

# A Study of Seasonal Influence in Quantitative Variation of The Citrus Nema, *Tylenchulus semipenetrans* Cobb

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## Abstract

This investigation has been conducted for one year, from July of 1962 to June of 1963, at the Citrus Experiment Station, Yangmingshan, Taipei, Taiwan, China. Results reveal that the mean number of the adult female was highest in June, while lowest in December, January, February and March; and that from July to October the mean number significantly increased, then decreased from October to March, and again prominently increased from March to June. From these results it may be approximately concluded that the population of this nema varied with season, and may be influenced by different natural conditions occurred in different season, such as soil temperature, rainfall, and its natural enemies. In addition, the "June drop" seriously occurred in early summer at this place seems to be possibly in part associated with this nema, because the most severe infestation of this nema took place just in this period. Hereafter, if some orchard control measures for this nema will be available, this period should be given a special consideration.

## INTRODUCTION

The citrus nema, *Tylenchulus semipenetrans* Cobb (1913), is a world-wide important parasite on citrus feeder roots (4, 8, 9, 10). It has an extensive distribution in common citrus orchards of Taiwan (6, 8). For understanding whether or not its population may be influenced by seasonal fluctuation, and what relationship exists between them in the Taiwan field condition, this investigation has been carried out for one year, from July of 1962 to June of 1963, at the Citrus Experiment Station, Yangmingshan, Taipei, Taiwan, China. In this investigation only adult females were taken to be examined and calculated. This is because the infestation of this nema is the female only (4, 10).

## MATERIALS AND METHODS

Ten trees of 6-year-old Tankan (*Citrus sinensis?* × *Citrus reticulata?*) (7) with Sunki (*Citrus reticulata* var. *Sunki* Toung 1962) (7) rootstock grown at the Citrus Experiment Station were selected for investigation. Before this investigation was initiated, these ten trees had been fully understood to be heavily infected with the citrus nema, *Tylenchulus semipenetrans* Cobb.

Under each of these ten trees, 5 grams of feeder roots were sampled on the 15th of each month from July of 1962 to June of 1963. At each time of sampling, the root sample was taken approximately from similar direction and depth (about 15cm. in depth) under each of these ten trees.

In order that adult females of the citrus nema on roots could be easily examined, not overlooked, and kept well for counting of longer duration, each root sample was fixed and stained with the lactophenol solution plus acid fuchsin. The process was as follows (2):

- (1) Each root sample carefully washed clean of soil particles and weighed out 5 grams to put into boiling lactophenol solution plus acid fuchsin for one minute.
- (2) Then washed in tap water to remove excess stain and transferred to pure lactophenol solution (no acid fuchsin) and left overnight.

Such treated root samples were carefully examined and counted under a dissecting microscope section by section. Clumps of eggmasses and some adhering soil particles frequently were removed carefully by dissecting needle to expose females.

Besides, from July 1 of 1962 to June 30 of 1963, the air temperatures and soil temperatures at this Experiment Station were recorded day after day. Average air and soil temperatures in each month are shown in Table 2.

## RESULTS

From July of 1962 to June of 1963, numbers of the adult female of citrus nema sampled in each month are presented in Table 1. Mean numbers of the adult female occurred were significant in difference between months, except

Table 1. Numbers of adult female citrus nema in 5 grams of citrus feeder roots sampled in each month from July of 1962 to June of 1963.

Sampling dates	Tree number										Sums	Means
	1	2	3	4	5	6	7	8	9	10		
1962 July 15	421	323	226	258	351	331	282	312	363	411	3378	337.8
Aug. 15	351	262	383	267	262	291	378	292	264	360	3110	311.0
Sept. 15	379	291	421	393	474	389	497	364	391	495	4094	409.4
Oct. 15	931	834	726	868	971	831	782	822	773	911	8449	844.9
Nov. 15	821	724	636	751	879	741	852	731	694	876	7705	770.5
Dec. 15	256	195	124	212	163	121	170	243	115	220	1819	181.9
1963 Jan. 15	86	65	51	74	48	55	46	62	38	58	583	8.3
Feb. 15	75	56	43	66	39	50	44	60	35	52	520	52.0
Mar. 15	78	61	47	70	43	51	45	54	41	57	547	54.7
Apr. 15	240	187	296	214	325	233	198	255	380	301	2629	262.9

May.	15	1851	1262	1457	1714	1921	1533	1198	2014	1315	1676	15941	1594.1
June	15	3672	3851	3174	2960	3502	4280	2695	2953	4499	2062	33648	3364.8
L.S.D. at the 5% level												267.6	
L.S.D. at the 1% level												272.1	

Table 2. Average air and soil temperatures in each month from July of 1962 to June of 1963 at the Citrus Experiment Station, Shan-Tzu-Hou, Yangmingshan, Taipei, Taiwan, China.

