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LIFE CYCLE OF *PRATYLENCHUS GOODEYI* IN BANANA ROOTS

by
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Summary. A study was undertaken of *Pratylenchus goodeyi* population increase in susceptible and resistant banana cultivars Nakyetengu and Sukalindizi, respectively. The life cycle was completed in 24 days in Nakyetengu and 30 days in Sukalindizi. In Nakyetengu up to 29.8 eggs were laid by a single female in 35 days and in Sukalindizi 18.8 eggs were laid in the same period.

Pratylenchus goodeyi is an important pest of *Musa* spp. and widely distributed in the Canary Islands and East Africa (Machon and Hunt, 1985; Bridge, 1987). Nematode populations increase rapidly, causing damage to the roots and the infested plants topple (Mbwana, 1992). There is no information on the life cycle of this nematode on banana and therefore a study was undertaken on resistant and susceptible banana cultivars.

Materials and methods

Banana (*Musa* spp.) cvs Sukalindizi and Nakyetengu, which were reported to be resistant and susceptible, respectively, to *P. goodeyi* (Speijer, 1993) were selected for this study. Roots of both the cultivars infested with *P. goodeyi* Sher *et* Allen were collected from a field at Oyugis, western Kenya. The roots were washed and cut into 2-5 mm long pieces from which the nematodes were extracted using a modified Baermann dish technique. Gravid females were isolated from the extraction dish and colonized in hanging drops of water on microslides (Dasgupta and Raski, 1968) in groups of 15 in ten replicates. After oviposition, the females were removed and in each slide ten eggs were retained and incubated at 24±4 °C. The progress of embryogenesis was observed at 1 hr intervals, until eclosion of the second stage juveniles.

Pared and hot water-treated corms of banana cvs Sukalindizi and Nakyetengu were grown in plastic buckets filled with sterilized soil. Five growing roots from each bucket were drawn out through holes made with a cork borer and introduced into 1.5 cm diam. wax coated paper tubes filled with sterile soil (Blake, 1966). Five days later small holes were made in the paper tubes and each root was inoculated with 20 second stage juveniles of *P. goodeyi* collected from the hatchings of colonized eggs. A set of five such tubes was then introduced into a perforated polythene sampling bag filled with sterile

soil. In total fifteen such sets were made per cultivar to provide five replicates whenever one set was sampled. At intervals of two days, for 30 days, one set of roots was clipped off, cleaned, stained in lactophenol blue, cleared in clear lactophenol, teased apart and observed for different life stages and eggs. The duration of each stage was computed as the period between the first appearance of two successive stages.

In a further study of the life cycle of *P. goodeyi* each of the cvs Sukalindizi and Nakyetengu were grown in ten plastic buckets and fifty growing roots were drawn out on to glass plates. Each root was inoculated with a single fully grown *P. goodeyi* female in a small amount of moist soil to cover the root. Sixteen hours after inoculation, the roots were placed in wax coated paper tubes. At 2, 5, 10, 15, 20, 25, 30, 35 and 40 days after inoculation, roots were clipped in five replicates and observed for number of eggs laid as above.

Results and discussion

Gravid females of *P. goodeyi* were observed with one or two eggs in the uterus. Only about 1% of the females were found with two eggs in the uterus. The passage of the eggs after formation, from uterus to vagina, took 5-13 hr. In the females bearing two eggs, the first egg passed out within 2-4 hr. Eggs were one to multicelled at the time of egg laying but most of them were in the two celled stage. Depending on the stage at the time of deposition, the time taken for development from the 2-3 celled stage to the eight celled stage was 13 to 20 hr. Further ensuing rapid divisions produced a mass of cells forming the marula stage at 25-35 hr and the demarcation of ectoderm and endoderm was observed at 39-45 hr. An invagination initiating the tadpole differentiation occurred at 72 to 86 hr, the first appearance of prorhabdion in the first stage juvenile at 85 to 110 hr, moulting occurred at 112 to 130 hr, and the fully developed second stage juvenile was observed at 128 to 155 hr after egg laying. Eclosion of the second stage juvenile was effected in 22 to 34 hr thereafter. The embryonic developmental duration was computed as 6.8 to 8.9 days and no differences were observed in the developmental duration in the eggs collected from the cvs Sukalindizi or Nakyetengu.

