

## THE DISTRIBUTION OF THE PADDY NEMATODE, *HIRSCHMANNIELLA ORYZAE* IN SRI LANKA.

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**Abstract :** The paddy root nematode, *Hirschmanniella oryzae* (Van Breda de Haan) Luc et Goodey, is an important pest of rice, which causes root rot and gradual retardation of plant growth. It was first recorded in Sri Lanka in 1962.<sup>8</sup> Paddy is grown in all the districts of Sri Lanka, occupying 758,940 hectares of land (1985-1986). The occurrence and distribution of *H. oryzae* was investigated by collecting samples of paddy roots from 52 locations in 22 districts. Results of this study indicate an islandwide distribution of the nematode. High populations were observed in many locations in the wet zone rather than in the dry zone. Some paddy growing areas were still free of *H. oryzae* and consequently it is very important to prevent its spread from infested areas because of the serious damage it can cause to paddy.

### 1. Introduction

*Hirschmanniella oryzae* is an important pest and is widely distributed in all rice growing areas in the world. It was originally reported from Indonesia.<sup>1,11</sup> *Hirschmanniella* species are long slender nematodes, which enter roots of healthy plants, feed on parenchyma cells and multiply inside tissues. Heavily attacked roots become dark brown or black and eventually rot. Except a gradual retardation of plant growth, no specific symptoms of the disease can be seen on the aerial parts of the plant. Damage roots with brown lesions are visible symptoms on the root systems. The first record of the nematode in Sri Lanka was in 1962.<sup>8</sup>

The effect of *H. oryzae* on the growth and yield of rice was observed by many authors. A yield of 24%, 32%, 36% and 25% in various treatments controlling the nematode was observed in Thailand.<sup>9</sup> Studies in Japan showed that the height, tillering ability and weight of foliage and roots of infested plants were reduced.<sup>2,4,5,6,7</sup> Information on the distribution of *H. oryzae* in most rice growing countries in the world is very little. Damaged roots with brown lesions were observed on paddy roots collected from various parts of Sri Lanka. They were heavily infested with this nematode. Extensive and intensive paddy cultivation in the country with the irrigation projects could facilitate rapid multiplication of this nematode in paddy growing soils. Research on development of practical and profitable

method of controlling this nematode will be essential to increase yields. Therefore, this survey was carried out to provide a firm foundation for future studies.

## 2. Materials and Methods

Rice root samples from 52 locations in 22 districts of the country were collected. Each sample consisted of 10 plants per location. The sampling was carried out when seedlings were 45 days and 3 months old. One hundred grammes of washed roots selected randomly from 10 plants were stained with acid fuchsin and lactoglycerol solution and kept in plastic vials until examination was possible. The stained roots were dissected under a microscope and the number of nematodes were counted.

## 3. Results and Discussion

The occurrence and distribution of *H. oryzae* determined in this study is indicated in Figure 1. Samples were examined from 52 locations in 22 districts. Table 1 indicates the districts, locations, paddy varieties and the number of nematodes observed in 100 gm of roots of 45 days and 3 months of age. Considering the number of nematodes found in these varieties there was no correlation between the degree of infestation and the varieties.

All the locations in Kegalle, Matale, Matara, Colombo and Kandy districts; Madhu in Mannar; Kalladi in Puttalam; Dummalasooriya in Kurunegala; Chenkaladi in Batticaloa; Iranamadu in Jaffna; Mirigama in Gampaha; Puliyankulam in Vavuniya; Malvattai, Karativu and Amparai in Amparai; Kirinda in Hambantota; and Bentota in Galle district have high counts (< 100 nematodes per 100 gm of roots). Of these locations 13 were situated in wet zone and 10 were in the dry and intermediate zones. Root systems of plants examined in these areas were found damaged with brown lesions.

Low populations of the nematode were observed in samples examined from Batapola in Galle; Ratnapura, Pothupitiya, Thiruwanketiya and Kuruwita in Ratnapura; Paranthan, Kilinochchi, Vellankulam and Mankulam in Jaffna; Madukanda in Vavuniya; Inginiyagala in Hambantota; Matugama in Kalutara; Hingurakgoda in Polonnaruwa; Mahailluppallama in Anuradhapura and Bibile in Moneragala districts. Of these locations 15 sites were located in the dry and intermediate zones and only six were located in wet zone.

