COMPARISON BETWEEN ORIENTED AND WHOLE TREE SPRAYING FOR CONTROLLING THE RED MITE, *CENOPALPUS PULCHER* AND EFFECT ON ASSOCIATED MITE, *ORTHOTYDES CALIFORNICUS* (ACARINA : TENUIPALPIDAE : TYDEIDAE)

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INTRODUCTION

The red mite, *Cenopalpus pulcher* (C&F) (Acarina : Tenuipalpidae) attacks several deciduous fruit trees specially apple and quince, its damage results from the removal of plant sap with its piercing-sucking mouth parts, causing bronzed and off-coloured foliage. Under heavy infestations, defoliations and undersized poorly coloured fruit are produced. It affects the quantity and the size of fruits and also reduces their quality. The eggs are laid singly and stuck to the underside of leaves (Zaher *et al.* 1973 and El-Halawany *et al.* 1990).

Orthotydes californicus (Banks) *(=Tydeus californicus)*(Acarina : Tydeidae) seemed to be difficult to analyze its feeding behavior as Flescher & Arakwa (1953), Zaher & Shehata (1963) and Wahab *et al.* (1974) considerd it a phytophage, while Baker & Wharton (1952) considered it a predator of the bud mite *Aceria mangifera*. In 1976, Wahab reported this mite to predator on eriophyids in adult stage, while immature stages fed on fungus. In 1988, Ibrahim indicated this mite to develop from larvae to adult on the fungi *Fusarium* sp. and *Alternaria* sp. but females were unable to deposit eggs. Thus feeding on fungi was not the way of nutrition for reproduction, while when fed on citrus leaves covered with sooty mould fungi associated with honey dew secretion, female could deposit egg. Therefore, this mite may be considered as unspecialized feeding behaviour (Zaher 1986).

The main purpose of this study was to investigate the following aspects: 1- Studying the distribution of *Cenopalpus pulcher* and its associate, *Orthotydes*

californicus (Acarina: Tydeidae) on apple trees. 2-Comparing oriented spraying with whole tree spraying and the costs of the two spraying methods.

MATERIAL AND METHODS

Distribution study of *Cenopalpus pulcher* and its associate, *Orthotydes californicus* on apple trees:

The distribution study was carried out in Gharbia Governorate. Twenty badly infested apple trees (Anna/MM 106), nearly of the same age (ca. 15 years) and size (height 4-4.5 m), were selected. Counting started from August 2002 to August 2003. Each sample contained 60 leaves representing each tree. Twenty mature full sized leaves (senescent) were selected at random from lower interior parts at the base of the tree. Other 20 full grown leaves presents on old branches were selected randomly from the outer parts around of the tree, and other twenty new leaves were taken from the terminal branches. Samples were randomly taken biweekly. Leaves were kept in paper bags and transferred to the laboratory for examination by the aid of stereomicroscope. The upper and lower surfaces of the collected leaves were inspected. Eggs, immatuers and adults were counted. Methods of sampling developed by Marshall (1955) were adopted with some modifications.

Spraying methods:

Two spraying methods were tested: An oriented spraying applied to the outer circumference of apple tree including mature and new leaves which are the most infested. While; the whole tree was sprayed in the second method. The treated apple trees were of the same age and size (ca. 15 year old and about 4-4.5 m high). A knapsack sprayer CP-20of 20L capacity accomplished spraying. Pre-spraying count was made just before spraying and the post-spraying counts were made weekly. Each sample contained 60 leaves; selected at random twenty mature full sized leaves (senescent) from lower interior parts at the base of the tree, other 20 full grown leaves on old branches from the outer parts around of the tree, and other twenty new leaves were taken from the terminal branches. Leaves were kept in paper bags and transferred to the laboratory for stereomicroscopic examination. The upper and lower leaf surfaces were inspected. Egg, immature and adult stages were counted. Methods of sampling developed by Marshall (1955) were adopted with some modifications. Spraying was applied once during August 2004 when mite population was high (El-Halawany *et al.* 1990). About 5 litres were sufficient to cover the outer circumference of apple tree and about 15 litres of spraying liquid per

tree were enough to insure complete coverage in the second method (whole tree spraying).