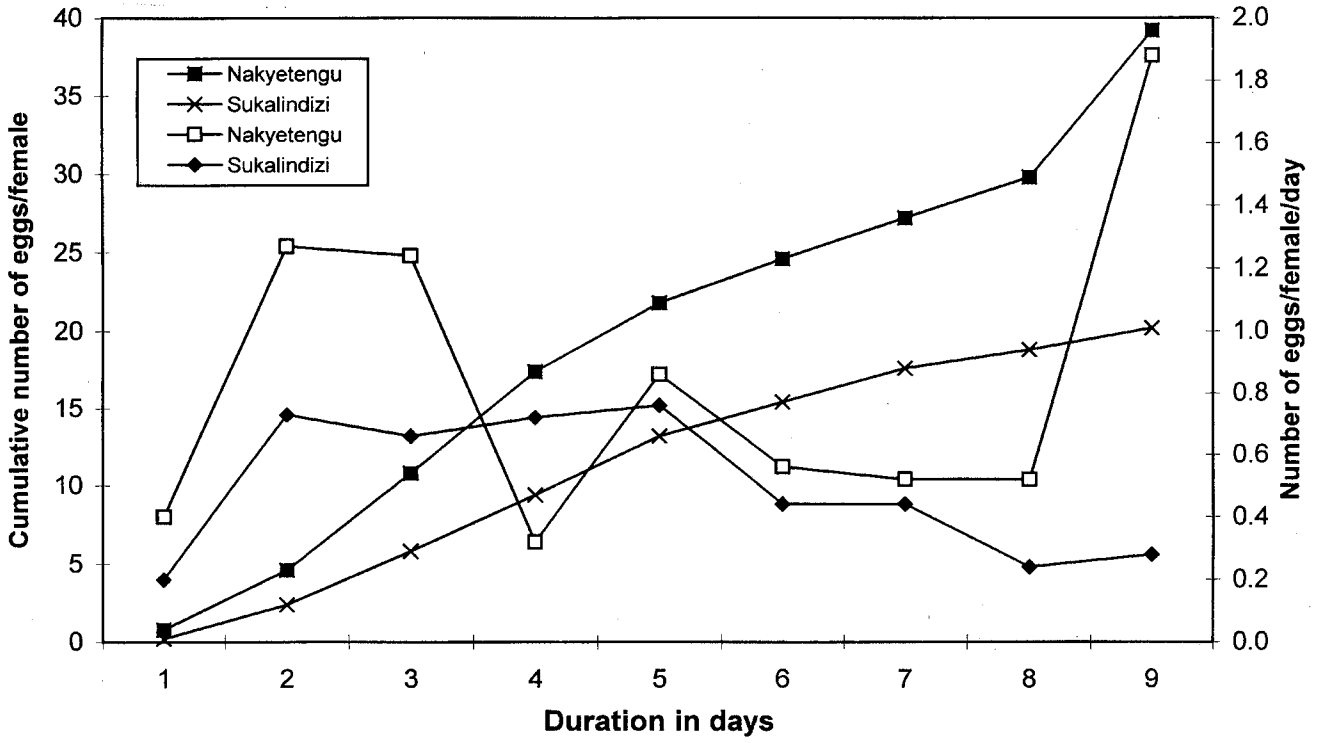
Root invasion by second stage juveniles was recorded on day two after inoculation. Invasion continued until day 22 in Sukalindizi but in Nakyetengu second stage juveniles were not observed after day 12 (Table I). The first appearance of third stage juveniles was recorded in Nakyetengu on day six, fourth stage juveniles on day 12, adults on day 20 and eggs on day 24. In Sukalindizi third stage juveniles were recorded on day eight, fourth stage juveniles on day 16, adults on day 24 and eggs on day 30. In the susceptible cultivar Nakyetengu the adults deposited eggs six days earlier than in Sukalindizi.

