with 36 accessions of *C. annuum*, two hot pepper cultivars and the 'Santa Cruz Kada' tomato and three nematodes species mentioned earlier. The total number of eggs and second-stage juveniles (TNEJ), number of eggs and second-stage juveniles per gram of root (NEJGR), reproduction index (RI) and reproduction factor (RF) were evaluated. Based on RI and RF, the genotypes CNPH 185, CNPH 187 and CNPH 680 were resistant and very resistant to *M. incognita* race 3 and *M. javanica*, simultaneously. The *C. frutescens* line presented resistance to the three root-knot nematode species.

KEYWORDS: *Meloidogyne incognita*. *Meloidogyne javanica*. *Meloidogyne enterolobii*. chili and sweet peppers. reaction.

INTRODUCTION

Cropping of sweet and hot peppers (*Capsicum* spp.) is gaining notoriety in the Brazilian market, due to the growing demand in the segment of fresh vegetables, condiments, seasonings and preserves. Among the domesticated species of *Capsicum*, the sweet pepper (*Capsicum annuum* L.) stands out for the high yield and economic value (BÜTTOW et al., 2010; PIMENTA et al., 2016), with an estimated national production area of 12.000 hectares (MOURA et al., 2012). In Brazil, the main producing regions are the Southeast and Center-West, especially the state of São Paulo, which produced, in the 2012 harvest, 65.6 thousand tons in 2.2 thousand hectares (IEA, 2016).

With the increase of sweet pepper consumption, cropping mainly carried out in protected environment, due to the greater productivity and fruit quality, as well as the regularization of product supply throughout the year (PINHEIRO et al., 2014). However, successive crops, together with inadequate soil and crop management, have led to a rise in root diseases, especially root-knot nematodes.

The *Meloidogyne* spp. nematodes are phytoparasites that have caused serious damages in cropping of hot and sweet peppers. Several studies have reported the parasitic action of these nematodes on *Capsicum* (MELO et al., 2011; GONÇALVES et al., 2014; PINHEIRO et al., 2014; PINHEIRO et al., 2015).

Genetic control is the most sustainable way to manage root-knot nematodes, since it poses no risk to human health; it is relatively of low cost and does not pollute the environment (HUSSAIN; MUKHTAR; KAYANI, 2014; LIU et al., 2015). Lópes-Pérez et al. (2006) point out that the use of genetic resistance is an attractive alternative because it does not require major adaptations in the productive procedures of the property.

It is known that 90 species are described belonging to the genus *Meloidogyne* (MOENS et al., 2009). Among them, *Meloidogyne incognita* (Kofoid & White) and *Meloidogyne javanica* (Treub) are the most important species for the sweet pepper (PINHEIRO et al., 2014). Recently, the species *Meloidogyne enterolobii* Yang and Eisenback (sin. *Meloidogyne mayaguensis* Rammah and Hirschmann) has gained importance, as effective sources of resistance against the major

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species of *Meloidogyne* have been shown to be ineffective in its control (BRITO et al., 2007; PINHEIRO et al., 2013).

To minimize losses caused by nematodes occurrence, croppers have adopted the grafting technique, using resistant rootstocks. There are some commercial hybrids available for sweet peppers rootstocks, such as 'Silver' and 'Snooker', both resistant to *M. incognita* and *M. javanica* (PINHEIRO et al., 2014). However, these rootstocks do not present resistance to *M. enterolobii*.

There are no reports of sweet pepper cultivars with multiple resistance to root-knot nematodes, being the search for *Capsicum* genotypes that, simultaneously, present resistance to the major *Meloidogyne* species, is of fundamental importance for the development of resistant cultivars or rootstocks. Thus, this study aimed to assess *Capsicum* genotypes for resistance to *M. incognita* race 3, *M. javanica* and *M. enterolobii.*

MATERIAL E METHODS

For the identification of resistant genotypes to the species of root-knot nematodes, two experiments were carried out consecutively in a greenhouse in the Sector of Vegetable Crops and Aromatic Medicinal Plants and Plant Pathology Laboratory, Department of Plant Protection, Universidade Estadual Paulista (UNESP), Faculdade de Ciências Agrárias e Veterinárias (FCAV), Jaboticabal (21º15'22" S, 48º18'58" W; 595 m a.s.l.), São Paulo, Brazil, between the months of September of 2015 to February of 2016.

A total of 63 genotypes of *Capsicum annuum*, two commercial pepper cultivars (BRS Moema and BRS Mari), one sweet pepper cultivar (Ikeda) and one chilli pepper strain (*C. frutescens*) were evaluated for resistance to *M. incognita* race 3 , *M. javanica* and *M. enterolobii*.

The accessions of *Capsicum annuum* are part of the collection of peppers and sweet peppers present from the Active Germplasm Bank of Embrapa Hortaliças, these being from collections and/or partnerships with national and international institutions. Table 1 shows the relation of the genotypes used, as well as the origin and main morphological characteristics.

Table 1. Origin and main characteristics of 63 genotypes of *Capsicum annuum* from the Active Germplasm Bank of Embrapa Hortaliças, evaluated in two experiments on the reaction to root-knot nematodes.

Nº	Genotypes	Origin	Fruit color	Fruit format
	Experiment 1			
1	CNPH 29	FAO*	Dark red	Elongated
2	CNPH 30	Spain	Dark red	Rectangular
3	CNPH 31	FAO	Dark red	Elongated
4	CNPH 32	Japan	Dark red	Rectangular
5	CNPH 33	USA	Red	Triangular
6	CNPH 40	Japan	Red	Elongated
7	CNPH 42	Japan	Dark red	Elongated
8	CNPH 43	Japan	Dark red	Elongated
9	CNPH 44	Japan	Red	Elongated
10	CNPH 45	Japan	Red	Elongated
11	CNPH 47	USA	Dark red	Triangular
12	CNPH 48	USA	Red	Elongated
13	CNPH 66	Brazil	Red	Triangular
14	CNPH 67	Brazil	Dark red	Rectangular
15	CNPH 68	Brazil	Dark red	Triangular
16	CNPH 69	Brazil	Dark red	Triangular
17	CNPH 144	Malaysia	Dark red	Elongated
18	CNPH 147	France	Dark red	Rectangular
19	CNPH 149	Mexico	Red	Triangular
20	CNPH 150	Argentina	Red	Rectangular
21	CNPH 183	Guatemala	Yellow/Orange	Rectangular
22	CNPH 184	India	Dark red	Rectangular