The following materials were tested:

a. Biofly, an entomopathogenic fungi (3X 10^7 c.f.u./1ml), containing the fungus *Beauveria bassiana*. It was applied at a rate of 1.5 ml/liter of water.

b. Micronized sulphur 85%+ Super Misrona 95% EC, a local mineral oil, containing 95% paraffinic oil w/w and 5% inert ingredients, unsulfonated residue content reached 92%. It was applied at a rate of 2 gm + 20ml/liter of water.

c. Flufenoxuron (Cascade 10% EC), it was applied at a rate of 0.75 ml/ liter of water.

d. Kelthane-S 0.25% EC, it was applied at a rate of 2.5 ml/ liter of water.

Relative cost and efficiency of the tested programs (per feddan): The cost estimation of one spray was calculated according to the formula described by Mangoud (2003).

Rate of application x amount of pesticide liquid/tree x number of trees/unit area (feddan) x price of formulated insecticides.

In the two experiments, the percent reduction of infestation was calculated according to the equation of Henderson and Tilton 1955. Data were subjected to analysis of variance (ANOVA) and the means were compared by L.S.D. test at 0.05 level, using SAS program (Anonymous, 1988).

RESULTS AND DISCUSSION

Distribution study of *Cenopalpus pulcher* and its associate, *O. californicus* on apple trees:

The distribution study of *Cenopalpus pulcher* on apple trees is considered important, particularly when oriented spraying is practiced. Data in Table (1) show that 53.6% (39.2 individuals/leaf) of the mite was found on mature leaves from old outer leaves (around the tree) "OOL" and 29.8% (21.8 individuals/leaf) of the mite population was found on new terminal leaves "NTL". On the other hand, 16.6% (12.1 individuals/leaf) was found on mature leaves from lower interior parts at the base of the tree (near the trunk) and named old lower leaves "OLL". A similar pattern of distribution associate *O. californicus* was also observed showing 45.2%

(2.1 individuals/leaf) of the population was found on mature leaves from old outer leaves and 38.7% (1.8 individuals/leaf) was found on new terminal leaves. On the other hand, 16.1% (0.75 individuals/leaf) was found on old lower leaves (near the trunk).

TABLE (I)

Distribution of *Cenopalpus pulcher* and its associate *Orthotydes californicus*/leaf on apple trees expressed as average numbers/two weeks during 2002 year.

Infested site	Mean number/leaf of:		Percent of:	
	C. pulcher	*O. californicus*	*C. pulcher*	*O. californicus*
Whole tree	73.1	4.65	100	100
New terminal leaves	21.8	1.8	29.8	38.7
Mature leaves*	39.2	2.1	53.6	45.2
Mature leaves**	12.1	0.75	16.6	16.1

*Mature leaves from outer parts, old outer leaves (around the tree) "OOL".

**Mature leaves from old lower leaves (near the trunk) "OLL".

Data in Table (1) show that more than 80% of *C. pulcher* population was concentrated on the new terminal leaves and old outer leaves (around the tree), while less than 20% was found on old lower leaves (near the trunk), therefore the oriented spraying (circumference spraying) was conducted.

Mangoud and Abd El-Gawad (2003a) they found that 95 and 94.8% of adult females (ovipositing and non-ovipositing) and nymphs of the mealybug, *Icerya seychellarum* aggregated on apple branches, while, 5 and 5.2% aggregated on apple leaves, respectively. The same trend was observed with the distribution of the vedalia beetle, *Rodalia cardinalis*. Also, Mangoud and Abd El-Gawad (2003b) they found 90.0% and 88.3% of adult females (ovipositing and non-ovipositing) and nymphs stages of the Egyptian fluted mealybug, *Icerya aegyptiaca* concentrated on the lower level of trees, while, 10.0% and 11.7% concentrated on middle level, respectively. No mealybug stages were noticed on the upper part. Similar trend was observed with the distribution of vedalia beetle, *Rodalia cardinalis*.