In some areas the very low degree of infestation indicates that infection is in its early stages. Certain places are still free from infestation. Ahungalle in Galle; Pelmadulla in Ratnapura; Mullaittivu in Mullaittivu; Vavuniya and Omantai in Vavuniya; Nilaveli in Trincomalee and Bandaragama and Panadura in Kalutara districts are the places, which were free from infestation.

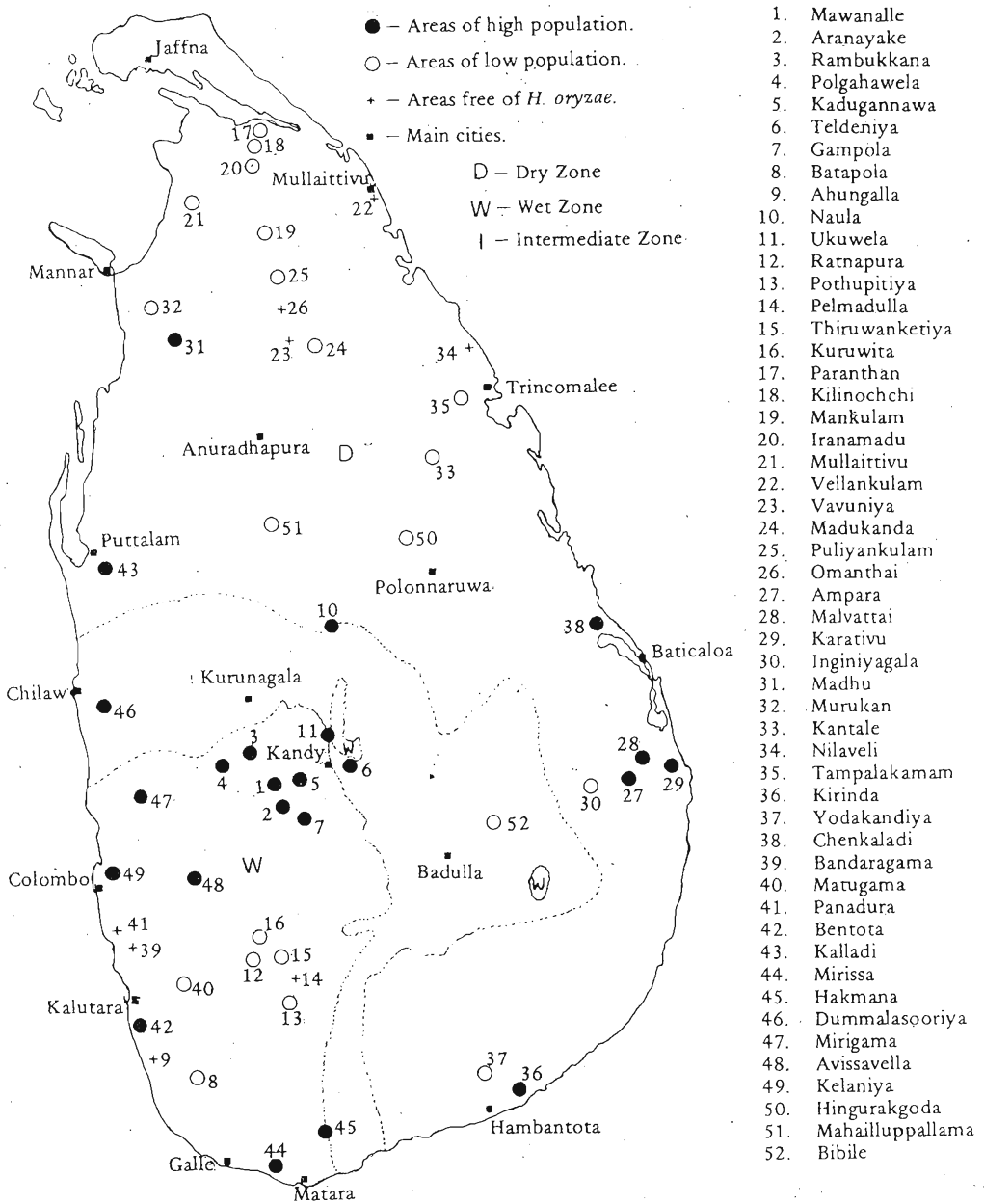


Figure 1 : Occurrence and distribution of *Hirschmanniella oryzae* in Sri Lanka.