23	CNPH 185	Mexico	Dark red	Elongated
24	CNPH 186	Mexico	Dark red	Triangular
25	CNPH 187	Mexico	Dark red	Triangular
26	CNPH 188	India	Dark red	Rectangular
27	CNPH 190	India	Dark red	Rectangular
Experiment 2				
28	CNPH 64	USA	Red	Elongated
29	CNPH 145	Malaysia	Dark red	Elongated
30	CNPH 191	Brazil	Red	Triangular
31	CNPH 194	Spain	Red	Triangular
32	CNPH 198	Argentina	Dark red	Rectangular
33	CNPH 199	Argentina	Red	Rectangular
34	CNPH 200	Argentina	Red	Rectangular
35	CNPH 291	USA	Yellow/Orange	Rectangular
36	CNPH 292	USA	Dark red	Rectangular
37	CNPH 295	USA	Red	Rectangular
38	CNPH 296	USA	Red	Rectangular
39	CNPH 297	USA	Red	Rectangular
40	CNPH 432	Figi	Dark red	Elongated
41	CNPH 433	Taiwan	Red	Rectangular
42	CNPH 580	Netherlands	Red	Rectangular
43	CNPH 581	Netherlands	Red	Rectangular
44	CNPH 582	Netherlands	Red	Rectangular
45	CNPH 583	Netherlands	Red	Rectangular
46	CNPH 593	Netherlands	Red	Rectangular
47	CNPH 602	USA	Dark red	Triangular
48	CNPH 640	Hungary	Red	Triangular
49	CNPH 641	Hungary	Dark red	Pitanga type
50	CNPH 642	Hungary	Red	Triangular
51	CNPH 644	Hungary	Dark red	Rounded
52	CNPH 646	Hungary	Dark red	Elongated
53	CNPH 677	Iran	Dark red	Triangular
54	CNPH 680	USA	Dark red	Triangular
55	CNPH 682	India	Dark red	Elongated
56	CNPH 683	India	Dark red	Triangular
57	CNPH 684	Spain	Red	Triangular
58	CNPH 687	Turkey	Dark red	Triangular
59	CNPH 688	Turkey	Red	Triangular
60	CNPH 690	Turkey	Dark red	Triangular
61	CNPH 691	Turkey	Red	Elongated
62	CNPH 692	Turkey	Dark red	Triangular
63	CNPH 693	Turkey	Dark red	Triangular

*FAO: Food and Agriculture Organization of the United Nations

Both experiments were conducted in a completely randomized design. The first experiment was arranged in a factorial scheme 31 x 3, being 27 genotypes of *C. annuum* (Table 1), the hot pepper cultivars BRS Moema and BRS Mari, a line of tabasco pepper (*C. frutescens*) and the tomato 'Santa Cruz Kada' used as a susceptibility control to the genus *Meloidogyne* spp., and three species of root-knot nematodes (*M. incognita* race 3, *M. javanica* and *M. enterolobii*).

The second experiment was conducted in a factorial scheme 39 x 3, with 31 genotypes of *C.*

annuum (Table 1), two hot peppers cultivars (BRS Moema and BRS Mari), the 'Santa Cruz Kada' tomato and three species of root-knot nematodes (*M. incognita race* 3, *M. javanica* and *M. enterolobii*). Both experiments contained six replicates and the plots were composed of one plant.

The subpopulations of *M. incognita* race 3, *M. javanica* and *M. enterolobii* were obtained from 'Santa Cruz Kada' tomato roots, belonging to the nematode collection of the Laboratory of Nematology, Department of Plant Protection, Faculdade de Ciências Agrárias e Veterinárias (UNESP), Campus of Jaboticabal.

We prepared the inoculum as described by Hussey and Barker (1973). The estimation of eggs and second-stage juveniles' population in the suspension was performed using a Peter's counting chamber under a photonic microscope, with a subsequent concentration adjustment for 1.000 eggs and second-stage juveniles mL^{-1}.

The seedlings, in both experiments, were produced in 128 cells expanded polystyrene trays filled with Bioplant®. Two seeds were disposed per cell, with subsequent thinning to obtain one quality seedling. We transplanted the seedlings at 40 days after sowing to 2.0 L plastic pots, containing the mixture of soil, sand and bovine manure, in the ratio 1:1:1, previously autoclaved (120ºC, 1 atm, 1 hour). At the time of transplantation, with the aid of an automatic pipette, we inoculated 5 mL of a suspension containing 5,000 eggs and second-stage juveniles (J_2) in each pot, for each root-nematode species separately, characterizing the initial population (Pi).

After 90 days of inoculation, the plants were evaluated by separating between shoot and roots. We extracted eggs and other nematode stages according to the technique of Hussey and Barker (1973). With the aid of a Peter's chamber and a photonic microscope, we quantified the total number of eggs and second-stage juveniles (TNEJ). From this procedure, we obtained the final nematodes population (FP) in the roots.

To assess the resistance of genotypes to *M. incognita* race 3, *M. javanica* and *M. enterolobii,* we used the total number of eggs and second-stage juveniles (TNEJ), number of eggs and second-stage juveniles per gram of root (NEJGR), reproduction index (RI) and reproduction factor (RF). The number of eggs and J_2 per gram of root was determined from the division of the TNEJ /root total weight. The reproduction factor was calculates as the following formula:

$$RF = \frac{fP}{iP}$$

Where: RF = Reproduction factor, *f*P = Final population and *i*P = Initial population of viable eggs and second-stage juveniles. Plants with RF<1 were considered resistant to the nematode, and with RF≥1 were considered susceptible to the nematode, according to Oostenbrink (1966).

We calculated the reproduction index (RI) considering the 'Santa Cruz Kada' tomato as a susceptibility control (100%) in relation to nematodes reproduction obtained in *Capsicum* genotypes. Thus, the formula was used: 100 x (Number of eggs per gram of root of each replicate/Average number of eggs per gram of root of the susceptible tomato cultivar). According to the criteria established by Taylor (1967), the degree of resistance was classified as susceptible (S) - RI greater than 50% of the value obtained for the 'Santa Cruz Kada' tomato; Slightly resistant (SR) - RI with 26 to 50%; Moderately resistant (MoR) - RI with 11 to 25%; Very resistant (VR) - RI with 1 to 10%; Highly resistant (HR) - RI with less than 1%, and immune (I) - when there was no reproduction.

To meet the assumptions of normality and error distribution, the data were transformed to log (x+5). Data were submitted to analysis of variance, and when significant differences were identified by the F test, were grouped by the Scott-Knott test at 5% probability. For analysis, we used the statistical software AgroEstat (BARBOSA; MALDONADO JUNIOR, 2015).

RESULTS AND DISCUSSION

For both experiments the viability of the inoculum and the experimental conditions were satisfactory, since the values of TNEJ and NEJGR obtained for the susceptibility control, the 'Santa Cruz Kada' tomato, were considered as high (Tables 2 and 5), differing statistically from the other evaluated genotypes. Pinheiro et al. (2014) using the 'Rutgers' tomato as susceptibility control for a *Capsicum* experiment, also observed an excellent multiplication of the same nematode species, which presented high NEJGR and reproduction factor.

