

PROGRESS REPORT ON ROOT KNOT NEMATODE STUDIES IN THAILAND

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Research on root-knot nematodes conducted by the Nematology Section, Department of Agriculture, has been done on various aspects such as identification, population dynamics, host-nematode relationship and control.

So far six species of root-knot nematode have been recorded: *Meloidogyne arenaria*, *M. exigua*, *M. graminicola*, *M. incognita*, *M. javanica*, and *M. nassi*, attacking seventy-nine host plants.

The population density of *M. incognita* (Mi) has been studied in two locations in Ubol and Khonkhaen, Northeast (NE) Thailand in kenaf fields. The population increases when it rains and the growing season starts in May and decreases in October-November after harvest. High populations of Mi are almost always associated with the death of kenaf. After harvest the land is ploughed and left unplanted until the next growing season. This is the normal cropping pattern in the Northeast. In doing so only weeds grow during the dry season and some of them are hosts of Mi such as *Cassia* sp, *Ceslea argentea*, *Eragrostia tenella*, *Eleusine indica*, *Ipomoea pileata*, *Indigofera hirsuta*, *Pueraria* sp, and *Sesbania acuteata* and two other unidentified weeds. These weeds are native and are widely distributed in the NE. It seems possible that Mi survives on these native weeds and attacks cultivated crops the following growing season. Besides, we also observed host preference of Mi in field conditions on a number of locally grown cultivated crops in the NE such as cassava, corn, mungbean, groundnut, jute, kenaf, cotton, sesame, soybean, as well as sunnhemp and marigold. These plants were grown in 1977 in a field at Ubol where kenaf had been heavily infested by Mi a year earlier. The following crops have a tendency to suppress Mi population corn (cv. Khaen-on), groundnut (ves. Lam pang, Tainan 9, SK 38), soybean (SJ 1, SJ 2, SJ 4), cotton (ves. BS-197-3, BTK 12, I-142), sesame (cv. Nakorn-sawan), sunnhemp, and marigold (*Tagetes erecta*).

Severity of root knot nematodes was studied

at Chantaburi province on black pepper. At the present time black pepper is being grown on about 60,000 rai (24,000 acres) throughout the Kingdom totalling more than 20 million plants (approximately 450 plants/rai). It is and will remain an economic crop in the country. In the past plants declined and/or died prematurely and the cause was believed by senior investigators to be due to root rot or worms.

Investigations made in 1977 to determine Mi population levels and whether plant failure was due to its presence showed that more than 90 % of the plants were infested (see Table 1 and 2). Generally, plant vitality begins to decline 4 to 5 years after planting.

Before the start of chemical control on Mi of black pepper, indication or observation tests had been done by applying certain nematocidal chemicals such as Aldicarb and Oxamyl to determine if any positive results in growth and vigor. The results were positive which may not necessarily prove that Mi is the cause of black pepper decline, but do indicate the need for further investigations. The tests began in late 1976 in two growers' plantations located about 2 kms apart. Observations showed positive results both in growth and vigor at both places. Despite these promising results it is premature to blame the plant decline solely on Mi.

Control is aimed at two methods, cultural and chemical. Cultural control is at present better for the majority of Thai farmers because of low costs and safety aspects. Chemical control is usually expensive and applying chemicals must be done with extreme care. Nematicide utilization in Thailand is very limited. It is used only among a few educated farmers and only on a few cash crops such as black pepper and tobacco.

Crop rotation as a means to control *Meloidogyne javanica* was conducted in the North (Mae Jo, Chiang Mai) and for Mi in the Northeast (Ubol and Khonkhaen). The crops were grown cross-wise every other cropping season in chess board square plots in the

following order:

Chieng Mai:— marigold-shallot-garlic-tomato
soybean-stringbean-corn.

Ubol and Khonkhaen:— marigold-soybean-
groundnut-kenaf-sunn hemp-corn (See fig. 1, 2
for further explanation.)

