

NEMATODES ASSOCIATED WITH THEOBROMA CACAO

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RINGKASAN

Di dalam pemilihan rawak bagi 3 variti koko (Amelonado, Upper Amazon, Sabah mixed hybrid), tujuh genera nematoda phytoparasitic dicatatkan. Darpada ini *Helicotylenchus* dan *Rotylenchulus* adalah yang paling biasa dijumpai. Di antara dua genera ini, *R. reniformis* didapati lebih menggemari *Tephrosia* jika dibandingkan dengan koko bila kedua-duanya ditanam bersama-sama. Di Malaysia, tiada lagi spesies yang dibuktikan pathogenik terhadap koko.

INTRODUCTION

In recent years, increasing acreages of cocoa are being planted in Malaysia. In 1974 there were 46,163 acres (Total Sole Crop Equivalent) in Peninsular Malaysia (ANON, 1974a), 20,080 acres in Sabah (ANON, 1974b) and 2,058 acres in Sarawak (NGIAM & WONG, 1974). As Malaysia has indigenous populations of nematodes in her soils, it would be expedient to have a knowledge of those genera which in time would come to be associated with the crop.

MATERIALS AND METHODS

During visits to a number of estates and agricultural stations in 1972-1975, random soil samples around cocoa plants were collected for nematological analysis. Composite soil samples were made to 30 cm. depth around feeder roots, using a 2.5 cm. bore tube auger. The number of sample probes taken per plant varied from one to five. Samples were processed using the Decanting-Sieving Method (COBB, 1918). The soil samples were mainly from the Upper Amazon cocoa variety, others being Amelonado and Sabah mixed hybrid: intercropped with coconut or with interplants of *Flemingia*, *Gliricidia* or *Tephrosia*.

RESULTS AND DISCUSSION

Phytoparasitic nematode genera and their respective population counts recorded from cocoa varieties in various localities are shown in *Table 1*. The genera isolated from around cocoa roots were *Criconemoides*, *Helicotylenchus*, *Meloidogyne*, *Pratylenchus*, *Rotylenchulus*, *Tylenchus* and *Xiphinema*. All these genera except *Rotylenchulus* and *Tylenchus* have been reported in local cocoa plantings by LOW and TING (1970). The genus *Helicotylenchus* was isolated from three cocoa varieties (Amelonado, Upper Amazon and Sabah mixed hybrid) while the remaining genera with the exception of *Pratylenchus* were found on at least two cocoa varieties. The root-knot nematodes (*Meloidogyne* spp.) are polyphagous and are widely distributed in Peninsular Malaysia as may be noted from several accounts (LOW and TING, 1970; WINOTO, 1975). Although prominent galls are formed in roots of susceptible herbaceous hosts, they are usually inconspicuous on woody perennials. Only very slight swellings were observed on cocoa roots of samples where even with mature females the galls were small. Two species (*Meloidogyne incognita* and *M. javanica*) were reported on cocoa (WHITEHEAD, 1969) and though galling had been recorded, serious damage to cocoa trees had not been described. *Xiphinema* spp. were isolated in small numbers from two localities. Certain species of this genus (e.g. *X. diversicaudatum*, *X. index*) are known vectors of NEPO viruses (nematode-transmitted polyhedral particles) but no such relationship on cocoa has been reported here to date. *Pratylenchus* sp. was found in two of the areas sampled and only on Upper Amazon variety. It has been postulated that there may be a disease complex on cocoa, involving this nematode and

