

QI00007

Managing Banana Nematodes



2nd edition

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Managing Banana Nematodes

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2. MONITORING BURROWING AND LESION NEMATODE

a. How to Monitor Nematode Damage in Bananas

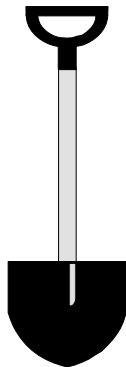


The aim of sampling is to estimate the nematode status of the whole crop. This means that samples must be taken from throughout the block. Studies show that 20 samples in a block of up to 2 ha give a good estimate of the nematode damage. Because nematodes tend to be clustered in confined areas within a crop, it is essential that your 20 samples be taken uniformly over the block.

Sampling should be done in uniform areas, i.e. blocks with similar soil type, cropping history, management, etc. If your block has distinct differences within it, divide it into two or more sections to be sampled separately with 20 samples from each section. Also, if your block is larger than 2 ha, divide it into smaller sections. The advantage of doing this is that you may require nematicide application on only part of the block. This may save the expense of treating the whole block.

How to take samples

The best time to sample is at bract fall, just before bagging. At this stage, no new roots are being produced on the bunching sucker and old roots have not yet died. Use a spade to collect the roots from the plant base, on one side of the bunching sucker away from the mother plant and the following sucker.



The soil block should be about 25 x 25 x 25 cm (10 x 10 x 10”), i.e. about the width and depth of a standard spade. Collect five roots at random from each of the 20 plants and you will have 100 roots. Place the roots in a bucket and rinse them with water. See photographs on pages 26-27.

How to measure root damage

Slice each root lengthwise and use the rating scale on the next page to estimate the proportion of the root cortex that is occupied by red-brown lesions. Disease rating is best done immediately after sampling, as the roots tend to go brown which makes recognising lesions difficult.

RATING SCALE FOR LESIONS ON BANANA ROOTS

Proportion of root cortex occupied by lesions	Rating
No lesions	0
1-25%	1
26-50%	3
51-75%	5
76-100%	7

How to calculate the Disease Index of roots

The Disease Index can be calculated using the following equation:

$$\text{Disease index} = \frac{\text{Sum of all root ratings} \times 100}{\text{Total number of roots} \times 7}$$

The Disease Index Worksheet will help you with the calculation.

b. Disease Index Worksheet

The Disease Index Worksheet is used when monitoring the nematode status of a banana block. The Disease Index Worksheet is used after a banana block has been sampled and the roots are washed and ready for assessment. The Disease Index Worksheet allows you to keep a record of each root that is rated and gives simple instructions for calculating the Disease Index for the banana block.

How to use the Disease Index Worksheet

(see example on page 29)

- 1.** At the top of the Worksheet, fill in the property name, block name and the date the block was sampled.
- 2.** Cut each root lengthwise and assign each root a rating of 0, 1, 3, 5 or 7 depending on the amount of cortex that is rotten. At the bottom of the Disease Index Worksheet is a guide for assessing roots. Photographs of the different rating classes on page 28 will help to determine root ratings.
- 3.** For each root, cross through a square on the Disease Index Worksheet below the corresponding root rating. The numbered squares allow you to determine the number of roots in each rating class.
- 4.** When all 100 roots have been rated, multiply the number of roots in each rating class (i.e. the number of squares that have been crossed through) by the root rating number (i.e. 0, 1, 3, 5 or 7).
- 5.** Add all the totals from each rating class and divide the total by 700 (= 100 roots multiplied by 7, i.e. the maximum possible score).
- 6.** Multiply the result by 100 and this will give you the Disease Index for that block.

Note: The Disease Index Worksheet is included at the back of this manual for you to photocopy.

Taking root samples



1. Sample banana plants at bract fall.



2. Insert the shovel into the soil 5 cm (2") from the base of the bunching sucker.



3. Dig a block of soil 25 x 25 x 25 cm (10 x 10 x 10").

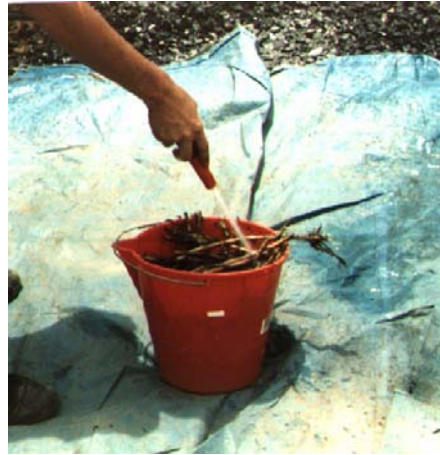


4. Drop the soil block so that the roots are separated from the soil.

Taking root samples (cont'd)