Tables 2 and 5 show the means of *C. annuum* genotypes, *C. frutescens* line and BRS Mari and BRS Moema cultivars inoculated with *M. incognita* race 3, *M. javanica* and *M. enterolobii*, evaluated in the first and second experiments, respectively. For all variables analyzed, in both experiments, there was a significant interaction by F test at 1% probability.

The *C. frutescens* line presented the lowest values for the variables analyzed in the first experiment, differing from the other evaluated genotypes. *C. frutescens* was the only genotype classified as resistant and very resistant to the three species of root-knot nematodes, as we verified RF<1 and RI<10% (Table 2).

Table 2. Analysis of variance and test of comparison of means of the total number of eggs and second-stage juveniles (TNEJ) of root-knot nematodes, reproduction factor (RF), number of eggs and second-stage juveniles per gram of root (NEJGR), reproduction index (RI) and reaction (R) of 27 genotypes of *Capsicum annuum*, two commercial hot pepper cultivars, one *Capsicum frutescens* lineage and one cultivar 'Santa Cruz Kada' tomato.

Genotypes (G)	TNEJ	RF	R(2)	NEJGR	RI	R(3)
CNPH 29	102,733 c	20.54	S	3,679.45 b	49.95	SR
CNPH 30	110,600 c	22.12	S	4,198.24 b	58.25	S
CNPH 31	107,838 b	21.56	S	2,849.89 c	39.18	SR
CNPH 32	118,666 c	23.73	S	4,389. 99 b	60.31	S
CNPH 33	63,733 d	12.74	S	2,290. 53 c	30.83	SR
CNPH 40	95,413 d	19.08	S	2,200.77 d	30.17	SR
CNPH 42	71,000 c	14.20	S	3,450.33 b	47.54	SR
CNPH 43	70,333 d	14.06	S	2,054.14 d	27.34	SR
CNPH 44	97,066 d	19.41	S	2,125.13 e	28.67	SR
CNPH 45	141,533 b	28.30	S	2,587.84 c	35.36	SR
CNPH 47	55,000 d	11.00	S	1,345.85 e	18.26	MoR
CNPH 48	84,933 c	16.98	S	2,239.33 c	30.68	SR
CNPH 66	146,333 c	29.26	S	4,608.88 b	63.97	S
CNPH 67	125,333 b	25.06	S	3,959.14 b	54.76	S
CNPH 68	80,133 d	16.02	S	1,874.53 d	25.27	MoR
CNPH 69	132,133 b	26.42	S	4,502.91 b	62.29	S
CNPH 144	86,466 d	17.29	S	1,674.48 e	22.52	MoR
CNPH 147	86,733 c	17.34	S	2,152.63 c	29.29	SR
CNPH 149	81,800 d	16.36	S	2,745.89 c	37.22	SR
CNPH 150	122,000 b	24.40	S	3,578.45 b	48.92	SR
CNPH 183	68,000 d	13.60	S	2,254.45 d	30.90	SR
CNPH 184	100,800 d	20.16	S	2,722.89 c	36.64	SR
CNPH 185	131,466 e	26.29	S	3,150.97 e	42.56	SR
CNPH 186	102,266 c	26.29	S	3,740.19 b	50.91	S
CNPH 187	117,533 e	23.50	S	2,952.30 d	39.74	SR
CNPH 188	79,733 e	15.94	S	1,905.14 e	25.68	MoR
CNPH 190	120,133 d	24.02	S	2,020.97 e	27.27	SR
C. frutescens	3,333 f	0.66	R	80.22 f	1.06	VR
BRS Mari	165,733 b	33.14	S	2,977.50 c	40.91	SR
BRS Moema	189,733 b	37.94	S	5,292.75 b	73.40	S
'Sta Cruz Kada'	248,666 a	49.73	S	8,065.70 a	100	S
Test F	25.96**			25.18**		
Nematodes (N)						
M. incognita race 3	84,162.58 b	16.83		2,702.43 b	38.39	
M. javanica	12,897.31 c	2.57		487.28 c	4.89	
M. enterolobii	222,990.32 a	44.59		5,875.28 a	79.54	
Test F	1985.31**			1421.35**		
Interaction (G x N)	16.00**			12.80**		
CV (%)	5.50			8.89		

(1) Means followed by the same letter in the column do not differ by Scott-Knott's test at 5% probability; Real means with statistic based on transformed data for log (x+5). (2) S = susceptible, RI>51%; SR = slightly resistant, 26 %< RI>50%; MoR = moderately resistant, 11 %< RI>25%; VR = very resistant, 1 %< RI>10%; HR = highly resistant, IR<1%. (3) R = resistant; S = susceptible. NsNot Significant. ** and * significant at 1 and 5% probability, respectively, by the F test.

As expected, the cultivars BRS Mari and BRS Moema performed as resistant to *M. javanica*, with RF inferior to 1 and susceptible to *M. enterolobii* (RF>1). The cultivar BRS Moema showed a susceptibility reaction to *M. incognita* race 3 for the two experiments, both by the reproduction factor and the reproduction index (Tables 3 to 7). The resistance and susceptibility reactions of the cultivars BRS Mari and BRS Moema to the species of root-knot nematodes in the present study corroborate with the study done by Pinheiro et al. (2013). However, the cultivar BRS Mari showed susceptibility to *M. incognita* race 3 in both experiments, with RF of 33.56 (Table 3) and 63.84 (Table 6), differing from the result found by the same authors, who observed resistance of this genotype, with RF of 0.92. Probably, these differences are attributed to the populations and even to different *M. incognita* races used, in addition to experimental environmental methodologies and conditions. In the Pinheiro et al. (2013) study, the *M. incognita* race 1 was used and the experiment was carried out in the environmental conditions of Brasília-DF, which has an altitude of 1.200 m in relation to sea level, while in the present study *M. incognita* race 3 was used, and the altitude of Jaboticabal-SP is 595 m.

Dias-Arieira et al. (2012) and Andrade-Junior et al. (2016) reported that certain variations between results obtained in studies involving resistance to nematodes may occur due to differences in evaluation methodologies or to variability among the nematode isolates used in the experiments. Another characteristic that may be related to the discrepancy of the results is the environmental factor, since the studies in question were carried out under different environmental conditions.