Oriented spraying (outer circumference part of apple tree):

Oriented spraying method was carried out in August 2004, where the outer circumference part of apple tree was sprayed. About 5 litres of spraying volume per tree were sufficient. Three control agents (Super Misrona oil + Sulphur, Biofly and

Flufenoxuron) were applied and compared with Kelthane-S compound. The average number of mite immatuers and adult stages *C. pulcher* were 39.8-43.8 individuals/leaf on old outer leaves "OOL", 13.9-14.8 individuals/leaf on old lower leaves (near trunk) "OLL" and 26.7-29.4 individuals/leaf on new terminal leaves "NTL", respectively (before spraying). The average numbers of *O. californicus* were 0.9-1.2 individuals/leaf on old outer leaves, 0.6-0.8 individuals/leaf on old lower leaves (near trunk) and 0.6-0.9 individuals/leaf on new terminal leaves, respectively (Table 2). On old outer leaves, Super Misrona oil + Sulphur and Flufenoxuron gave good average reduction in infestation against mite (87 and 89%, respectively); while Biofly gave moderate average reduction (68%). Also, for new terminal leaves, Super Misrona oil + Sulphur and Flufenoxuron gave good average against mites (86 and 82%); while Biofly gave medium average reduction (63%) (Table 2). On the other hand, the indirect spraying liquid "drift" gave some reduction on old outer leaves (near the trunk), Super Misrona oil + Sulphur and Flufenoxuron gave 74 and 76%, respectively average in infestation against mites; while Biofly gave 53% average reduction. In general, the chlorinated hydrocarbon compound (Kelthane-S) was highly effective against all stages of mite. The recommended programme Kelthane-S, on old outer leaves gave good average reduction in mature leaves infestation (97%); while gave (93%) in new terminal leaves. The indirect spraying liquid "drift" during spraying, gave (83%) infestation reduction on old lower leaves (Table 2).

On old outer leaves, Super Misrona oil + Sulphur gave highly toxicity effect against, *O. californicus* (100% kill); Flufenoxuron and Biofly 90 and 84%, respectively. On new terminal leaves, Super Misrona oil + Sulphur gave highly toxicity effect against, *O. californicus* (100% kill); Flufenoxuron and Biofly 91 and 80%, respectively. Also, on old lower leaves (near the trunk), during the spraying technique, the compounds drift gave reduction as follow, Super Misrona oil + Sulphur gave (79%) toxicity against, *O. californicus*; Flufenoxuron and Biofly gave 69 and 79%, respectively (Table 2). In general, the chlorinated hydrocarbon compound (Kelthane-S) was highly effective against *O. californicus* (100% kill). Sieburth *et al.*, (1998); reported that mineral oil must coat the pest and its eggs, since complete coverage was essential for optimum results. Mineral oil was the most effective when applied against eggs, and treated first instars stopped development. Nymphs were not able to moult and to grow normally.

Statistical analysis in Table (2) show that the differences in responses between the three tested materials (combination between Super Misrona+Sulphur, Flufenoxuron, Biofly and Kelthane-S) were highly significant on the different

sample locations [old outer leaves, old lower leaves (near trunk) and new terminal leaves] against different stages of mites (F= 148.5 and 17.4, P<0.05) and also were highly significant against stages of the associated *O. californicus* (F= 195.2 and 21.5, P<0.05) for oriented spraying.

TABLE (II)

Effect of various control agents on *Cenopalpus pulcher* and associate, *Orthotydes californicus*/leaf on apple trees (oriented spraying method) during 2002 year.