5. Select five roots at random from each of the 20 soil samples (= 100 roots) and place them in a bucket.



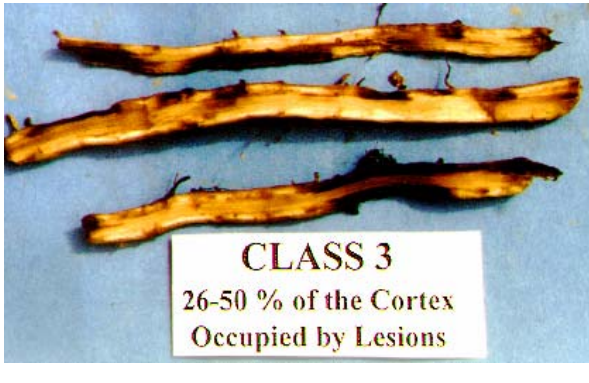
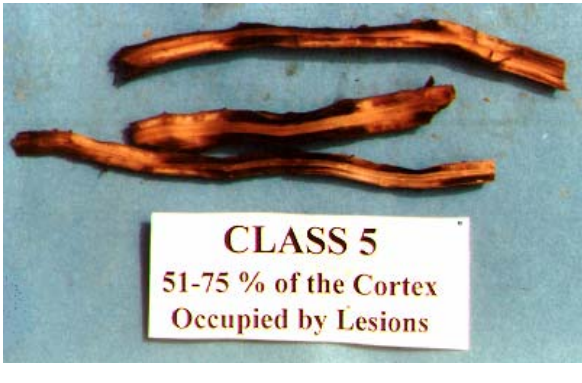

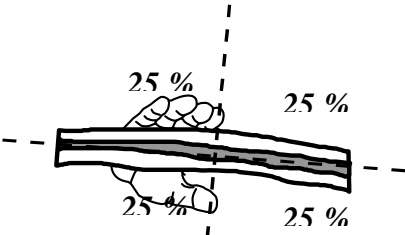


6. Rinse most of the soil from the roots.



7. Slice roots lengthwise and assess the amount of root cortex that is occupied by lesions.

Root rating classes

 <p>CLASS 0 No Visible Lesions</p>	 <p>CLASS 1 1-25 % of the Cortex Occupied by Lesions</p>
 <p>CLASS 3 26-50 % of the Cortex Occupied by Lesions</p>	 <p>CLASS 5 51-75 % of the Cortex Occupied by Lesions</p>
 <p>CLASS 7 76-100 % of the Cortex Occupied by Lesions</p>	 <p>To determine the percentage of the root occupied by lesions, grip the root halfway along between your thumb and forefinger. This forms 50% segments. Use the stele to divide the root into quarters (25%). Imagine all the lesions fitting next to each other to determine how much of the cortex is occupied by lesions.</p>

Example of how to use the Disease Index Worksheet

DISEASE INDEX WORKSHEET																																							
DATE :	3/12/95	PROPERTY :	<i>South Johnstone Research Station</i>	FIELD :	3																																		
ROOT RATING																																							
0					1					3					5					7																			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	96	97	98	99	100	96	97	98	99	100	96	97	98	99	100	96	97	98	99	100
a = No. x 0 = 43 x 0 a = 0					b = No. x 1 = 22 x 1 b = 22					c = No. x 3 = 17 x 3 c = 51					d = No. x 5 = 11 x 5 d = 55					e = No. x 7 = 7 x 7 e = 49																			
Disease Index = $\frac{(a + b + c + d + e)}{\text{Total no. roots} \times 7} \times 100$ Disease Index = $\frac{(0 + 22 + 51 + 55 + 49)}{(100 \times 7)} \times 100 = \frac{177}{700} \times 100$ Disease Index = 25																																							

The Disease Index can then be compared with the Economic Threshold to help make decisions on nematode management.

Transfer the Disease Index from the Disease Index Worksheet to the Banana Nematode Management Poster for future reference.

c. Banana Nematode Management Poster

The Banana Nematode Management Poster allows you to keep records of the Disease Index of each block over time. It also reminds you when to sample for nematode damage.

The Banana Nematode Management Poster is divided into sections:

1. to record the date the block was sampled and its Disease Index
2. to graph the Disease Index so that changes can be seen over time
3. to enter nematode management details