In the first experiment, there was a significant difference between genotypes and nematode species for TNEJ and NEJGR in the F test at 1% probability (Tables 3 and 4). However, in the second experiment, there was no difference for *M. enterolobii* among the analyzed materials (Tables 6 and 7). The genotypes of *C. annuum* CNPH 185, CNPH 187, CNPH 188 (experiment 1) and CNPH 680, CNPH 682, CNPH 690, CNPH 693 (experiment 2) presented the lowest values of TNEJ and NEJGR for *M. incognita* race 3, being classified in distinct groups from the other genotypes analyzed by the Scott-Knott test ($p<0.05$) (Tables 3, 4, 6 and 7). When we observed the reaction of these genotypes, we classified as HR or VR by the reproduction index, however, the genotypes CNPH 188 and CNPH 693 were classified as susceptible by the reproduction factor, since RF>1.

When evaluated the reaction to *M. javanica*, it was observed that 19 genotypes were classified as resistant by the reproduction factor in the first experiment (Table 3). As for experiment 2, nine genotypes were in the resistance group (Table 6). Based on RI, the genotypes CNPH 30, CNPH 40, CNPH 183, CNPH 432, CNPH 647, BRS Mari and *C. frutescens* were classified as HR, with RI <1% (Tables 4 and 7).

Table 3. Slicing of interactions between genotypes and root-knot nematodes species for total number of eggs and second-stage juveniles.

Genotypes	***M. incognita* raça 3**			***M. javanica***			***M. enterolobii***			**Test F**
	TNEJ	**RF**	**R[(1)]**	**TNEJ**	**RF**	**R[(1)]**	**TNEJ**	**RF**	**R[(1)]**	
CNPH 29	49,200 cB	9.84	S	4,000 cC	0.80	R	255,000 aA	51.02	S	83.71^{**}
CNPH 30	190,400 aA	38.08	S	2,800 dB	0.56	R	138,600 bA	27.72	S	103.70^{**}
CNPH 31	118,800 bA	23.76	S	7,916 bB	1.27	S	196,800 bA	39.36	S	54.77^{**}
CNPH 32	118,000 bA	23.60	S	4,200 cB	0.84	R	233,800 bA	46.76	S	91.67^{**}
CNPH 33	26,200 dB	5.24	S	7,200 bC	1.44	S	157,800 bA	31.56	S	34.66^{**}
CNPH 40	83,040 bA	16.61	S	2,600 dB	0.52	R	200,600 bA	40.12	S	94.37^{**}
CNPH 42	88,400 bA	17.68	S	4,000 cB	0.80	R	120,600 bA	24.12	S	68.46^{**}
CNPH 43	11,000 eB	2.20	S	7,200 bB	1.44	S	192,800 aA	38.56	S	63.99^{**}
CNPH 44	10,600 eB	2.12	S	4,000 cC	0.80	R	276,600 aA	55.32	S	92.58^{**}
CNPH 45	113,400 bB	22.68	S	5,400 cC	1.08	S	305,800 aA	61.16	S	84.74^{**}
CNPH 47	32,000 cB	6.40	S	5,400 cC	1.08	S	127,600 bB	25.52	S	44.93^{**}
CNPH 48	82,000 bA	16.40	S	5,600 bB	1.12	S	167,200 bA	33.44	S	52.75^{**}
CNPH 66	185,000 aA	37.01	S	2,800 dB	0.56	R	251,200 aA	50.24	S	120.33^{**}
CNPH 67	201,400 aA	40.28	S	3,600 cB	0.72	R	171,000 bA	34.20	S	92.06^{**}
CNPH 68	22,200 dB	4.44	S	5,000 cC	1.00	S	213,200 aA	42.62	S	72.33^{**}
CNPH 69	210,200 aA	42.05	S	4,600 cB	0.92	R	181,600 bA	36.32	S	88.43^{**}
CNPH 144	17,000 dB	3.40	S	7,000 bC	140	S	235,400 aA	47.08	S	58.05^{**}
CNPH 147	63,800 cB	12.76	S	4,800 cC	0.96	R	191,600 bA	38.32	S	63.87^{**}
CNPH 149	25,600 dB	5.12	S	4,800 cC	0.96	R	215,000 aA	43.01	S	74.88^{**}
CNPH 150	119,200 bB	23.84	S	6,600 bC	1.32	S	240,200 aA	48.14	S	70.04^{**}
CNPH 183	79,000 bA	15.80	S	1,400 dB	0.28	R	123,600 bA	24.72	S	108.42^{**}
CNPH 184	13,200 eB	2.64	S	7,800 bB	1.32	S	281,400 aA	5630	S	69.04^{**}
CNPH 185	3,800 fB	0.76	R	2,200 dB	0.44	R	388,400 aA	77.66	S	151.28^{**}
CNPH 186	51,000 cB	10.20	S	4,600 cC	0.92	R	251,200 aA	50.21	S	81.26^{**}
CNPH 187	3,600 fB	0.72	R	4,800 cB	0.96	R	344,200 aA	68.84	S	125.40^{**}
CNPH 188	5,600 fB	1.12	S	3,800 cB	0.76	R	229,800 aA	45.96	S	98.51^{**}
CNPH 190	17,800 dB	3.56	S	5,000 cC	1.00	S	337,600 aA	67.49	S	95.90^{**}
C. frutescens	4,200 fA	0.84	R	1,800 dB	0.36	R	4,000 cA	0.80	R	4.40^{*}
BRS Mari	167,800 aB	33.56	S	4,000 cC	080	R	325,400 aA	65.08	S	110.53^{**}
BRS Moema	264,400 aA	52.88	S	4,200 cB	0.84	R	300,600 aA	60.10	S	110.08^{**}
'Stª Cruz Kada'	231,200 aA	46.24	S	26,070 aA	52.14	S	254,100 aA	51.00	S	0.17^{ns}
Test F	32.64^{*}			13.67^{**}			11.65^{**}			

Lower case letters in the column and upper case in the row do not differ by Scott-Knott's test (p <0.05). [(1)]R = resistant; S = susceptible. ** and * significant at 1 and 5% probability, respectively, by the F test.

Table 4. Slicing of interactions between genotypes and root-knot nematodes species for number of eggs and second-stage juveniles per gram of root.

