

## **Monitoring Fruit Flies in Avocado Orchards**

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Die drie belangrikste vrugtevliespesies by die verbouing van subtropiese gewasse is in avokadoboorde in die Nelspruit omgewing gemoniteer. Monitoring het in Januarie 1997 begin en het tot Januarie 1998 geduur. Sensusvalle met trimedlure en  $\beta$ -caryophyllene en 'n melkbottelval met 'n proteien hidrolisaat, Hymnlure, is gebrui. In sensusvalle met trimedlure het meer mannetjies van Natal vrugtevlies, *Ceratitits rosa*, as Mediterreense vrugtevlies, *Ceratitits capitata*, voorgekom. In die sensusvalle waar die tokmiddel,  $\beta$ -caryophyllene gebruik is, het meer Maroela vrugtevlies, *Ceratitits cosyra*, as *C. rosa* voorgekom en byna geen *C. capitata* is gevang nie. Meer mannetjie as wyfie vliee is deur  $\beta$ -caryophyllene aangelok. In die melkbottelvalle het meer *C. rosa* as *C. cosyra* en *C. capitata* voorgekom. Meer wyfie vliee is deur die Hymnlure aangelok. Resultate het getoon dat *C. capitata* se getalle laag was en dat die spesie nie van belang is nie. *C. rosa* kan beskou word as die belangrikste spesie wat in avokadoboorde voorkom.

### **ABSTRACT**

The three most important fruit fly species in the cultivation of subtropical crops were monitored in avocado orchards in the Nelspruit area. Monitoring commenced during January 1997 and continued until January 1998. Sensus traps with trimedlure and  $\beta$ -caryophyllene as well as a milk bottle trap with a protein hydrolysate, Hymnlure, were used. Sensus traps with trimedlure caught more males of the Natal fruit fly, *Ceratitits rosa*, than Mediterranean fruit fly, *Ceratitits capitata*. In the Sensus traps where the attractant  $\beta$ -caryophyllene was used, more Manila fruit fly, *Ceratitits cosyra*, occurred than *C. rosa* while virtually no *C. capitata* were captured. More males than females were attracted by the  $\beta$ -caryophyllene. In the milk bottle traps more *C. rosa* occurred than *C. cosyra* and *C. capitata*. More female flies were attracted to the Hymnlure. Results indicated that the numbers of *C. capitata* were low and that this species is not of importance. *C. rosa* can be regarded as the most important species occurring in avocado orchards.

### **INTRODUCTION**

Three fruit fly species are known to attack subtropical crops in Southern Africa namely the Mediterranean fruit fly, *Ceratitits capitata* (Wiedemann), the Natal fruit fly, *Ceratitits rosa* Karsch and the Marula fruit fly, *Ceratitits cosyra* (Walker). All three species are indigenous to Africa (White & Elson-Harris, 1992). *C. capitata* occurs in many countries of the world while *C. rosa* occurs only in Africa, Mauritius and Reunion. *C. cosyra* is restricted to Africa. In South Africa *C. rosa* is recorded as laying eggs on avocado (Du

Toit *et al.*, 1979). *C. cosyra* has not been reported to attack avocado in South Africa, although it has been recorded in Zimbabwe (Hancock, 1987).

The avocado is not considered a suitable host for fruit fly development. De Villiers & Van den Berg (1987) state that under normal orchard practices no larval development takes place in the avocado fruit. There are however, isolated instances where larvae can be dissected from over-ripe fruit rotting on the ground underneath the avocado tree. According to Du Toit & De Villiers (1990) fruit fly larvae do not develop in the fruit of commercial avocado cultivars. The aim of this study was to monitor fruit fly populations in avocado orchards and to determine the abundance of species.

## **MATERIALS AND METHODS**

Fruit flies were monitored in avocado orchards of H.L. Hall & Sons LTD in the Nelspruit area. The avocado orchards are situated between the airport and pecan orchards. The trees in the orchards were mostly of the cultivar Fuerte.