Table 1: Distribution of *Hirschmanniella oryzae* and its degree of infestation with regard to locations and paddy varieties.

DISTRICTS	LOCATION	VARIETY	NEMATODE NUMBER IN 100gm OF ROOTS	
			At 45 days	At 3 months
Kegalle	Mawanella	Bg 94-1	2	261
	Aranayake	Bg 94-1	42	250
	Rambukkana	Bg 400-1	11	304
	Polgahawela	Bg 11-11	8	266
Kandy	Kadugannawa	Bg 400-1	6	248
	Teldeniya	Bg 94-1	21	321
	Gampola	Bg 34-8	28	311
Galle	Batapola	Bg 34-6	0	30
	Ahungalle	Bg 400-1	0	0
	Bentota	Bw 267-3	2	128
Matale	Naula	Bg 11-11	10	258
	Ukuwela	Bg 400-1	2	121
Ratnapura	Ratnapura	Bg 400-1	0	36
	Pothupitiya	Bg 94-6	0	28
	Pelmadulla	Bg 400-1	0	0
	Thiriwanketiya	Bg 400-1	0	12
	Kuruwita	Bg 379-2	0	10
Jaffna	Paranthan	Bg 34-6	1	35
	Kilinochchi	Bg 34-6	0	10
	Mankulam	Bg 400-1	0	8
	Iranamadu	Bg 34-6	3	108
	Vellankulam	Bg 34-8	2	68
Mullaittivu	Mullaittivu	Bg 11-11	0	0
Vavuniya	Vavuniya	Bg 94-1	1	0
	Madukanda	Bg 400-1	6	81
	Puliyankulam	Bg 11-11	8	101
	Omanthai	Bg 400-1	3	0
Amparai	Amparai	Bg 94-1	4	258
	Malwattai	Bg 94-1	8	276
	Karativu	Bg 94-1	6	266
	Inginiyagala	Bg 94-1	5	38
Mannar	Madhu	Bg 400-1	10	301
	Marukan	Bg 11-11	5	50
Trincomalee	Kantale	Bg 400-1	3	88
	Nilaveli	Bg 400-1	2	0
	Tampalakamam	Bg 94-1	8	36

Table 1 contd.

Hambantota	Kirinda	Bg 379-2	9	158
	Yodakandiya	Bg 94-1	3	88
Batticaloa	Chenkaladi	Bg 94-1	10	261
Kalutara	Bandaragama	Bw 267-3	0	0
	Matugama	Bg 400-1	1	78
	Panadura	Bw 267-3	0	0
Puttalam	Kalladi	Bg 276-5	4	144
Matara	Mirissa	Bg 400-1	8	148
	Hakmana	Bg 94-1	6	188
Kurunagala	Dummalasooriya	Bg 34-8	8	116
Gampaha	Mirigama	Bg 400-1	8	168
Colombo	Avissavella	Bg 400-1	10	114
	Kelaniya	Bg 94-1	12	210
Pollonnaruwa	Hingurakgoda	Bg 34-8	0	21
Anuradhapura	Mahailuppallama	Bg 11-11	8	30
Moneragala	Bibile	Bg 11-11	4	28

A few studies on the effect of this nematode on the growth of paddy plants have provided evidence that root nematodes are often important factors in growth and yield of rice.<sup>9</sup> The results of this study indicate a wide distribution of the nematode at different densities in all the rice growing areas in the country. *Hirschmanniella* spp. are well adapted to live in marshes and flooded paddy fields and multiply on some sedges and grasses. When the paddy is dry, the nematode become quiescent until the next rainy season.<sup>10</sup> In the absence of host plants they could live in soil for 10 weeks and the minimum time of development from egg to adult is about one month. The multiplication factor per generation being as high as 13.<sup>12</sup>

In this study high populations were observed in many locations in wet zone rather than in dry zone. In Japan<sup>5</sup> it was also observed that this nematode was more common in damp paddy fields than in well-drained soils. In this country with intensive irrigation projects the cultivation of paddy could be increased extensively and intensively in all parts of the country. These factors and the suitable climatic conditions prevailing in rice growing areas will lead to the rapid multiplication and distribution of *H. oryzae* in paddy growing soils. Therefore, the results of this study will be valuable to evaluate effective and economic control measures for *H. oryzae* to reduce population densities below economic threshold level.

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