Treatment		Rate of applic. ml/L.	Pre treatment count		Average number*		Average reduction%	
			B. pulcher	*O. californicus*	*B. pulcher*	*O. californicus*	*B. pulcher*	*O. californicus*
Super Misrona + Sulphur	(OLL)	20 ml + 2.5 gm	13.9	0.7	4.8	0.2	74	79
	(NTL)		29.1	0.6	5.2	0	86	100
	(OOL)		39.8	1.1	6.5	0	87	100
Flufeno-xuron	(OLL)	0.75 ml	14.2	0.7	4.4	0.3	76	69
	(NTL)		26.7	0.7	6.1	0.1	82	91
	(OOL)		40.8	0.9	5.6	0.1	89	90
Biofly	(OLL)	2 ml	14.1	0.7	8.6	0.2	53	79
	(NTL)		26.8	0.6	12.3	0.3	63	80
	(OOL)		41.8	1.1	16.1	0.2	68	84
Kelthane S	(OLL)	2.5 ml	14.6	0.6	3.2	0	83	100
	(NTL)		28.7	0.7	2.6	0	93	100
	(OOL)		42.9	1.2	1.8	0	97	100
Control	(OLL)	-	14.8	0.8	19.4	1.1	-	-
	(NTL)		29.4	0.9	36.4	1.5	-	-
	(OOL)		43.8	1.2	53.1	1.4	-	-
F value							148.5	195.2
L.S.D. 5%							17.4	21.5

OOL = Old outer leaves OLL = Old lower leaves (near trunk)

NTL = New terminal leaves * Average numbers of 3 post-treatment counts (3 months)

Whole tree spraying:

Whole tree spraying method was also carried out in August 2004. The average maximum and minimum temperatures in the field were (38.4 and 29.9°C) and relative humidity was 79%. This trail gave similar results to those obtained from the oriented trail (outer circumference spraying).About 15 litres of spraying volume per tree were sufficient to complete cover the whole tree. Three control agents (Super Misrona oil +Sulphur, Biofly and Flufenoxuron) were also applied and compared with and Kelthane-S compound. Before spraying, the average number of mite stages and mature stages of *C. pulcher* were 39.5-45.9 individuals/leaf on old outer leaves, 25.8-31.5 individuals/leaf on new terminal leaves, respectively and 13.9-15.6 individuals/leaf on old lower leaves (near trunk) and the average number

of, *O. californicus* were 1.1-1.3 individuals/leaf on old outer leaves, 0.6-0.9 individuals/leaf on new terminal leaves, respectively and 0.4-0.8 individual/leaf on old lower leaves (near trunk) (Table 3). On old outer leaves, Super Misrona oil + Sulphur and Flufenoxuron gave good average reduction in infestation against tenupalpid mite (86 and 88%); while Biofly gave poor average reduction (67%). Also on new terminal leaves, Super Misrona oil + Sulphur and Flufenoxuron gave good average infestation reduction (88 and 84%, respectively); while Biofly gave medium average reduction (65%). Also, on old lower leaves (near the trunk), Super Misrona oil + Sulphur gave good average infestation reduction of mite (83%); while Flufenoxuron and Biofly gave medium average reduction (71 and 53%) (Table 3). For old outer leaves, Super Misrona oil + Sulphur and Flufenoxuron gave highly toxicity effect against, *O. californicus* (100 and 100% kill); Biofly gave also, high toxicity effect (86%). For new terminal leaves, also Super Misrona oil + Sulphur gave high toxicity effect against, *O. californicus* (100% kill); while Flufenoxuron gave (91%) and Biofly gave moderate toxicity effect (84%) (Table 3). Also, Super Misrona oil + Sulphur gave high toxicity effect against, *O. californicus* (100% kill) on old lower leaves (near the trunk, Flufenoxuron gave highly toxic effect (88% kill). Biofly was also highly toxic (81% kill) (Table 3). In general, the chlorinated hydrocarbon compound (Kelthane S) gave high reduction against all stages of *O. californicus* (100% kill) (Table 3).