Sensus traps with trimedlure (Capilure) or  $\beta$ -caryophyllene (Outspan Ceratitis lure) were used. Dichlorvos (2.5ml) was added to 50ml trimedlure to kill the flies and 3ml of the mixture was placed on each felt ring of the Sensus trap. This was replaced every three months. In the case of  $\beta$ -caryophyllene 0.5ml was mixed with 30ml Hymmlure 1:1. To this mixture 1.0g trichlorfon was added to kill the flies. Of this mixture 5ml was added to the felt ring of the Sensus traps and reapplied at 6 week intervals. The para-pheromone, trimedlure attracts the males of *C. capitata* and *C. rosa*,  $\beta$ -caryophyllene attracts both males and females of *C. capitata* and *C. rosa* and males of *C. cosyra*.

Traps, made of two litre milk bottles with a protein hydrolysate bait, Hymmlure were also used, which attracts the males and females of all three *Ceratitidis* species. Openings were cut into the four sides of the container in such a way that a flap was left. Each flap was folded upwards to prevent rain water from entering the container. The protein hydrolysate attractant, Hymmlure, was mixed with a pesticide and poured into the bottom of the trap. The following mixture at 200ml per trap was used: Hymmlure @ 200m plus 50g trichlorfon / 100l water. The bait mixture was replaced once a week.

Traps were attached to the trees with a thin wire at a height of approximately 1.5m above the ground, within the tree canopy. The traps with the three different attractants were placed approximately 100m apart and this was repeated four times in different avocado orchards on the estate. All traps were examined once a week and the fruit flies counted. Traps were placed in the orchards from January 1997 to January 1998.

## **RESULTS**

### **Sensus traps with trimedlure**

High numbers of *C. rosa* males were present during February, May, July and August (figure 1). *C. capitata* numbers remained low through-out the season although there was a slight increase during April and May (figure 1). Significantly more *C. rosa* females were found in the traps (table 1).

### Sensus traps with $\beta$ -caryophyllene

Virtually no *C. capitata* were captured throughout the sampling period (figure 2; table 2). High numbers of *C. rosa* were present during January to March. The highest number of *C. cosyra* occurred during February. The numbers of *C. cosyra* present, were the highest, although differences between the species were not significant (table 2). More male flies were attracted by the  $\beta$ -caryophyllene than females (table 3).

### Milk bottle trap with Hymlure

Virtually no *C. capitata* were captured in the milk bottle traps (figure 3).

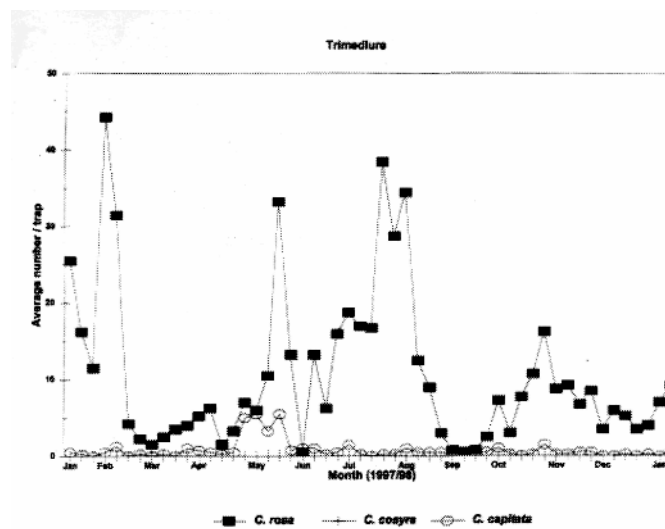


Figure 1: Weekly fruit fly catches with Sensus traps and trimedlure

Table 1. Average number of *C. capitata* and *C. rosa* captured in the Sensus traps with trimedlure

Average number of males per trap		
	<i>C. capitata</i>	<i>C. rosa</i>
Trap 1	1.19	15.57
Trap 2	0.53	8.15
Trap 3	0.53	4.19
Trap 4	0.77	15.06
Average	0.76a	10.74b
DF	3	
P	0.0006	

DF = degrees of freedom;

P = significance level.

