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Monitoring Adult Psyllas on Yellow Traps in Reunion Island

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ABSTRACT. The populations of several Psyllidae, including *Diaphorina citri* Kuwayama, were monitored with fluorescent yellow traps, over 2 yr in 12 different sites of Reunion. The results were consistent with previous scouting obtained by visual inspections, *i.e.*, absence of *Trioza erytreae* (Del Guercio) and residual spots of *D. citri* on *Murraya paniculata* hedges. Weekly catches of *D. citri* on yellow traps were compared with the number of winged adults obtained by aspirating plant-host canopies with a D-VAC machine.

Index words. Yellow traps, greening disease.

Proper assessment of psylla populations and forewarning of outbreaks on a spatial and temporal basis is of paramount importance for the management of the citrus greening disease (CGD). Surveys involving the examination of randomly selected flushes on data trees, although useful, must be completed by adequate monitoring, especially when dealing with low populations.

Permanent records of psylla density may be obtained by sequential monitoring of traps. The latter are based on visual attractiveness for certain colours. In the case of homopterous insects, *viz.* psyllas, aphids or cicadellids, yellow surfaces reflecting in the wavelengths of 500-550 nm, inhibit flight or walking and tend to attract these insects to yellow objects (4, 5, 7). Therefore sequential catches by sticky material on such yellow traps can be related to the actual density of these insect pests in target crops or target areas.

Such a survey was carried out in Reunion Island over 2 yr in citrus orchards and ornamental rutaceous hedges for the following reasons:

- 1) Reunion was found to harbour the African CGD vector *Trioza erytreae* (Del Guercio) and the Asian CGD vector *Diaphorina citri* Kuwayama (2). Both insects had previously been surveyed for several years by visual scouting.
- 2) After the introduction and successful establishment of natural

enemies of both CGD vectors, the population levels of these psyllas decreased sharply (1).

- 3) Low to extremely low levels of populations, especially for *D. citri*, are more difficult to assess by visual scouting. We also wanted to ascertain whether *T. erytreae* had been completely eliminated from the Island.
- 4) The trapping technique could identify other possible species of psyllas visiting citrus orchards.

The sequential catches of *D. citri* on yellow traps were compared to the actual number of winged adults collected on neighbouring canopies with a D-VAC aspirating machine.

MATERIALS AND METHODS

Fluorescent saturn yellow scotch-al bands (3M color code number 3485) manufactured by 3M Company, were selected, owing to their strong attractiveness for *T. erytreae* (6). In previous studies, we had also found that the same colour was more attractive to *D. citri* and other psyllid species, than ordinary yellow colours *e.g.*, bright yellow (3M Code N° 3622) or lemon yellow (3M Code N° 580581).

Metallic rectangular boards, 21 x 14 cm, supporting yellow scotch-al band were used. A transparent sheet of PVC smeared with polybutene was clipped over the yellow band, and replaced every week. After exposure, the PVC sheets were brought back to

the laboratory and scanned directly under microscope for identification and counting of the trapped insects. The same sheets were also easily stored for further investigation.

Twelve sites were monitored regularly. Seven sites were on the dry leeward side of the Island (between sea level and 1000 m of elevation), and five sites on the humid windward side (between sea level and 600 m). Each site was represented by at least one trap and all the traps were established in citrus orchards, except two traps which were located near *Murraya paniculata* hedges. Previous surveys carried out by visual scouting had identified these *M. paniculata* hedges as *D. citri* residual spots. The leeward traps were monitored over 25 months and the windward traps were monitored for only 12 months.

The records obtained by yellow traps were compared with other techniques of evaluation, *i.e.*:

- 1) visual scouting and catching with a mouth aspirator: *D. citri* were collected directly with a mouth aspirator comprised of a perforated vial and an aspirating tube of 1.5-mm diameter allowing winged adults to be aspirated singly. The number of individuals caught in 10 min was noted. Mouth aspiration took place prior to operation of the D-VAC machine.
- 2) A D-VAC collector (model 24) also was used for sampling whole canopies. In commercial orchards, the total number of psyllas collected on five canopies of adult citrus trees was noted; meanwhile in the case of *M. paniculata* hedges the aspiration was made on a 10-m² basis.

