

Research Note

NEMATODE SURVEY ON COMMERCIAL PAPAYA FARMS¹

Papaya is an agricultural commodity that has been expanding substantially in Puerto Rico in recent years. Currently, there are over 500 acres in commercial papaya plantings with a farm value of \$1,151,000². In Hawaii,³ a serious constraint for papaya is phytoparasitic nematodes, especially *Rotylenchulus reniformis* (Kofoid and White) Chitwood. High nematode populations were encountered there when the crop continued to be harvested two years or longer. In Florida⁴ young papaya transplants can be killed by *Meloidogyne* spp., but there is usually very little root damage on mature plants.

A survey was conducted in 1987 to determine the presence and population levels of these two nematodes on the papaya farms in Puerto Rico. The main purpose of this survey was to obtain the information needed for pre-registration research on nematicides which at present are not available for this crop.

The survey was conducted on 44 commercial farms, each 3 acres or more, totaling 469 acres, in 15 municipalities of Puerto Rico (table 1).

Several composite samples of soil (300 g each) and root tissues (50 g) were taken on each farm to determine whether the aver-

TABLE 1.—Number and area of farms surveyed for reniform nematodes and nematode count range obtained with 300 cm³ soil samples

Municipality	No. of farms	Acres	<i>Rotylenchulus</i> count range	
			0-6000	6000 up
Guánica	3	160	2	1
Santa Isabel	1	10	1	
Sabana Grande	1	27		1
Isabela	2	10	2	
Corozal	7	33	4	
Comerio	10	67	10	
Ciales	2	6	1	
Naranjito	9	46	9	
Morovis	1	7	1	
Río Grande	2	30	2	
Fajardo	1	10	1	
Toa Alta	1	10	1	
Salinas	1	15	1	
Guayama	2	20	1	
Canóvanas	2	18	1	

¹Manuscript submitted to Editorial Board 6 July 1988.

²Department of Agriculture, 1987. Office of Agriculture Statistics, Commonwealth of P. R.

³Lange, A. H., 1960. The effect of fumigation on the papaya replant problem in two Hawaiian soils. *Proc. Am. Soc. Hort. Sci.* 75: 305-12.

⁴McSorley R., 1983. Population buildup and effects of the reniform nematode on papaya in southern Florida. *Fla. State Hort. Soc.* 69: 198-200.

age population level was above or below 6,000 nematodes/300 cm³ of soil.⁶ *Meloidogyne* and *Pratylenchus* were detected at what were considered low levels on only one farm. An average of 80 *Meloidogyne* and 228 *Pratylenchus*/300 cm³ of soil were found in 20 composites. Their presence could have been due to a previous crop, possibly a favorite or preferred host, and they may have developed to serious levels since the time of sampling, because a claim of nematode damage on the papaya plantation has recently been made by the farmer. Consequently, *Meloidogyne* and/or *Pratylenchus*, if present in a field from a favorable previous crop, may become serious in papaya under some conditions, but on the basis of the lack of their presence in all other farms sampled, not normally so.

The reniform nematode is at present the most commonly found nematode in papaya in Puerto Rico according to Sivakumar and Sheshadri⁵. It feeds on phloem cells in papaya roots, and induces formation of giant cells in the phloem. It may also feed in the root cortex or may cause mechanical damage to cortical cells as it moves toward the phloem. As a result of this damage cortical cells break down, and the cavity provides suitable sites for fungal infection⁵.

The economic threshold of this nematode has not been established for papaya in Puerto Rico. Ayala in 1962^{6,7} related poor growth and yield of several plant species to the presence of *R. reniformis*. Data obtained by McSorley et al.⁸ in Florida suggested that *R. reniformis* at first year mid-season, 2,000 to 6,000 nematodes per

100/cm³ of soil, did reduce economic yield slightly but not significantly. By the same standards, farms in Puerto Rico having fewer than 6,000 nematodes/300 cm³ of soil appear to be below the economic threshold during the first season.

Table 1 presents 2 of the larger farms (60 and 27 acres) with populations averaging well above 6,000 nematodes/300 cm³ of soil. These could be at the economic-loss threshold with population averages of 14,000 and 12,600/300 cm³ of soil. McSorley's report⁴ indicates that populations of the reniform nematode increase rapidly in papaya plantings. This increase suggests that low nematode levels of the first year crop may increase to levels which reduce yields the second year, as seen in Hawaii⁹. Consequently, those farms with population levels averaging above 6,000 nematodes/300 cm³ of soil that will continue papaya production for more than 1 year need to be checked for high population buildup and subsequent yield reduction.

Two experiments are in progress at the Isabela and Corozal Substations to identify a suitable and efficient nematicide that may control nematode populations in papaya under Puerto Rico conditions. If possible, future research should include the determination of the economic threshold of *R. reniformis* and *M. incognita*. This information could assist in monitoring population levels of these nematodes and in programming nematicide applications when necessary for their control.

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⁵Sivakumar, C. V. and A. R. Sheshadri, 1972. Histopathology of infection by the reniform nematode, *Rotylenchulus reniformis* Linford and Oliviera, 1940 on castor, papaya and tomato. *Indian J. Nematol.* 2: 173-81.

⁶Ayala A., 1962. Pathogenicity of the reniform nematode on various hosts. *J. Agric. Univ. P. R.* 46 (2): 73-82.

⁷Ayala A. and C. T. Ramirez, 1964. Host range, distribution, and bibliography of the reniform nematode, *Rotylenchulus reniformis*, with special reference to Puerto Rico. *J. Agric. Univ. P. R.* 48 (2): 140-61.

⁸McSorley, R., 1981. Plant parasitic nematodes associated with tropical and subtropical fruit. Bull. 823. Univ. Fla. pp. 1-47.