Genotypes	*M. incognita* raça 3			*M. javanica*			*M. enterolobii*			Test F
	NEJGR	RI	R(1)	NEJGR	RI	R(1)	NEJGR	RI	R(1)	
CNPH 29	1,811.72 Bb	25.74	MoR	217.52 bC	2.18	VR	9,586.62 aA	129.80	S	56.70**
CNPH 30	6,835.21 aA	97.11	S	9108 cB	0.91	HR	5,668.45 aA	76.75	S	96.25**
CNPH 31	3,594.87 bA	51.07	S	135.22 bB	1.36	VR	4,785.73 aA	64.80	S	51.41**
CNPH 32	4,902.09 aA	69.65	S	186.85 bB	1.88	VR	8,081.05 aA	109.41	S	71.60**
CNPH 33	768.30 cB	10.92	VR	302.52 bC	3.04	VR	5,800.79 aA	78.54	S	33.08**
CNPH 40	2,193.66 bA	31.17	SR	84.48 cB	0.85	HR	4,362.47 aA	59.06	S	68.16**
CNPH 42	4,771.14 aA	67.79	S	198.10 bB	1.99	VR	5,448.87 aA	73.77	S	56.98**
CNPH 43	314.62 eB	4.47	VR	456.56 bB	4.59	VR	5,391.25 aA	72.99	S	43.32**
CNPH 44	215.06 eB	3.06	VR	129.25 bB	1.30	VR	6,031.10 aA	81.66	S	70.11**
CNPH 45	2,210.77 bB	31.41	SR	142.41 bC	1.43	VR	5,410.36 aA	73.25	S	59.11**
CNPH 47	903.97 cB	12.84	MoR	139.76 bC	1.40	VR	2,993.82 aA	40.53	SR	34.52**
CNPH 48	2,539.68 bA	36.08	SR	169.89 bB	1.71	VR	4,008.43 aA	54.27	S	3977**
CNPH 66	7,763.23 aA	110.35	S	136.38 cB	1.37	VR	5,923.00 aA	80.19	S	82.66**
CNPH 67	6,093.32 aA	86.57	S	173.78 bB	1.75	VR	5,614.90 aA	76.02	S	64.02**
CNPH 68	629.45 cB	8.94	VR	207.68 bC	2.09	VR	4,824.67 aA	54.44	S	47.14**
CNPH 69	7,064.34 aA	100.87	S	216.12 bB	2.17	VR	6,192.52 aA	83.84	S	66.14**
CNPH 144	335.51 eB	4.77	VR	193.33 bB	1.94	VR	4,494.60 aA	60.85	S	45.15**
CNPH 147	1,732.85 bA	24.62	MoR	204.57 bB	2.05	VR	4,520.49 aA	61.20	S	35.95**
CNPH 149	1,481.41 bB	21.05	MoR	243.95 bC	2.45	VR	6,656.21 aA	90.12	S	48.47**
CNPH 150	3,246.88 bB	46.13	SR	216.41 bC	2.17	VR	7,517.64 aA	101.78	S	55.73**
CNPH 183	1,951.24 bB	27.72	SR	50.66 dC	0.51	HR	4,858.10 aA	65.78	S	89.20**
CNPH 184	389.21 dB	5.53	VR	225.94 bB	2.27	VR	7,601.03 aA	102.91	S	53.10**
CNPH 185	13.,39 fB	1.97	VR	111.42 cB	1.12	VR	9,514.54 aA	128.82	S	96.74**
CNPH 186	2,404.56 bB	34.16	SR	220.40 bC	2.21	VR	8,900.20 aA	120.50	S	55.92**
CNPH 187	236.55 eB	3.36	VR	238.43 bB	2.39	VR	8,381.94 aA	113.49	S	69.76**
CNPH 188	226.76 eB	3.22	VR	134.97 bB	1.36	VR	5,353.72 aA	72.49	S	67.43**
CNPH 190	385.65 dB	5.48	VR	145.56 bC	1.46	VR	5,549.07 aA	75.13	S	60.48**
C. frutescens	113.01 fA	1.61	VR	36.35cB	0.37	HR	91.32 bA	1.24	VR	4.37*
BRS Mari	3,129.14 bA	44.46	SR	82.16 cB	0.83	HR	5,721.22 aA	77.46	S	84.80**
BRS Moema	8,414.47 aA	119.55	S	108.24 cB	1.09	VR	7,395.13 aA	100.12	S	96.59**
'Stª Cruz Kada'	6,382.30 aA	100.00	S	9,956.70 aA	100.00	S	7,386 aA	100.00	S	0.75ns
Test F	28.15**			12.57**			10.07**			

Lower case letters in the column and upper case in the row do not differ by Scott-Knott's test ($p < 0.05$). (1) S = susceptible, RI>51%; SR = slightly resistant, 26%<RI>50%; MoR = moderately resistant, 11%<RI>25%; VR = very resistant, 1%<RI>10%; HR = highly resistant, IR<1%. ** and * significant at 1 and 5% probability, respectively, nsNot significant, by the F test.

Table 5. Analysis of variance and test of comparison of means of the total number of eggs and second-stage juveniles (TNEJ) of root-knot nematodes, reproduction factor (RF), number of eggs and second-stage juveniles per gram of root (NEJGR), reproduction index (RI) and reaction (R) of 36 genotypes of *Capsicum annuum*, two commercial hot pepper cultivars and one cultivar 'Santa Cruz Kada' tomato.

Genotypes (G)	TNEJ	RF	R[2]	NEJGR	RI	R[3]
CNPH 64	97,733 c[1]	19.54	S	4,915.31 d	36.41	SR
CNPH 145	111,544 c	22.30	S	3,731.21 e	26.57	SR
CNPH 191	178,122 b	35.62	S	6,442.23 c	34.46	SR
CNPH 194	216,333 b	43.26	S	6,605.61 c	42.15	SR
CNPH 198	197,566 b	39.51	S	9,105.82 b	61.82	S
CNPH 199	234,122 b	46.82	S	8,181.95 d	49.80	SR
CNPH 200	118,822 b	23.76	S	3,983.15 d	27.06	SR
CNPH 291	230,133 b	46.02	S	9,382.83 c	53.09	S
CNPH 292	200,066 b	40.01	S	7,380.24 c	43.35	SR
CNPH 295	178,888 b	35.77	S	5,184.28 c	35.74	SR
CNPH 296	241,288 b	48.25	S	6,939.06 c	40.75	SR
CNPH 297	183,444 b	36.68	S	5,961.58 c	36.59	SR
CNPH 432	271,400 c	54.28	S	7,644.21 e	39.82	SR
CNPH 433	180,100 b	36.02	S	4,633.18 d	26.62	SR
CNPH 580	215,288 b	43.05	S	5,568.14 d	30.98	SR
CNPH 581	194,177 b	38.83	S	6,387.96 c	33.87	SR
CNPH 582	206,800 c	41.36	S	5,751.49 e	31.84	SR
CNPH 583	178,244 c	35.64	S	5,844.53 e	34.16	SR
CNPH 593	174,766 b	34.95	S	4,814.48 d	27.22	SR
CNPH 602	193,188 b	38.63	S	6,518.16 c	37.70	SR
CNPH 640	175,222 c	35.04	S	5,146.33 e	25.06	MoR
CNPH 641	116,344 b	23.26	S	5,687.13 c	34.56	SR
CNPH 642	123,122 c	24.62	S	8,590.06 c	44.38	SR
CNPH 644	223,077 b	44.61	S	9,225.24 b	56.98	S
CNPH 646	197,477 c	39.49	S	8,258.64 e	41.72	SR
CNPH 677	87,711 c	17.54	S	2,176.90 e	14.83	MoR
CNPH 680	116,466 d	23.29	S	3,293.04 g	24.83	MoR
CNPH 682	123,388 d	24.67	S	3,28.,82 f	24.93	MoR
CNPH 683	138,644 c	27.72	S	4,385.34 e	27.78	SR
CNPH 684	54,211 c	10.84	S	2,351.64 e	15.28	MoR
CNPH 687	156,977 b	31.39	S	7,460.63 c	43.96	SR
CNPH 688	176,944 b	35.38	S	6,163.10 c	41.59	SR
CNPH 690	53,477 d	10.69	S	1,986.06 f	14.87	MoR
CNPH 691	84,711 c	16.94	S	3,660.79 e	27.66	SR
CNPH 692	133,800 b	26.76	S	5,531.69 c	31.41	SR
CNPH 693	84,422 d	16.88	S	2,136.56 f	15.81	MoR
BRS Mari	196,088 c	39.21	S	4,410.42 e	22.84	MoR
BRS Moema	202,944 b	40.58	S	6,816.15 d	39.75	SR
'Stª Cruz Kada'	721,444 a	144.28	S	16,800.63 a	100.00	S
Test F	12.62**			21.85**		
Nematodes (N)						
M. incognita raça 3	220507.69 b	44.10		7801.28 b	29.84	
M. javanica	33955.55 c	6.79		1002.59 c	9.07	
M. enterolobii	281576.07 a	56.31		9068.64 a	68.65	
Test F	652.44**			1313.90**		
Interaction (G x N)	9.58**			14.96**		
CV (%)	10.02			9.47		