RESULTS

Total number of winged adult psyllas collected on yellow traps.
The total number of winged adult

TABLE 1
TOTAL NUMBER OF WINGED ADULTS COLLECTED ON
FLUORESCENT YELLOW TRAPS

Location	Altitude	Dry leeward side (period of record 2 yr)			
		<i>Trioza erytreae</i>	<i>Trioza + Paraupsylla</i>	<i>Diaphorina citri</i>	<i>Mesohomotoma lutheri</i>
Etang-Salé ^y	5m	0	32	17	5
LeCol ^z	12m	0	38	0	1
Bassin-Plat ^z	100m	0	248	0	2
Bassin-Martin ^z	300m	0	412	0	3
Tampon 400 ^z	400m	0	352	0	9
Tampon 600 ^y	600m	0	45	1 002	18
Petite Plaine ^y	1000m	0	52	0	7
Total		0	1 179	1 019	45
Location	Altitude	Humid windward side (period of record 1 yr)			
		<i>Trioza erytreae</i>	<i>Trioza + Paraupsylla</i>	<i>Diaphorina citri</i>	<i>Mesohomotoma lutheri</i>
Ste-Anne ^z	130m	0	259	0	—
Ste-Anne ^z	130m	0	205	0	—
Ste-Marie ^z	140m	0	132	0	—
Ste-Suzanne ^z	100m	0	75	2	—
Bois de Nêfles		0	153	0	—
St-Denis ^z	390m				
St-François ^z	600m	0	421	0	—
Total		0	1 245	2	—

^zTraps established in citrus orchards.

^yTraps established near *Murraya paniculata* hedges.

psyllas collected during the whole period of survey is given in table 1 for the four groups of species.

Not a single *T. ferytreae* was caught in any of the above collections. The most abundant psyllid group collected was *Trioza litseae* Bordage + *Paraupsylla* sp., which is widespread on the island whatever the altitude or the rainfall. *Paraupsylla* sp., is a species newly discovered on the island and is not easy to differentiate routinely from *T. litseae*. This psyllid is thought to have *Ficus* sp. as a host plant. The *T. litseae* + *Paraupsylla* sp. group yielded a total of 2424 winged individuals equally divided between the leeward and the windward sides. The elevation at which the most insects of this group were caught was 300 m. *T. litseae* was very seldom seen on citrus and the great majority of the collected individuals was presumed to originate from the windbreaks or adjacent vegetation.

With the exception of two adults obtained from a citrus orchard in Ste-

Suzanne, *D. citri* was recorded only from the traps located near *Murraya paniculata* hedges. As formerly noticed from visual surveys, this psylla is found mostly on the dry leeward side of the island. A surprisingly higher number of individuals was recorded from Tampon 600, compared to Etang-Salé. Unexpectedly, the sex ratio of the *D. citri* population caught was 45.5% females and 54.5% males.

The fourth group of psyllidae collected on fluorescent yellow traps is represented by *Mesohomotoma lutheri* Enderlein, the *Hibiscus* psylla. Although widespread on the island on the windward and leeward sides, this species is more restricted to its preferred host plant.

Apparent population fluctuation obtained by yellow traps. Fig. 1 shows the weekly counts of *D. citri* obtained from the yellow trap established in the *M. paniculata* hedge of Tampon (600 m). Extremely high catches were recorded during the second and third weeks of January 1985,

