POPULATION DEVELOPMENT AND EFFECTS OF *ROTYLENCHULUS RENIFORMIS* ON GROWTH OF *AMARANTHUS VIRIDIS* AND THREE CULTIVARS OF *HIBISCUS SABDARIFFA*

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RESUMEN

Heffes, T. P., P. L. Coates-Beckford y D. G. Hutton. 1990. Desarrollo poblacional y efectos de *Rotylenchulus reniformis* sobre el crecimiento de *Amaranthus viridis* y tres cultivares de *Hibiscus sabdariffa*. Nematrópica 20:95–98.

Plántulas de amaranto (*Amaranthus viridis*) y de los cultivares 'Rojo,' 'Rojado' y 'Blanco' del alazán (*Hibiscus sabdariffa*) fueron mantenidos en condiciones de invernáculo durante 6 semanas previa inoculación con 0, 100, 1 000 ó 10 000 larvas de *Rotylenchulus reniformis*. El amaranto y los cultivares 'Rojo' y 'Rosado' resultaron ser buenos hospedantes del nematodo mientras que el incremento poblacional en el cultivar 'Blanco' no fue de la magnitud observada en los otros tres hospedantes, particularmente a la densidad inicial de 100 larvas/maceta. A la densidad de inóculo más elevada, hubo una reducción en la longitud de tallo en el cultivar 'Rosado' asociada con la presencia del nematodo. No se observó reducción de crecimiento en el amaranto y en el cultivar 'Rojo.' Los efectos de *R. reniformis* sobre el crecimiento del cultivar 'Blanco' fueron inconclusos.

Palabras claves: alazán, *Amaranthus viridis*, amaranto, desarrollo poblacional, *Hibiscus sabdariffa*, patogenicidad, *Rotylenchulus reniformis*.

Meloidogyne incognita (Kofoid & White) Chitwood, the root-knot nematode, and *Rotylenchulus reniformis* Linford & Oliveira, the reniform nematode, are ubiquitous and important pests in Jamaica. Hutton et al. (4) and Heffes et al. (2) have demonstrated poor reproduction of *M. incognita* on callaloo (*Amaranthus viridis* L.) and White sorrel (*Hibiscus sabdariffa* L. cv. White). The potential usefulness of both plants in crop rotation for managing root-knot nematodes prompted investigations on their tolerance and resistance to the reniform nematode.

Four groups of 24, 12.5-cm-diam plastic pots were filled with 1 L of steam-sterilized sand. Two 15-day-old seedlings of callaloo were transplanted in each pot of one group and three seeds of sorrel were planted in each of 24 pots for each of cvs. Red, Pink, and White. All pots were thinned 14 days later to leave one seedling/pot. Six pots, containing either a 33-day-old callaloo seedling or, for each cultivar, an 18-day-old sorrel seedling, were infesteed with 0, 100, 1 000 or 10 000 nonsurfacesterilized juveniles of *R. reniformis* obtained from pot cultures on *Cajanus cajan* (L.) Millsp., the progeny of nematodes originally from the rhizosphere of *Ricinus communis* L. Nematodes, extracted by the Christie and Perry method (1), were added by pouring 20 ml suspensions of the nematode in 2-cm-deep cavities beside each seedling. Control pots received 20 ml of tap water. The cavities were filled with sterile sand, plant heights were recorded, and a 25-ml aliquot of Long Ashton nutrient solution (3) was added to each pot then and once each week thereafter. For each cultivar, the pots were arranged in a completely randomized design on a greenhouse bench and grown for 6 weeks at a mean daytime temperature of 30 C.

Shoot height, number of leaves, weight of shoot cut at soil level, and dry root weight (70 C for 5 days) were recorded for each plant 6 weeks after sand inoculation. Nematodes in each pot were extracted for 48 hours using the Christie and Perry method (1). Each nematode suspension was made up to 100 ml with tap water and the density estimated by using a Peter's counting slide to determine the numbers of *R. reniformis* in either three or five 1-ml aliquots for high ($\geq$ 10/ml) and low ($<$ 10/ml) population densities, respectively. The ratio of the final population density (Pf) to the initial population density (Pi) was calculated.

The data were subjected to the analysis of variance and means were separated using Duncan's Multiple Range test at $P \leq 0.05$ (6).