Statistical analysis in Table (3) show that the differences in responses between the three tested materials (Biofly, Flufenoxuron, combination between Super Misrona + Sulphur and Kelthane S) were highly significant against *C. pulcher* ($F= 151.9$ and 18.2, $P<0.05$) and *O. californicus* ($F= 181.3$ and 19.5, $P<0.05$) for in whole tree spraying method.

Coast of different Programs:

As mentioned before, 5 litres of spraying liquid were sufficient for spraying the outer circumference part of apple tree (oriented spraying technique), while, spraying of the whole tree needed 15 litres. In other words, the oriented spraying of circumference part is more economic (about 4 times), and safer to the environment than the spraying of the whole tree.

Estimate of costs of tested programs (using Kelthane-S as example) is given in Table (4). The whole tree spraying was the most expensive. The costs of this method included [300 LE for used pesticide plus 60 LE for labour and 50 LE machinery (for spraying) and the total cost will be 410 LE]. In the oriented spraying

method (outer circumference part), the total cost was 145 LE [100 LE for pesticide, 20 LE for labour and 25 LE machinery (for spraying)] Table (4).

TABLE (III)

Effect of various control agents on *Cenopalpus pulcher* and its associate, *Orthotydes californicus*/leaf on apple trees (whole tree spraying) during 2002 year.

Treatment		Rate of applic. ml/L.	Pre treatment count		Average number*		Average reduction%	
			B. pulcher	*O. californicus*	*B. pulcher*	*O. californicus*	*B. pulcher*	*O. californicus*
Super Misrona + Sulphur	(OLL)	20 ml + 2.5 gm	14.5	0.4	3.1	0.0	83	100
	(NTL)		29.5	0.7	4.3	0.0	88	100
	(OO)		41.3	1.2	7.2	0.0	86	100
Flufeno-xuron	(OLL)	0.75 ml	14.8	0.6	5.2	0.1	71	88
	(NTL)		25.8	0.8	5.2	0.1	84	91
	(OOL)		39.5	1.1	6.1	0.05	88	100
Biofly	(OLL)	2 ml	13.9	0.8	8.1	0.2	53	81
	(NTL)		27.9	0.9	12.3	0.2	65	84
	(OOL)		43.9	1.3	18.2	0.2	67	86
Kelthane-S	(OLL)	2.5 ml	15.6	0.5	1.1	0	94	100
	(NTL)		31.5	0.6	0.8	0	98	100
	(OOL)		45.9	1.1	1.5	0.0	97	100
Control	(OLL)	-	15.2	0.6	18.7	0.8	-	-
	(NTL)		28.5	0.8	35.9	1.1	-	-
	(OOL)		41.8	1.1	52.9	1.2	-	-
F value							151.9	181.3
L.S.D. 5%							18.2	19.5

OOL = Old outer leaves OLL = Old lower leaves (near trunk)
NTL = New terminal leaves * Average numbers of 3 post-treatment counts (3 months)
Relative cost and efficiency of the tested programs (per feddan).

TABLE (IV)

Comparison between different *Cenopalpus pulcher* spraying programs concerning efficiency and costs (Kelthane-S as example).

Item	Oriented spraying (outer circumference part)	Whole tree spraying
Efficacy*	91.0	96.3
Control agent**	100	300
Labour	20	60
Machinery	25	50
Total costs	145	410

*Average % reduction for Kelsin-S treatment (as example in four spraying experiments).
**Average price of used control agents.

In general, the whole tree spraying was the most expensive (estimated cost was 410 LE). On the other hand oriented spraying program showed the lowest costs (i.e. estimated was 145 LE) (Table 4).

In conclusion, oriented spraying experiment may be recommended for the control of the red mite, *Cenopalpus pulcher* as being less costly and efficient.

