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PROGRESS REPORT: *D. CITRI* TRAPPING, IDENTIFICATION OF PARASITE AND POSSIBLE FIELD ESTABLISHMENT OF THE IMPORTED PARASITE, *TAMARIXIA RADIATA* IN THE PHILIPPINES

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Abstract

Citrus Greening Disease (or Leaf Mottle) has severely affected the Philippines Citrus Industry for 20 years, and local entomologists have clearly demonstrated the transmission of this disease by the Oriental Citrus Psyllid Diaphorina citri Kuwayama. However it is not until recently, with the implementation of the Regional FAO-UNDP Project RAS/86/022, that new research activity was resumed on this vector. Its geographical distribution in the Philippines archipelago was more accurately assessed by systematic inspections and trapping techniques. The list of its natural enemies in Philippines was updated, thus opening the possibility of importing an efficient exotic parasite Tamarixia radiata which being established in three different areas of the country. This research work will be helpful for the citrus rehabilitation in the Philippines.

1. Introduction

The Asian citrus psyllid, *Diaphorina citri*, has long been recognized as the vector of the greening disease in the Philippines (Martinez and Wallace, 1967). Various studies conducted in the early 70's dealt with the biology and ecology of this psyllid (Bigornia and Obala 1974, Panaligan et al 1970), its transmission ability of the Greening disease (Cortez and Celino 1972 Salibe and Cortez 1966) and its sensibility to insecticides (Celino and Molino 1972). On parasite identification, only one study had been carried out (Celino and Panaligan 1969), while assessing of field populations using different traps were only tried upon the implementation of the FAO Regional Project.

Aubert (1987) reported that trapping of winged adults on Saturn Yellow adhesive tape is a useful tool for assessing outbreads of the Asian citrus psyllid. However, recent information gathered in China and subsequently confirmed by the Philippines workers (Gavarra et al., 1989) indicated that the Samways traps used effectively in monitoring the African psyllid, *Trioza erytreae*, was preceded in the case of *D. citri* by other trapping techniques. The Rebell trap and improvised cylindrical traps seemed to be more promising. It was also observed that the number of adult psyllids caught was affected by the height of the traps. More catches were obtained from traps at 0.5 to 1.5 meters above ground than at much higher elevations.

This paper reports the continuation of the results concerning 1) the trapping of *D. citri* at different heights for six months (July-December 1989), 2) the different parasites identified from Luzon and Mindanao, Philippines and 3) the observations on the behaviour of an imported ectoparasite, *Tamarixia radiata*.

2. Trapping Results

The results of the Rebell, cylindrical and Samways Trapping Methods have been reported at the third FAO Citrus Workshop in Malang, Indonesia. In the case of the bamboo pole traps with yellow paper at different heights, a total of 752 adult psyllids were caught from March to June, 1989 in the province of Batangas, Luzon. Of that total, 611 were found at the trap heights of 0.5-1.5 meters (Gavarra et al., 1989). Trap catches decreased with increasing height above 2.0 meters. Table 1 shows very low catches for the period from July to December 1989, with a total of only 14 adults. The traps at 1.5 meters still had the highest total of 4 adults. The results of the bamboo poles trapping in the province of Oriental Mindoro, an island province of Luzon, is interesting. The same type of traps using bamboo poles were set up in Socorro, Oriental Mindoro, where large hectarage of mandarins and calamansi (*Citrus madurensis*) were found. Since the start of trapping in April 1989 up to the present observation, not a single adult of *D. citri* has been caught.

These results will still have to be verified using the two types of Rebell traps that have just been received. The results could be significant to the Philippines citrus Rehabilitation Program in relation to the selection of ideal areas for citrus nursery activities and establishment of disease-free citrus foundation orchards.

Table 1. Distribution of *Diaphorina citri* caught on three bamboo pole traps at varying heights in Pecho Orchard, Sambat, Tanauan, Batangas, July-December, 1989.

Height (meters)	Bamboo Poles			Total
	A	B	C	
0.5	0	1	0	1
1.0	0	0	0	0
1.5	4	0	0	4
2.0	2	0	1	3
2.5	1	0	2	3
3.0	1	1	1	3
3.5	0	0	0	0
4.0	0	0	0	0

3. Primary and Secondary Parasites Associated with *D. citri*

The insect taxonomy branch of the University of the Philippines at Los Banos identified the following parasites:

From Luzon:

1. *Diaphorencyrtus aligarhensis* (Encyrtidae)
2. *Psyllaephagus* sp. (Encyrtidae)
3. *Marietta javensis* (Aphelinidae)
4. *Prochiloneurus* sp. (Encyrtidae)
5. *Tetrastichus* sp. (Eulophidae)

From Mindanao:

1. *Diaphorencyntus aligarhensis* (Encyrtidae)
2. *Prochiloneurus* sp. (Encyrtidae)
3. *Signiphora* sp. (Signiphoridae)
4. *Tetrastichus* sp. (Eulophidae)

Table 2a and 2b give the percent parasitism attributed to the different parasites in Luzon and Mindanao. The most important species for both sites is *Diaphorencyrtus aligarhensis* which accounted for 17.63% and 36.12% of total parasitism in Luzon and Mindanao, respectively. Earlier reports stated that its rate of parasitism was generally averaging 20% (Aubert 1987). Other species had very little effect on the psyllid population.