Averages followed by the same letter are not significantly different.

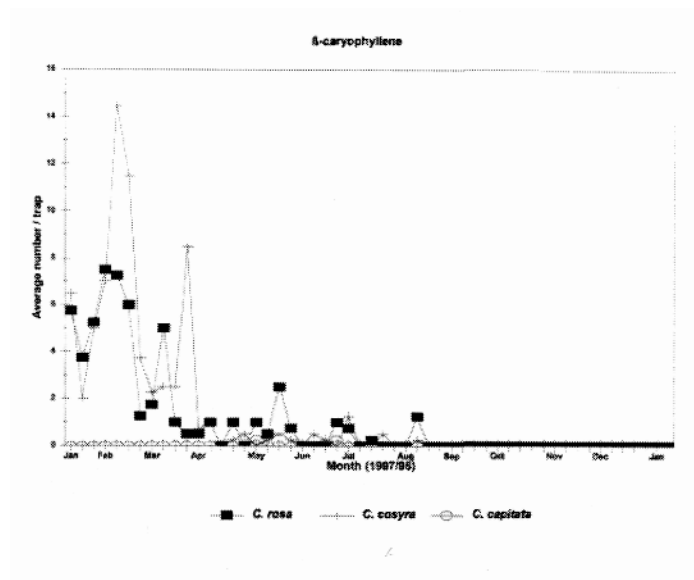


Figure 2: Weekly fruit fly catches with Sensus traps and B-caryophyllene

Table 2. Average number of *C. capitata*, *C. rosa* and *C. cosyra* captured in the Sensus traps with  $\beta$ -caryophyllene

Average number of fruit flies per trap			
	<i>C. capitata</i>	<i>C. rosa</i>	<i>C. cosyra</i>
Trap 1	0	3.53	0.98
Trap 2	0.02	0.47	2.68
Trap 3	0.02	0.08	1.55
Trap 4	0	0.11	0.25
Average	0.01a	1.05a	1.37a
F-value	1.58		
P	0.2588		
DF	2.9		

DF = degrees of freedom; P = significance level).

Averages followed by the same letter are not significantly different.

Table 3. Average number of *C. capitata*, *C. rosa* and *C. cosyra* males and females captured in the Sensus traps with  $\beta$ -caryophyllene

Average number/trap						
	<i>C. capitata</i>		<i>C. rosa</i>		<i>C. cosyra</i>	
	Male	Female	Male	Female	Male	Female
Trap 1	0	0	3.51	0.02	0.98	0
Trap 2	0.02	0	0.47	2.62	0.06	0
Trap 3	0.02	0	0.08	0	1.55	0
Trap 4	0	0	0.11	0	0.25	0
Average	0.01	0	0.93	0.12	1.35	0.02

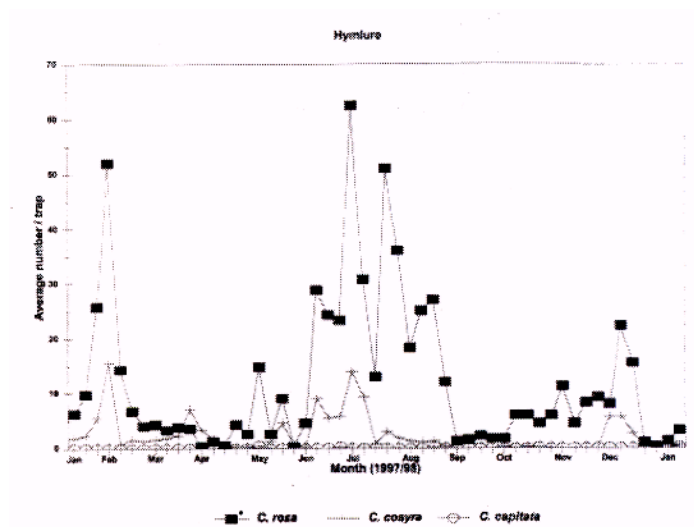


Figure 3. Weekly fruit fly catches with milk bottle traps and Hymlure

Table 4. Average number of *C. capitata*, *C. rosa* and *C. cosyra* captured in the milk bottle traps with Hymlure