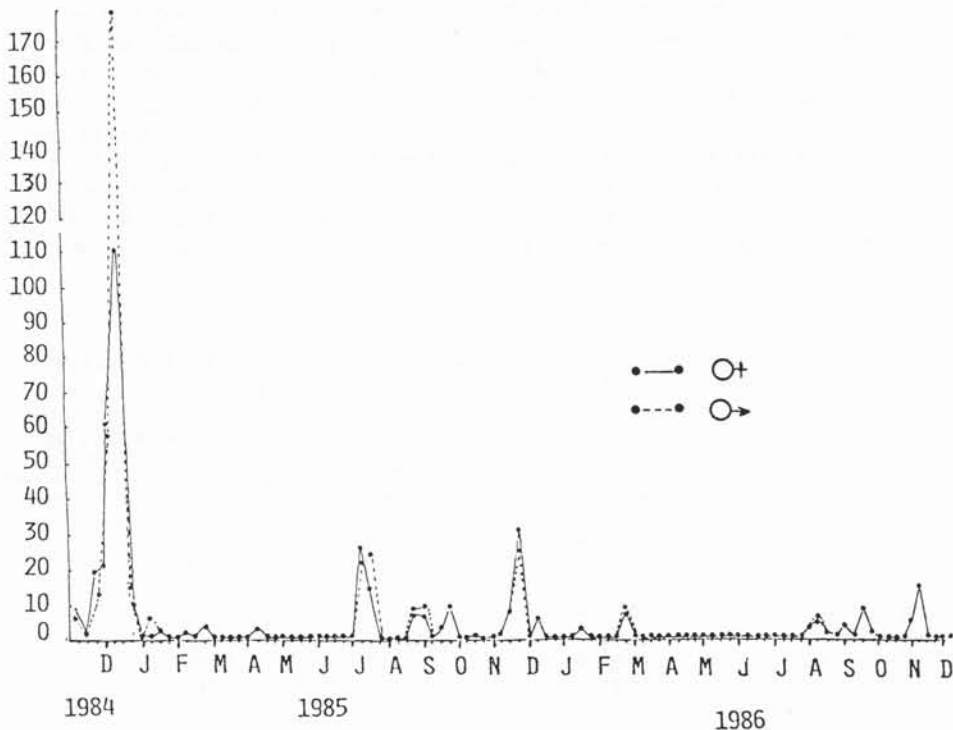


Fig. 1. Number of *Diaphorina citri* caught weekly on fluorescent yellow traps on *Murraya paniculata* at Tampon (600 m).

followed by sporadic outbreaks between August and November. Lower populations were collected in 1986, but with a similar timing of the outbreaks. The percentage of males was higher than that of females in January 1985, March 1986 and September 1986.

Etang-Salé was the second place where *D. citri* were trapped. Although numbers were much lower than at Tampon 600, the catches were concentrated during the third and fourth weeks of December 1984, 1985, and 1986.

Actual population of *D. citri* aspirated with the D-Vac machine. Twenty trials were made with the D-Vac equipment in eight citrus orchards and two *Murraya paniculata* hedges. A single citrus orchard was positive for *D. citri*, with only three adults caught at Ste-Suzanne.

Much higher numbers of insects were obtained from the *M. paniculata* hedges. The number of aspirated *D. citri* was two or three times as many on the sunny side as on the shaded side of these hedges. The sex ratio obtained from aspirated batches of psylla was 49% males and 51% females.

Mouth-aspirator catches. The number of winged *D. citri* adults caught with the mouth aspirator technique is presented in figure 2. Al-

though less accurate than broad canopy suction, especially for very low or very high populations, this technique gives a relatively good indication of psylla outbreaks.

DISCUSSION AND CONCLUSIONS

The current survey has presented clearcut evidence of total elimination of *T. erythrae* from Reunion, even in the high-lying windward side known to be more prone to the African psylla infestations, e.g. Plaine des Palmistes. The acute attractiveness of the fluorescent saturn yellow colour has also provided a good indication of the psyllid species visiting citrus orchards or established close to citrus orchards. In this respect, it was interesting to note the strong attraction of *D. citri* winged adults for the yellow colour.

As far as this psylla is concerned, the results obtained from the sticky trap technique have shown that: 1) the Asian CGD vector is subsisting in Reunion Island in few scattered residual spots, especially at 600 m of elevation on the leeward side, 2) *M. paniculata*, the orange jessamine tree, which is known as the preferred host plant of *D. citri*, provides excellent shelter for this insect due to regular flushes year round and the absence of any insecticidal spray; 3) the

TABLE 2
CATCHES OF *DIAPHORINA CITRI* OBTAINED WITH THE D-VAC ASPIRATOR
ON 10 M² OF *MURRAYA PANICULATA* HEDGE

Location	Dates of sampling	Type of exposure	Number of psyllas	
			<i>Diaphorina citri</i>	<i>Trioza erythrae</i>
Etang-Salé No. 1	07/30/86	Shaded	6	0
Etang-Salé No. 2	07/30/86	Sunny	32	0
Etang-Salé No. 3	07/30/86	Sunny	136	0
Etang-Salé No. 4	07/30/86	Sunny	194	0
Tampon 600 No. 1	07/23/86	Shaded	164	0
Tampon 600 No. 2	07/23/86	Sunny	1,409	0
Tampon 600 No. 3	07/23/86	Shaded	619	0
Tampon 600 No. 4	01/10/87	Shaded	358	0
Tampon 600 No. 5	01/10/87	Sunny	1,806	0
Tampon 600 No. 6	01/10/87	Shaded	24	0
Tampon 600 No. 7	01/10/87	Shaded	122	0