TABLE 1. NUMBER OF NEMATODES RECORDED ON COCOA VARIETIES (PER 100ML. SOIL)*

Locality	Crico.	Helico.	Meloid.	Praty.	Roty.	Tylen.	Xiphi.
MARDI Station							
Serdang, Selangor.		Cua (115)		Cua (45)	Cua (310)	Cua (5)	Cua (10)
Bukit Blimbing Est.							
Bukit Rotan, Selangor.	Cua (30)	Cua (13)			Cua (8)		
Torkington Est.		Cua (33)			Cua (267)		
Sabak Bernam, Selangor		Cam (33)	Cam (25)				
Sagil Estate, Johore	Cua (90)	Cua (30)	Cua (5)	Cua (5)	Cua (180)		
Chersonese Est.							
Kuala Kurau, Perak	Csm (6)	Csm (30)			Csm (96)	Csm (15)	
MARDI Station,							
Jerangau, Trengganu		Cua (162)	Cua (117)		Cua (111)		Cam (3)
		Cam (87)	Cam (15)				
Crico. = <i>Criconemoides</i> sp.	Praty. = <i>Pratylenchus</i> sp.				Cam = Cocoa (Amelonado)		
Helico. = <i>Helicotylenchus</i> sp.	Roty. = <i>Rotylenchulus reniformis</i>				Cua = Cocoa (Upper Amazon)		
Meloid. = <i>Meloidogyne</i> sp.	Tylen. = <i>Tylenchus</i> sp.				Csm = Cocoa (Sabah mixed hybrid)		
	Xiphi. = <i>Xiphinema</i> sp.				* = Max. counts recorded.		

the foot-rot fungus *Phytophthora* (WINOTO, 1975). The ring nematode, *Criconemoides*, has not been demonstrated to be pathogenic in Malaysia, while the genus *Tylenchus*, found occurring in low densities in two localities is considered a primitive plant parasite (MAGGENTI, 1971). Although over a dozen nematode genera has been listed associated with cocoa in Africa, Indonesia, Jamaica and New Guinea, little information on serious damage to cocoa was noted (WHITEHEAD, 1969). Apparently, nine genera reported on cocoa in Brazil had not been proven pathogenic (SHARMA, 1971).

Helicotylenchus and *Rotylenchulus* were most commonly encountered and frequently present in higher numbers than other genera (Table 1). Both nematodes were found in all localities sampled, suggesting that they are common fauna in cocoa areas. Their relatively higher population counts probably imply that they are able to thrive better than other genera on cocoa roots. The relative numbers of both nematodes at different soil levels (0–15 cm, 15–30 cm) is illustrated by samples from different localities in Sagil Estate, Johore (Tables 2 and 3). For *Rotylenchulus reniformis* the figures do not show any apparent differences in populations at the two depths. However, when cocoa and *Tephrosia* are grown together, the nematode prefers the shade plant, higher larval populations were recovered from around roots of the latter. A similar case of host preference was observed in Papua New Guinea (WHITEHEAD, 1969) where the root-knot nematode *M. javanica* did not gall or depress growth of cocoa but severely damaged the shade tree *Leucaena glauca*. With *Helicotylenchus* sp. however, there was no discernible preference for either host plant or any difference in the vertical distribution between the two soil layers. *Helicotylenchus dihystra*, the most common spiral nematode in Peninsular Malaysia is polyphagous and has been recorded on 30 plant species (WINOTO, 1975). Some preliminary observations indicate that infection of cocoa seedlings (Upper Amazon variety) by both *H. dihystra* and *R. reniformis* do not deleteriously affect plant growth (YUEN, 1977). Other nematode genera in the same locality did not show any marked predilection for either cocoa or *Tephrosia*.

Of the various nematode genera found locally on cocoa, none has yet been proved to be of economic importance. Some possible avenues for research include investigations on nematode pathogenicity, crop damage, the relationship between population density and yield loss, and the establishment of tolerance limits.

SUMMARY

In random sampling of three cocoa varieties (Amelonado, Upper Amazon and Sabah mixed hybrid), seven genera of phytoparasitic nematodes were recorded, of which *Helicotylenchus* and *Rotylenchulus* were most common. Of these two genera, *R. reniformis* showed a host preference for *Tephrosia* rather than cocoa when both were planted together. In Malaysia, no species has yet been proved to be pathogenic to cocoa.

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