Populations of *R. reniformis* increased on callaloo, 'Red' sorrel, and 'Pink' sorrel. Six weeks after infestation, the highest final to initial population ratios (Pf/pi) were 9.7, 16.0, and 12.2, respectively, occurring at Pi = 100 juveniles/pot (Table 1). The Pf/Pi was 1.3 on 'White' sorrel in pots which were infested with 100 nematodes. Among treatments receiving 10 000 nematodes, only callaloo had a Pf that exceeded the Pi. Fewer nematodes were recovered from pots with 'White' sorrel. At Pi = 1 000, the Pf/Pi was greater than 1.0 for all test hosts, with the largest and smallest populations occurring in pots with callaloo and 'White' sorrel, respectively.

Shoot length, number of leaves, and dry plant weights were not significantly different for callaloo and 'Red' sorrel regardless of the Pi. At Pi = 10 000, 'Pink' sorrel shoot length was reduced significantly when compared to the other treatments. Dry shoot weights also differed between Pi = 10 000 and Pi = 1 000 but not among the two other treatments and Pi = 1 000. Shoot length of 'White' sorrel was reduced significantly at Pi = 10 000 when compared to Pi = 1 000, but shoot length at Pi = 1 000 did not differ from Pi = 100 or Pi = 0. There were no differences in number of leaves, dry root weight, and dry shoot weight of 'White' sorrel regardless of Pi.

The large Pf/Pi at Pi = 100 indicated that callaloo and both 'Red' and 'Pink' sorrel were hosts of *R. reniformis*. In contrast, the compara-

Table 1. Population development of *Rotylenchulus reniformis* and growth of callaloo (*Amaranthus viridis*) and three cultivars of sorrel (*Hibiscus sabdariffa*) 6 weeks after infestation of soil with four initial nematode densities.

Initial number of juveniles/pot	Pf/Pi	Shoot length (cm)[z]	Number of leaves	Dry shoot weight (g)	Dry root weight (g)
		A. viridis			
0	0 a	3.8 a	12 a	0.46 a	0.26 a
100	9.7 b	6.6 a	9 a	0.43 a	0.18 a
1 000	4.7 c	4.8 a	9 a	0.40 a	0.16 a
10 000	1.3 d	5.2 a	9 a	0.34 a	0.14 a
		H. sabdariffa cv. Red			
0	0 a	5.3 a	7 a	0.28 a	0.14 a
100	16.0 b	5.7 a	8 a	0.26 a	0.14 a
1 000	3.5 c	5.3 a	8 a	0.23 a	0.10 a
10 000	0.9 d	4.3 a	7 a	0.20 a	0.14 a
		H. sabdariffa cv. Pink			
0	0 a	7.6 a	7 a	0.32 ab	0.15 a
100	12.2 b	7.5 a	7 a	0.33 ab	0.16 a
1 000	2.7 c	7.7 a	7 a	0.36 a	0.17 a
10 000	0.7 d	4.3 b	7 a	0.27 b	0.15 a
		H. sabdariffa cv. White			
0	0 a	5.7 ab	7 a	0.28 a	0.16 a
100	1.3 b	6.3 ab	7 a	0.27 a	0.16 a
1 000	2.1 c	7.8 b	6 a	0.28 a	0.16 a
10 000	0.5 d	5.0 a	6 a	0.24 a	0.15 a

Each figure is the mean of six replicates; numbers in each column followed by the same letter are not significantly different at $P \leqslant 0.05$, according to Duncan's Multiple Range test, for each host.

[z]Final height minus height at inoculation.

tively low ratio on 'White' sorrel indicated that reproduction was inhibited at that Pi. Although the nematode population doubled on 'White' sorrel within 6 weeks when infested with 1 000 juveniles, the Pf was smaller than that recovered from the other hosts at the same Pi. The lower Pf/Pi for all hosts at Pi = 10 000 when compared to the lower Pi's probably was a result of competition for resources (5).

Growth reduction associated with *R. reniformis* was not marked and only 'Pink' sorrel was affected adversely. The effects of the nematode on shoot length of 'White' sorrel and dry shoot weight of 'Pink' sorrel were inconclusive. Perhaps a longer experimental period would allow expression of additional deleterious effects on plant growth.

'White' sorrel may be unfavorable for sedentary nematodes. This cultivar inhibited population development of the root-knot nematode (2,4) and in this study supported only limited reproduction of the reniform nematode.

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