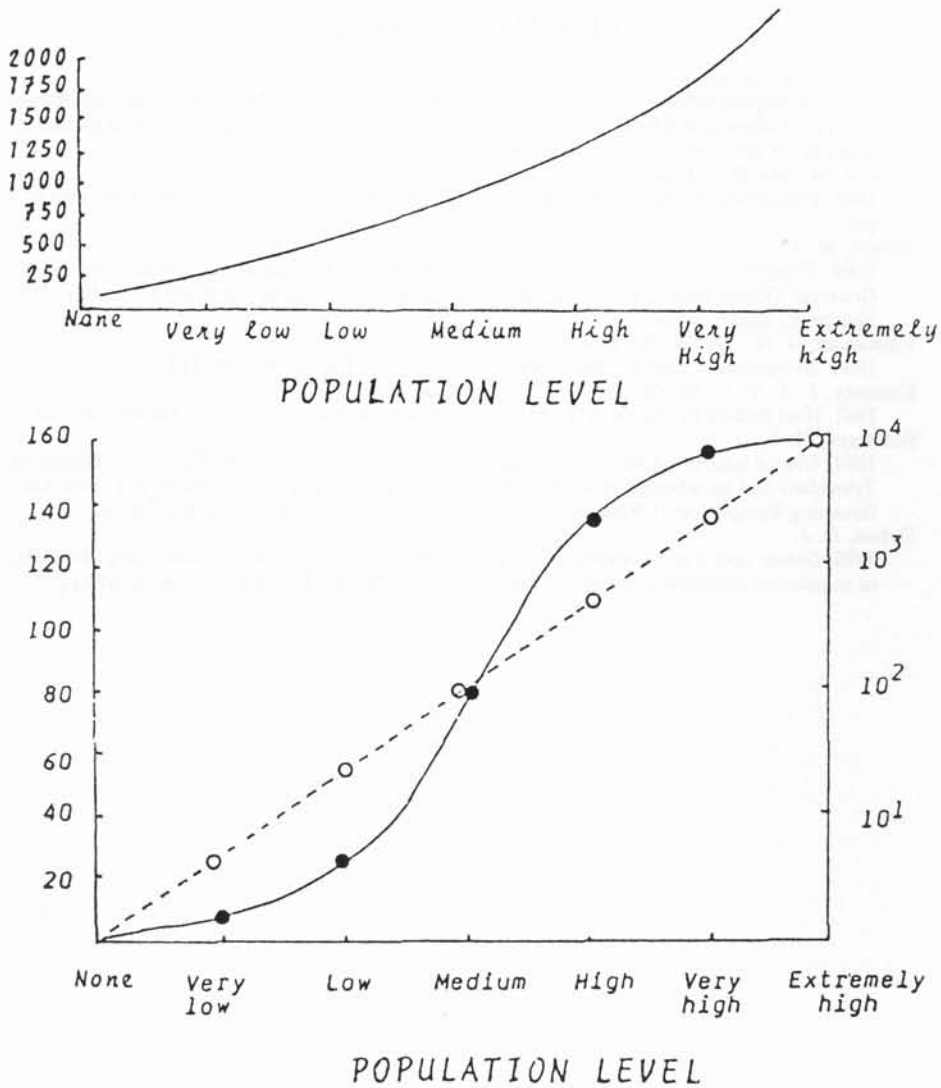


Fig. 2. Catches of winged adults of *Diaphorina citri* by three different methods: top) catches on yellow traps: total adults per month; bottom) catches by aspiration, —●— number aspirated by mouth in 10 min, left; ---○--- number collected from 10 m² of canopy with the D-Vac machine, right.

catches of winged adults on yellow traps reflect a flight activity which seems more important at times for males than for females. It is thought that such activity results from short flight migration toward sunny areas.

Yellow sticky traps proved useful in narrowing down the spatial and temporal search of *D. citri* outbreaks

by classical scouting. Similar results were reported for *T. erythrae* in the Transvaal (3), and it would probably be the same in many Asian countries where *D. citri* is endemic.

Finally the yellow sticky trap technique is a cheap and convenient method for recording CGD vector outbreaks.

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