How to use the Banana Nematode Management Poster

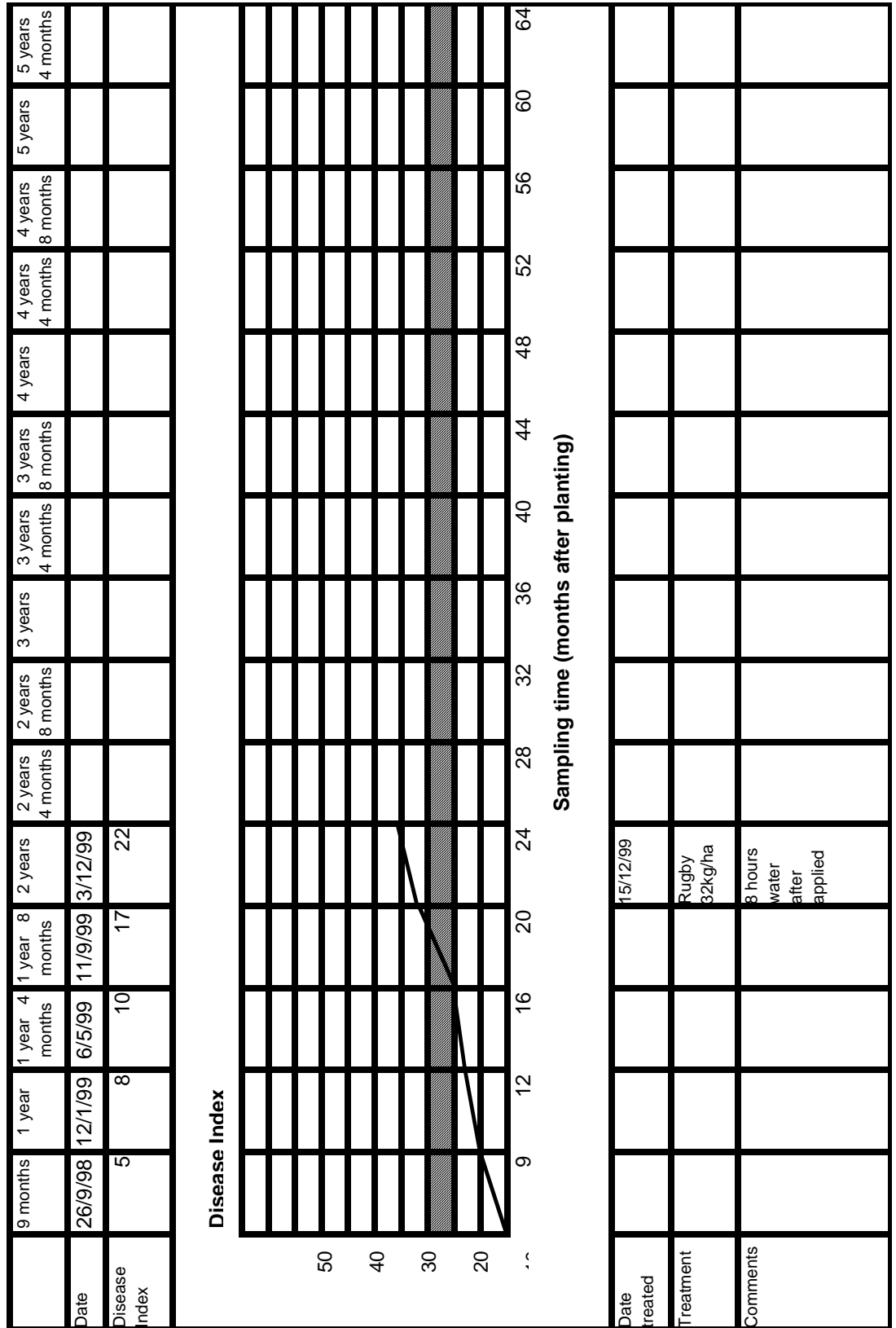
(see example on page 31)

1. Record the block name on each sheet that will be monitored.
2. For each block, record the planting date.
3. The first Disease Index should be calculated about 9 months after planting when two-thirds of the plants have passed the bract fall stage. Record the date the block was sampled and its Disease Index at the top of the sheet.
4. Each time the block is sampled, mark the Disease Index on the graph for that time.
5. The disease index should be calculated about every 4 months. Record the date the block was sampled and the disease index at that time, as shown above, every time the block is sampled.
6. Use your control codes to record the chemical or treatment and the actual rate of chemical used (i.e. the actual amount of chemical divided by the area of the banana block).

Example of how to use the Banana Nematode Management Poster

Block name: *South Johnstone Research Station Block 3*

Planted: 14/1/98



d. Economic Threshold

The Disease Index is related to the number of nematodes in the roots and is a good assessment of the severity of the nematode infestation. Studies in the tropics have shown that for every increase of 1 in the Disease Index, there is a loss of about 1 finger or 0.5% of the bunch weight. In the subtropics, an increase of 1 in the Disease Index causes a loss of 1% in bunch weight. The difference between the two regions is that growing conditions are less optimal in the subtropics so plants are less able to compensate for nematode damage.

The Economic Threshold depends on the value of the crop and the cost of applying nematicide.

Once the Disease Index of the block reaches about 10-15 in the tropics (depending on your nematicide application costs) or 20-25 in the subtropics, nematicide may be economic.

If the Disease Index has reached about 35, the damage is already too severe for the nematicide to be effective. The only options then are to either leave the crop to decline or fallow the land before replanting (see page 14).