Average number of fruit flies per trap			
	<i>C. capitata</i>	<i>C. rosa</i>	<i>C. cosyra</i>
Trap 1	0	14.79	0.79
Trap 2	0.04	14.92	0.83
Trap 3	0.08	8.15	6.36
Trap 4	0	10.49	1.15
Average	0.03b	12.09a	2.28b
F-value	26.6		
DF	2, 9		
P	0.0002		

(DF = degrees of freedom; P = significance level).

Averages followed by the same letter are not significantly different.

Table 5. Average number of *C. capitata*, *C. rosa* and *C. cosyra* males and females captured in the milk bottle trap with Hymlure

Average number/trap						
	<i>C. capitata</i>		<i>C. rosa</i>		<i>C. cosyra</i>	
	Male	Female	Male	Female	Male	Female
Trap 1	0	0	6.26	8.53	0.24	0.55
Trap 2	0.02	0.02	0.04	9.88	0.19	0.64
Trap 3	0	0.08	2.72	5.43	1.76	4.60
Trap 4	0	0	4.23	6.26	0.38	0.77
Average	0.005	0.03	4.56	7.53	0.64	1.64

High numbers of *C. rosa* were present in February, July and August while high numbers of *C. cosyra* were found during February and July. *C. rosa* was the dominant species in the milk bottle traps (table 4). The Hymlure attracted more females than males (table 5).

## DISCUSSION

*C. capitata* numbers were very low and it seems to be negligible as a pest of the avocado. This is supported by results obtained by Du Toit *et al.* (1979) and Du Toit & Tuffin (1980). They artificially exposed Fuerte fruit at four different stages of development to *C. capitata* and they found no eggs in the fruit.

The high number of *C. rosa* that occurred during the winter months, when no fruit were present, may be due to bugweed, *Solanum mauritianum*, growing in the vicinity of the orchard. *S. mauritianum* is a known host to *C. capitata* and *C. rosa* (White & Elson-Harris, 1992). The high numbers of *C. cosyra* during February may be due to the ripening of fruit of the Manila trees, *Sclerocarya birrea* which were found in the vicinity of the orchard. The high numbers of *C. rosa* and *C. cosyra* during February may be a threat as the females may cause lesions when laying eggs inside the fruit.

The results showed that *C. rosa* is the most abundant species in Fuerte orchards in the Nelspruit area.

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## REFERENCES

DE VILLIERS, E.A. & VAN DEN BERG, M.A. 1987. Avocado insects in South Africa.

- South African Avocado Growers' Association Yearbook* 10: 75 - 79
- DU TOIT, WJ. & DE VILLIERS, E.A. 1990. Identifisering van avokadovrugletsels wat deur insekte veroorsaak word. *South African Avocado Growers' Association Yearbook* 13: 56 - 60
- DU TOIT, WJ. DE VILLIERS, E.A. & TUFFIN, A. 1979. The identification of causes of typical surface lesions on avocado fruit. *South African Avocado Growers' Association Yearbook* 3: 52 - 53
- DU TOIT, WJ. & TUFFIN, A., 1980. The role of fruit flies on avocado early in the season. *South African Avocado Growers' Association Yearbook* 4: 86 - 87
- HANCOCK, D.L. 1987. Notes on some African Ceratitinae (Diptera: Tephritidae), with special references to the Zimbabwean fauna. *Transaction of the Zimbabwe Scientific Association* 64: 41 - 48
- WHITE, I.M. & ELSON-HARRIS, M.M. 1992. *Fruit flies of economic significance: Their identification and bionomics*. Redwood Press Ltd. Melksham, 601 pp.