[1] Means followed by the same letter in the column do not differ by Scott-Knott's test at 5% probability; Real means with statistic based on transformed data for log (x+5). [2] S = susceptible, RI>51%; SR = slightly resistant, 26%<RI>50%; MoR = moderately resistant, 11%<RI>25%; VR = very resistant, 1%<IR>10%; HR = highly resistant, RI<1%. [3] R = resistant; S = susceptible. [ns]Not Significant. ** and * significant at 1 and 5% probability, respectively, by the F test.

Table 6. Slicing of interactions between genotypes and root-knot nematodes species for total number of eggs and second-stage juveniles.

Genotypes	*M. incognita* raça 3			*M. javanica*			*M. enterolobii*			Test F
	TNEJ	RF	R(1)	TNEJ	RF	R(1)	TNEJ	RF	R(1)	
CNPH 64	13,200 cB	2.64	S	28,533 cB	5.70	S	251,466 aA	50.29	S	12.01**
CNPH 145	42,900 bB	8.58	S	13,066 cB	2.61	S	278,666 aA	55.73	S	11.68**
CNPH 191	255,300 aA	51.06	S	25,333 cB	5.06	S	253,733 aA	50.74	S	8.63**
CNPH 194	261,000 aA	52.20	S	60,800 bB	12.16	S	327,200 aA	65.44	S	4.57*
CNPH 198	176,700 aA	35.34	S	137,066 bA	27.41	S	278,933 aA	55.78	S	0.64ns
CNPH 199	309,300 aA	61.86	S	7,200 dB	1.44	S	385,866 aA	77.17	S	27.19**
CNPH 200	83,400 bB	16.68	S	20,000 cB	4.00	S	253,066 aA	50.61	S	8.11**
CNPH 291	352,800 aA	72.72	S	8,800 dB	1.76	S	328,800 aA	65.76	S	22.61**
CNPH 292	287,400 aA	57.48	S	21,066 cB	4.21	S	291,733 aA	58.34	S	11.11**
CNPH 295	114,000 bB	22.80	S	85,333 bB	17.06	S	337,333 aA	67.46	S	3.00ns
CNPH 296	421,200 aA	84.24	S	14,400 cB	2.88	S	288,266 aA	57.65	S	16.68**
CNPH 297	229,800 aA	45.96	S	15,200 cB	3.04	S	305,333 aA	61.06	S	14.01**
CNPH 432	442,200 aA	88.44	S	1,600 fB	0.32	R	370,400 aA	74.08	S	108.05**
CNPH 433	319,500 aA	63.90	S	11,466 cB	2.29	S	209,333 aA	41.86	S	15.90**
CNPH 580	331,200 aA	66.24	S	8,266 dB	1.65	S	306,400 aA	61.28	S	22.09**
CNPH 581	363,600 aA	72.72	S	11,466 cB	2.29	S	207,466 aA	41.49	S	17.08**
CNPH 582	332,400 aA	66.48	S	6,133 eB	1.22	S	281,866 aA	56.37	S	58.79**
CNPH 583	252,600 aA	50.52	S	4,533 eB	0.90	R	277,600 aA	55.52	S	61.13**
CNPH 593	266,700 aA	53.34	S	8,000 dB	1.60	S	249,600 aA	49.92	S	22.05**
CNPH 602	272,100 aA	54.42	S	11,466 cB	2.29	S	296,000 aA	59.20	S	16.86**
CNPH 640	327,000 aA	65.40	S	2,933 eB	0.58	R	195,733 aA	39.14	S	49.43**
CNPH 641	155,700 aA	31.14	S	15,466 cB	3.09	S	177,866 aA	35.57	S	9.61**
CNPH 642	247,500 aA	49.50	S	5,333 dB	1.06	S	116,533 aA	23.30	S	20.97**
CNPH 644	260,700 aA	52.14	S	78,933 bB	15.78	S	329,600 aA	65.92	S	2.88ns
CNPH 646	344,700 aA	68.94	S	3,200 fB	0.64	R	244,533 aA	48.90	S	90.51**
CNPH 677	49,800 bB	9.96	S	5,600 dC	1.12	S	207,733 aA	41.54	S	16.78**
CNPH 680	3,000 cB	0.60	R	3,466 eB	0.69	R	342,933 aA	68.58	S	71.74**
CNPH 682	2,700 cB	0.54	R	9,866 cC	1.97	S	357,600 aA	71.52	S	43.67**
CNPH 683	102,600 bA	20.52	S	2,666 eB	0.53	R	310,666 aA	62.13	S	45.82**
CNPH 684	50,100 bA	10.02	S	4,800 dB	0.96	R	107,733 aA	21.54	S	14.13**
CNPH 687	172,800 aA	34.56	S	8,533 dB	1.70	S	289,600 aA	57.92	S	18.93**
CNPH 688	97,500 bB	19.50	S	39,733 bB	7.94	S	393,600 aA	78.72	S	6.80**
CNPH 690	3,900 dC	0.78	R	5,600 dB	1.12	S	150,933 aA	30.18	S	28.46**
CNPH 691	7,200 cC	1.44	S	20,533 cB	4.10	S	226,400 aA	45.28	S	16.69**
CNPH 692	130,200 bA	26.04	S	18,666 cB	3.73	S	252,533 aA	50.50	S	8.87**
CNPH 693	9,000 cB	1.80	S	4,800 eC	0.96	R	239,466 aA	47.89	S	30.63**
BRS Mari	319,500 aA	63.84	S	3,466 eB	0.69	R	265,600 aA	53.12	S	49.07**
BRS Moema	365,100 aA	73.02	S	4,800 dB	0.96	R	238,933 aA	47.78	S	29.27**
'Stª Cruz Kada'	823,800 aA	164.76	S	586,133 aA	117.22	S	754,400 aA	150.88	S	0.17ns
Test F	15.67**			15,52**			0.59ns			