	1962						1963					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
Air(oC)	26.79	25.70	24.60	21.59	18.35	14.48	8.60	10.5	15.00	18.0	22.54	25.60
Soil(oC)*	25.22	24.28	23.29	20.68	18.95	15.78	10.59	11.30	14.85	17.42	22.92	23.92

\* 15cm. in depth.

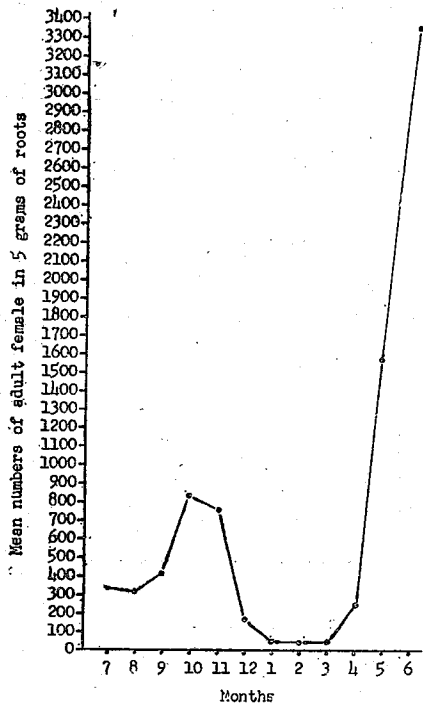
those between October and November, September and July, September and August, September and April, July and August, July and April, July and December, August and April, August and December, April and December, April and January, December and January, December and March, December and February, January and March, January and February, as well as March and February. The highest mean number was present in June, whereas the lowest mean numbers were present in December, January, February, and March. From July to October the mean number significantly increased; then decreased from October to March; again prominently increased from March to June. Such mode of variation is shown Figure in 1.

## DISCUSSION AND CONCLUSION

From the data present in Table 1 and Table 2, it would be quite possibly influenced by the soil temperature that mean numbers of the adult female citrus nema were lowest in winter and early spring and highest in early summer, because the optimum soil temperature for activity of the citrus nema is 25°-31°C, and over 35°C or under 15°C this nema is inactive according to the report of R. C. Baines in 1950 (1). However, in middle and late summer and in early autumn, soil temperatures were still favorable for the activity of this nema, but in these months, mean numbers of the adult female were about ten times less than that present in early summer. This discrepant phenomenon would be probably due to some causes other than the soil temperature, such as heavy Typhoon rainfall frequently occurred during these months or perhaps some natural enemies of this nema (3, 5) abundantly occurred in these months, or both. Hence, it may be approximately concluded that the population of this nema varied from season to season, and may be influenced by different natural environment occurred

in different season, such as soil temperature, rainfall, and its natural enemies. According to Table 1, the most heavy infestation of this nema would be in early summer. The "June drop" found to be serious in this time at this place seems to be possibly in part associated with this cause. So, if some orchard control measures for this nema will be available in the future, this period should be given a special consideration.

Figure 1. Graph of quantitative variation of the adult female citrus nema occurred in each month from July of 1962 to June of 1963.



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#### 中文摘要

## 線蟲柑橘發生量與季節關係之研究

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本試驗於1962年7月開始在陽明山橘柑試驗場內進行，至1963年6月止，為時一年。經此一年來觀察統計之結果，此蟲之發生量以六月為最高，十二月、元月、二月、及三月為最低。從七月至十月，此蟲發生之數量有顯著之增加；從十月至三月，則轉下降；從三月至六月，又復逐步上昇，至六月而達最高量。由此可知，此蟲在一年中發生之數量，因季節之變換而有不同。各季節之土溫、雨量、及其天敵，可能係影響其數量變異之重要因子。此外，在陽明山一帶之桶柑六月落果現象頗為嚴重，而此時恰為此蟲發生數量最多之時。故經推測，可能與此蟲之為害有部份之關連。將來對於此蟲如有適當之田間防治方法可尋，則在此一時期應宜特別注意施行防治。