Table 2b. Different parasites and their degree of parasitism on D. citri in Mindanao (Jan. 1989 - Jan. 1990)

Period	Total Nymphs Collected	*D. aligarhensis*		*Prochiloneurus* sp.		*Signiphora* sp.		*T. radiata**	
		No	%	No.	%	No.	%	No.	%
1989									
January	94	41	43.6	4	4.25	9	9.57	-	
February	74	46	62.16	1	1.35	2	2.70	-	
March	-	-	-	9	14.28	-	-	14	22.22
April	107	37	34.57	-	-	-	-	-	
November	50	23	46.00	-	-	-	-	8	16.00
December						-	-	-	
14	30	21	70.00	-	-	-	-	4	13.30
20	50	27	54.00	-	-	-	-	10	20.00
1990									
January									
2	200	20	10.00	-	-	-	-	30	15.00
5	15	9	60.00	-	-	-	-	1	6.66
Total	620	224		-	-	-	-	-	

36.12 percentage total parasitism
* due to accidental escape

Table 2a. Different Parasites and their Degree of Parasitism on *D. citri* in Luzon, January-December, 1989

Period	Total Nymphs Collected	*D. aligarhensis*		*Psyllaphagus* sp.		*Tetrastichus* sp.		*M. javensis*		*Prochiloneurus* sp.		*T. radiata**	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
January	415	88	21.21	3	0.72	-	-	-	-	-	-	-	-
February	200	62	31.00	3	1.5	-	-	1	0.5	-	-	-	-
March	280	53	18.92	10	3.57	-	-	-	-	-	-	-	-
April	205	29	14.14	11	5.31	1	0.47	-	-	2	0.97	3	1.46
May	117	-	-	-	-	-	-	-	-	-	-	-	-
June	-	-	-	-	-	-	-	-	-	-	-	-	-
July	181	33	18.23	-	-	-	-	-	-	-	-	3	1.65
August	117	10	8.54	0.85	-	-	-	-	-	-	-	5	4.27
September	313	61	19.48	1	0.32	-	-	-	-	-	-	-	-
October	598	88	14.71			-	-	-	-	-	-	2^2	0.33
November	170	33	19.00	-	-	-	-	-	-	-	-	114^1	67.05
	173	20		-	-	-	-	-	-	-	-	27^2	15.60
	176	7		-	-	-	-	-	-	-	-	27^3	15.34
December	32		0	-	-	-	-	-	-	-	-	3^3	9.34

* due to accidental escape
1 Station
2 Tanauan, Batangas
3 Sto. tomas, Batangas

4. Possible Field Establishment of *Tamarixia radiata*

Tamarixia radiata was first brought to the Philippines in July 1988 from Reunion Island. However, attempts to mass-produce it in insectarium failed. Then the second introduction was in November 1988. Both Lipa Experiment Station, Lipa City Luzon and Davao Experiment Station, were provided with several adults. The insect rearing is maintained in insect cages inside a glasshouse. No actual field release has been done, until in April 1989 at the Lipa Station, three adults of *T. radiata* were reared from a mummified nymphs collected from a Ladu Mandarin tree some 10 meters away from the Station rearing house. In July, another 3 adults were reared from nymphs of the same tree. Then in August 1989, there was 5 *Tamarixia* reared from mummified nymphs from

another Ladu Mandarin tree some 50 meters away from the station rearing house. In October, 2 *Tamarixia* were reared from the nymphs in Sto Tomas, Batangas which is about 15 kilometers from the Lipa Experiment Station. In November, high populations of the parasites were again collected, about 150 meters away from the rearing house of the Lipa Station. A high percentage parasitism of 67.66 was observed (Table 2a). Also in the same month, parasites believed to be *T. radiata* were collected from Pecho Orchard, some 13 kilometers north away from the Lipa Station. At a citrus farm in Sto. Tomas, Batangas, the ectoparasites were continuously collected from October to December, 1989 (Table 2a). The establishment of the ectoparasite was believed to be caused by escapes when a test tube containing adult parasites was accidentally broken outside the cage in the rearing house of the station which is not absolutely insect-proofed either.

At the Davao Experiment Station, Mindanao, the first indication of the possible establishment of the ectoparasite was in March 1989, when fourteen live specimen closely resembling the ectoparasite were reared from field collected mummies of *D. citri* found on a lime tree approximately 50 meters away from the rearing house of the station. Specimen were sent to Dr. Clare Baltazar, a taxonomist at the University of the Philippines, Los Banos Laguna and identified as *Tetrastichus sp.* (*Tamarixia radiata* is the new taxonomic name given by Graham to an Eulophid identified formerly as *Tetrastichus radiatus*).

Samples from the rearing Lipa Station were also sent to Dr. Baltazar and she confirmed that the two specimens were of the same species. The field establishment could be attributed to escapes of the parasites in the course of tranfer, manipulation and rearing of *D. citri* on *Murraya paniculata*.

Despite the follow-up field monitoring for its presence, this species practically disappeared until the 29th of November, 1989 when 8 specimens emerged from 50 nymphs collected. Since then and until January 1990, representatives of this particular species were reared from its hosts retrieved from citrus trees found within close proximities (distance of more or less 50 meters) from the rearing house of the station. With this development on the initial establishment of *T. radiata* in the field of both, Luzon and Mindanao station, the breakthrough in hastening the biological control of *D. citri* in the field could be foreseen in the immediate future.

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