Lower case letters in the column and upper case in the row do not differ by Scott-Knott's test ($p < 0.05$). (1)R = resistant; S = susceptible. ** and * significant at 1 and 5% probability, respectively, by the F test.

Table 7. Slicing of interactions between genotypes and root-knot nematodes species for number of eggs and second-stage juveniles per gram of root.

Genotypes	*M. incognita* raça 3			*M. javanica*			*M. enterolobii*			Test F
	NEJGR	RI	R(1)	NEJGR	RI	R(1)	NEJGR	RI	R(1)	
CNPH 64	1,123.36 dB	4.29	VR	1,225.90 cB	11.09	MoR	12,396.68 aA	93.84	S	25,43**
CNPH 145	1,495.14 cB	5.72	VR	402.00 dC	3.63	VR	9,296.48 aA	70.38	S	25,81**
CNPH 191	11,726.29 aA	44.86	SR	670.78 cB	6.06	VR	6,929.61 aA	52.46	S	26,19**
CNPH 194	7,150.84 aA	27.35	SR	2,187.59 bB	19.79	MoR	10,478.40 aA	79.32	S	9,57**
CNPH 198	8,348.06 aA	31.93	SR	6,727.79 aA	60.86	S	12,241.61 aA	92.67	S	1,00ns
CNPH 199	9,825.67 aA	37.59	SR	260.94 eB	2.35	VR	14,459.24 aA	109.46	S	64,11**
CNPH 200	2,795.20 cB	10.69	VR	804.12 cC	7.27	VR	8,350.14 aA	63.21	S	16,31**
CNPH 291	14,548.66 aA	55.65	S	446.37 dB	4.04	VR	13,153.47 aA	99.57	S	51,49**
CNPH 292	10,339.96 aA	39.55	SR	786.50 cB	7.11	VR	11,014.27 aA	83.38	S	27,16**
CNPH 295	9,682.42 aA	37.04	SR	623.68 cB	5.64	VR	10,511.07 aA	79.57	S	28,23**
CNPH 296	3,591.22 bB	13.73	MoR	1,993.44 bB	18.03	MoR	9,968.17 aA	75.46	S	8,13**
CNPH 297	7,019.69 aA	26.85	SR	453.67 dB	4.10	VR	10,411.38 aA	78.82	S	34,19**
CNPH 432	14,475.79 aA	55.38	S	46.80 gB	0.42	HR	8,410.04 aA	63.66	S	149,04**
CNPH 433	6,888.88 aA	26.35	SR	303.61 dB	2.74	VR	6,707.06 aA	50.77	S	37,26**
CNPH 580	9,058.01 aA	34.65	SR	273.14 eB	2.47	VR	7,373.27 aA	55.81	S	44,76**
CNPH 581	11,788.94 aA	45.10	SR	473.84 dB	4.28	VR	6,901.10 aA	52.24	S	32,93**
CNPH 582	9,422.74 aA	36.04	SR	133.08 fB	1.20	VR	7,698.67 aA	58.28	S	92,68**
CNPH 583	8,118.23 aA	31.05	SR	110.82 fB	1.00	VR	9,304.55 aA	70.44	S	100,54**
CNPH 593	7,490.50 aA	28.65	SR	248.53 eB	2.25	VR	6,704.43 aA	50.75	S	47,29**
CNPH 602	9,499.52 aA	36.34	SR	433.03 dB	3.91	VR	9,621.93 aA	72.84	S	35,72**
CNPH 640	11,180.69 aA	42.77	SR	132.50 fC	1.19	VR	4,125.80 aB	31.23	SR	87,06**
CNPH 641	7,015.02 aA	26.83	SR	549.58 dB	4.97	VR	9,496.78 aA	71.89	S	28,80**
CNPH 642	16,652.44 aA	63.70	S	281.29 eB	2.54	VR	8,836.46 aA	66.89	S	59,83**
CNPH 644	11,939.05 aA	45.67	SR	4,157.01 bB	37.61	SR	11,579.66 aA	87.66	S	5,96**
CNPH 646	16,697.10 aA	63.87	S	92.71 gB	0.83	VR	7,986.12 aA	60.46	S	134,56**
CNPH 677	1,366.79 cB	5.23	VR	130.18 eC	1.17	VR	5,033.73 aA	38.10	SR	37,60**
CNPH 680	126.75 fB	0.48	HR	132.39 fB	1.19	VR	9,619.99 aA	72.82	S	102,06**
CNPH 682	85.50 fC	0.32	HR	332.67 dB	3.01	VR	9,442.30 aA	71.48	S	76,97**
CNPH 683	4,388.50 bA	16.79	MoR	123.07 fB	1.11	VR	8,644.44 aA	65.44	S	70,10**
CNPH 684	2,075.23 cB	7.94	VR	151.65 eC	1.37	VR	4,828.06 aA	36.55	SR	36,51**
CNPH 687	10,176.10 aA	38.93	SR	371.33 dB	3.35	VR	11,834.46 aA	89.59	S	45,48**
CNPH 688	4,511.66 bB	17.26	MoR	1,149.94 cC	10.40	VR	12,827.71 aA	97.11	S	16,53**
CNPH 690	224.66 fB	0.86	HR	242.74 eB	2.19	VR	5,490.78 aA	41.56	SR	44,43**
CNPH 691	231.12 eB	0.88	HR	494.11 dB	4.47	VR	10,257.15 aA	77.65	S	45,37**
CNPH 692	8,687.54 aA	33.23	SR	769.67 cB	6.96	VR	7,137.88 aA	54.03	S	20,47**
CNPH 693	341.57 eB	1.30	VR	132.52 fC	1.19	VR	5,935.57 aA	44.93	SR	51,29**
BRS Mari	8,478.08 aA	32.43	SR	67.80 fB	0.61	HR	4,685.39 aA	35.47	SR	89,32**
BRS Moema	9,543.73 aA	36.51	SR	130.77 eB	1.18	VR	10,773.94 aA	81.56	S	69,75**
'Sta Cruz Kada'	26,139.35 aA	100.00	S	11,053.37 aA	100.00	S	13,209.16 aA	100.00	S	2,37ns
Test F	27.90**			22.76**			1,11ns			

Lower case letters in the column and upper case in the row do not differ by Scott-Knott's test (p <0.05). (1) S = susceptible, RI>51%; SR = slightly resistant, 26%<RI>50%; MoR = moderately resistant, 11%<RI>25%; VR = very resistant, 1%<RI>10%; HR = highly resistant, IR<1%. ** and * significant at 1 and 5% probability, respectively, nsNot significant, by the F test.