Egg laying was observed from the second day after inoculation in both cultivars. There was a steady increase in the cumulative number of eggs laid by a female. In cv. Nakyetengu up to 29.8 eggs were laid by a single female in 35 days (Fig. 1). In the corresponding period 18.8 eggs were recorded per female in cv. Sukalindizi. The peak number of eggs per female per day (1.16) was recorded at 15 days after inoculation in Nakyetengu and at 20 days after inoculation (0.66) in Sukalindizi (Fig. 1). However, in cv Nakyetengu on day 40, 1.88 eggs per female per day were recorded; this sudden increase may have been due to eggs laid by the second generation of females. The cumulative number of eggs laid by a single female and the number of eggs laid per female per day were significantly different in the two banana cultivars [P=1% (t=4.463)]. The ability of a single female to lay more eggs in a shorter duration in cv. Nakyetengu than cv. Sukalindizi suggests that the former supports rapid increase in nematode populations and hence is susceptible to *P. goodeyi.*

The life cycle of *P. goodeyi,* egg to egg was completed in 24 and 30 days in cvs Nakyetengu

TABLE I - *Post-embryonic development of* Pratylenchus *goodeyi in banana roots.*

Days after inoculation	Cultivar Sukalindizi (resistant)										Cultivar Nakyetengu (susceptible)									
	J_2	S.E±	J_3	S.E±	J_4	S.E±	Adults	S.E±	Eggs	S.E±	J_2	S.E±	J_3	S.E±	J_4	S.E±	Adults	S.E±	Eggs	S.E±
2	1.2	0.2									1.8	0.3								
4	5.6	0.5									13.6	1.5								
6	8.4	1.2									12.0	1.6	0.8	0.4						
8	7.0	2.2	1.6	0.5							7.8	1.4	7.2	1.1						
10	6.4	1.0	3.6	0.5							5.0	0.9	8.2	0.8						
12	3.2	0.3	5.8	1.7							3.0	0.7	7.6	1.0	1.8	0.7				
14	1.8	0.3	7.2	0.5									6.4	1.2	5.4	0.6				
16	0.6	0.2	5.4	0.7	2.4	0.4							4.4	0.6	7.4	1.9				
18	0.2	0.2	2.8	1.1	4.6	0.5							0.8	0.5	9.6	1.1				
20	0.0	0.0	1.6	0.6	5.8	0.9							1.8	0.5	7.8	2.1	1.8	0.6		
22	0.2	0.2	0.6	0.2	6.6	0.7									5.6	1.7	4.8	1.3		
24					4.4	0.9	2.0	0.4							0.8	0.3	7.8	2.1	1.0	0.4
26					0.4	0.2	5.8	0.5									8.8	2.5	5.4	1.8
28							6.6	0.8									9.6	0.9	7.0	1.3
30							6.0	1.6	1.2	0.3							10.0	1.4	8.6	1.8



X and ■: Cumulative number of eggs significant at 1% level where t=4.463
◆ and □: Number of eggs/day/female significant at 5% where t=2.59.

Fig. 1 - Oviposition of *Pratylenchus goodeyi* in roots of resistant and susceptible banana cultivars.

and Sukalindizi respectively. Fecundity rate was also much higher in Nakyetengu *i.e.* 29.8 in comparison to 18.8 in Sukalindizi in 35 days per female. The shorter duration of the life cycle and higher fecundity rate in cv. Nakyetengu probably contributes to the high build up of nematode populations, with increased feeding and decaying roots resulting in loosing anchorage and toppling of plants.

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