After six cropping seasons at Chieng Mai
which took 3 years, tomato was grown on
the plot and root galls indexed. The results
showed that tomato root gall indices were

low when grown after marigold, soybean
(cv. SJ 2), and sweet corn. Experiments at
Ubol and Khonkhaen were conducted in 1977
but these have not been completed and the
results would not be known for another two
years. Certain chemicals such as Aldicarb,
Carbofuran will be used for chemical control
experiments for Mi on black pepper at Pleu,
Chantaburi (East Thailand) and at Tarnto,
Yala (South) in 1978. Black pepper has already
been planted at both experiment stations for
this purpose.

Table 1. Level of infestation of black pepper plants by *Meloidogyne incognita*.

Locality	Khao-Wua	Khao-Ruesi	Khao-Buysi	Tachang	Khao-Tanog	Plubpla	Total
No. of plants examined*	70	30	30	20	10	10	170
Root-knot index**	0	9	-	-	2	-	11
	1	13	-	6	10	1	30
>1 =	2	1	-	1	-	-	2
	2	20	1	8	5	-	34
>2 =	3	1	1	-	-	-	2
	3	11	10	11	2	6	41
>3 =	4	-	-	-	-	2	2
	4	5	18	5	-	3	38

* At the rate of 10 plants per field

** same index as on the following page.

Table 2. Level of infestation by *Meloidogyne incognita* and age of black pepper plants.

Age (year old)	1	2	3	5	6	15	Total
No. of plants examined	20	30	60	20	20	20	170
Root-knot index*	0	7	-	2	-	1	11
	1	7	-	11	1	3	30
>1 =	2	-	-	-	1	-	2
	2	3	3	5	5	9	34
>2 =	3	-	1	-	-	1	2
	3	3	15	18	5	4	46
>3 =	4	-	-	2	-	-	2
	4	-	11	22	8	2	43

* : 0 = No nematodes found

1 = Few nematodes found

2 = Nematodes moderately found

3 = Many nematodes readily found

Infestation severe

4 = Nematodes in extremely large numbers

Infestation very severe

Experimental cropping patterns attempted for control of *Meloidogyne* species in Thailand

Cropping seasons 1, 3, 5

Cropping seasons 2, 4, 6	M	SH	G	T	SO	ST	C	Abbreviation	Crop
	SH								
	G								
	T								
	SO								
	ST								
	C								
								C	Corn
								G	Garlic
								M	Marigold
								SH	Shallot
								SO	Soybean
								ST	Stringbean
								T	Tomato

Fig 1. Experimental cropping patterns attempted for control of *Meloidogyne javanica* in Chiangmai, Northern Thailand.

Cropping season 1, 3, 5

Cropping seasons 2, 4	M	SO	GR	K	S	C	Abbreviation	Crop
	SO							
	GR							
	K							
	S							
	C							
							C	Corn
							GR	Groundnut
							K	Kenaf
							M	Marigold
							S	Sunn hemp
							SO	Soybean

Fig 2. Experimental cropping patterns attempted for control of *Meloidogyne incognita* at Ubol and Khon Khaen, North-Eastern Thailand.

Discussion

Inagaki: 1. Are your two different systems in two different locations common there? Or only for the experiments? 2. How long do these systems need for completing the cycle?

Chunram: 1. They are for experimental purpose only. We chose the plants which were locally grown. 2. Three years at Chiang Mai and five years at Ubol and Khon Khaen based on availability of irrigation.

Wang: How did you decide that a weed plant is the host of a root-knot nematode in your survey?

Chunram: We made surveys by digging up weeds and looking for galls on the roots.

Nishizawa: Will you please tell me about the practical methods of control of the root-knot nematodes in your country, especially in case of black pepper?

Chunram: There is no practical method that is being used as yet. However, we are trying on some chemicals, such as Temik and Vydate.