With regard to *M. enterolobii*, with the exception of the *C. frutescens* line, it was observed a high reproduction in the genotypes evaluated in both experiments, obtaining high values of TNEJ and NEJGR. Despite the difference between the genotypes in the first experiment, by the Scott-Knott test, presenting two distinct groups, all genotypes were classified as susceptible by the Oostenbrink (1966) methodology with RF greater than 21.54. In experiment 2, all genotypes were classified in the same group, confirming susceptibility of all materials. Regarding Taylor (1967) classification method, in both experiments, the genotypes were grouped, by the Scott-Knott test, into a single group. However, there was divergence for the reaction, with seven genotypes slightly resistant and the others susceptible (Tables 4 and 7).

The high susceptibility of *C. annuum* to *M. enterolobii* is reported in several studies. Gonçalves et al. (2014) evaluated 13 accessions of *C. annuum* and observed RI from 36.90 to 397.70, being characterized as slightly resistant to susceptible. Oliveira et al. (2009) tested different *Capsicum* species and verified that all accessions belonging to *C. annuum* were susceptible to *M. enterolobii*.

The low proportion of genotypes resistant to *Meloidogyne* spp. is stated in studies with *Capsicum* (MELO et al., 2011; PINHEIRO et al., 2013; GONÇALVES et al., 2014). Pinheiro et al. (2014) evaluated the resistance of 13 genotypes of *Capsicum* and verified that eight genotypes were susceptible to *M. incognita* and *M. javanica*, and for *M. enterolobii,* all genotypes were susceptible.

In general, classifications by index and reproduction factor were effective for the identification of genotypes resistant to *M. incognita* race 3, *M. javanica* and *M. enterolobii* (Tables 3, 4, 6 and 7). However, the classification proposed by Taylor (1967) provided a broader distribution of classes (I, HR, VR, MoR, SR and S), allowing more flexibility in classification, while the Oostenbrink (1966) methodology classified the genotypes exclusively as resistant (R) or susceptible (S). The classification of Oostenbrink (1966) becomes safer to select resistant genotypes, since it is based on the ratio of the initial and final numbers of nematode eggs and second-stage juveniles. In contrast, the classification of Taylor (1967) is based on the proportion of eggs and second-stage juveniles of nematodes, involving the highly susceptible control (Andrade-Junior et al., 2016), and in this study it was used the 'Santa Cruz Kada' tomato, that is classified in different genus and species of the *Capsicum* species, although they belong to the same botanical family. Therefore, classification by the reproduction factor (OOSTENBRINK, 1966) is more suitable for selection of resistant genotypes.

As regards the multiple resistances to the root-knot nematodes species, only the genotypes CNPH 185, CNPH 187 and CNPH 680 were considered resistant to *M. incognita* race 3 and *M. javanica*, simultaneously. However, the genotypes described were not resistant to *M. enterolobii*.

Bitencourt and Silva (2010) points out the ability of *M. enterolobii* to reproduce in plants resistant to other species of *Meloidogyne* spp, such as the commercial hybrid Snooker, which has a pyramid of the *Me1* and *Me3/Me7* genes, responsible for resistance to *M. incognita*, *M. arenaria* and *M. javanica* (PINHEIRO et al., 2015).

In Brazil, to date, there are no reports of *C. annuum* genotypes with simultaneous resistance to *M. incognita*, *M. javanica* and *M. enterolobii* with potential to be used as rootstocks in the control of infested areas. The first study on resistance in *Capsicum* spp. to these nematodes was developed by Oliveira (2007), who observed that only one genotype of *C. frutescens* is resistant simultaneously to *M. incognita* and *M. javanica*, presented resistance to *M. enterolobii*. However, this genotype was the only one that showed incompatibility for grafting, as the plants that were grafted onto this genotype had the lowest height, productivity and fruit quality (OLIVEIRA et al., 2009). It is necessary the continuity of studies that are engaged in the search for genotypes with multiple resistances to root-knot nematodes, and that are good rootstocks candidates for cropping sweet pepper and/or to be used in breeding programs.

CONCLUSIONS

The genotypes CNPH 185, CNPH 187 and CNPH 680 are resistant to *M. incognita* race 3 and *M. javanica*, however, with no resistance to *M. enterolobii*.

The line of *C. frutescens* is the only genotype that shows multiple resistances to the three species of root-knot nematodes.

RESUMO: O presente trabalho teve por objetivo avaliar acessos de *Capsicum* quanto à resistência a *Meloidogyne incognita* raça 3, *Meloidogyne javanica* e *Meloidogyne enterolobii*. Foram realizados dois experimentos, com diferentes genótipos de pimentas e pimentões, em delineamento inteiramente casualizado sendo o primeiro em esquema fatorial 31 x 3 com 27 genótipos de *Capsicum annuum*, duas cultivares de pimenta, uma linhagem de *Capsicum frutescens*, o tomateiro 'Santa Cruz Kada' e três espécies de nematoides (*M. incognita* raça 3, *M. javanica* e *M. enterolobii).* No segundo experimento foi utilizado esquema fatorial 39 x 3 com 36 acessos de *C. annuum*, duas cultivares de pimenta, o tomateiro 'Santa Cruz Kada' e três espécies de nematoides mencionadas anteriormente. Avaliou-se o número total de ovos e juvenis de segundo estádio (NTOJ), número de ovos e juvenis de segundo estádio por grama de raízes (NOJGR), índice de reprodução (IR) e fator de reprodução (FR). Com base no FR e IR os genótipos CNPH 185, CNPH 187 e CNPH 680 foram resistentes e muito resistentes a *M. incognita* raça 3 e *M. javanica*, simultaneamente. A linhagem de *C. frutescens* apresentou resistência às três espécies de nematoides de galha.

PALAVRAS-CHAVE: *Meloidogyne incognita. Meloidogyne javanica. Meloidogyne enterolobii.* Pimentas e pimentões. Reação**.**

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