SUMMARY

The distribution studies of *Cenopalpus pulcher* and *Orthotydes californicus* on different parts of apple trees in Gharbia Governorate during 2003 season, showed that more than 80% of the mite population occurred on the new terminal and mature leaves from the outer parts (around the tree), while less than 20% (near the trunk). Two spraying methods were conducted. In the oriented spraying method only the outer circumference part of apple tree was sprayed with Super Misrona oil + Sulphur, Biofly and Flufenoxuron compared with Kelthane-S. On old outer leaves, Super Misrona oil + Sulphur and Flufenoxuron gave 87 and 89% average reduction against the tenuipalpid mite; while Biofly gave 68%. Also, new terminal leave, Super Misrona oil + Sulphur and Flufenoxuron gave 86 and 82%; while Biofly gave 63%. On the other hand, the indirect spraying liquid "drift" gave some reduction on old outer leaves (near the trunk), Super Misrona oil + Sulphur and Flufenoxuron gave 74 and 76%; while Biofly gave 53%. Kelthane-S was highly effective against the tenuipalpid mite as, on old outer leaves it gave 97%; while gave 93% on new terminal leaves. On old outer leaves, Super Misrona oil + Sulphur was highly toxic against *O. californicus* (100% kill); Flufenoxuron and Biofly 90 and 84%. On new terminal leaves, Super Misrona oil + Sulphur gave highly toxicity against the predator (100% kill); Flufenoxuron and Biofly 91 and 80%. Also, Kelthane-S was highly effective (100% kill). In the whole tree spraying trail gave similar results to those obtained from the oriented trail (outer circumference spraying). The oriented spraying of circumference part was more economic (about 3 times). and safer to the environment than spraying the whole tree. The whole tree spraying was expensive (estimated cost was 410 LE). On the other hand, oriented spraying program showed the lowest cost (i.e. estimated as 145 LE).

REFERENCES

ANONYMOUS (1988): SAS/STAT *(User's Guide, Ver. 6.03. SAS Institute Inc., Cary, North Carolina).*

BAKER, E. W. and E. W. WHARTON (1952): An introduction to Acarology. *(The Macmillon Co., New York, 465 pp.).*

EL-DUWENI, F. K.; Z. R. SAWIRES and S. M. IBRAHIM (1989): Biological studies on *Tydeus (Tydeus) californicus* (Banks) to evaluate its feeding habit. *(3rd Nat. Conf. of Pests & Dis. of Veg. and Fruit in Egypt and Arab Count., Egypt, 1018-1026).*

EL-HALAWANYM. E.; M. E.; R. G. ABOUEL-ELA and H. M. ESMAIL (1990): Population dynamics of mites and their natural enemies on apple and apricot trees. *(Agric. Res. Rev., 68: 59-66).*

FLESCHER, C. A. and K. Y. ARAKWA (1953): The mite *Tydeus californicus* (Banks), on citrus and avocado leaves. *(J. Econ. Entomol., 45 (6):, p. 1092).*

HENDRSON, C.F. and E.W. TILTON (1955): Test with acaricides against the brown wheat mite. *(J. Econ Entomal., 48: 157-161).*

IBRAHIM, S. M. (1988): Ecological studies on some predaceous mites associated with citrus trees in Egypt. *(Unpublished Ph. D. Thesis, Fac. Agric., Cairo Univ., 148 pp.).*

MANGOUD, A. A. H. and H. A. S. ABD EL-GAWAD (2003a): Evaluation of different integrated pest management concepts for control the mealybug, *Icerya seychellarum* infested apple trees in new reclaimed lands in Egypt. *(J. Egypt Ger. Soc. Zool., 42 (E), Entomology: 119-132).*

MANGOUD, A. A. H. and H. A. S. ABD EL-GAWAD (2003b): Evaluation of different integrated pest management concepts for controlling the Egyptian fluted mealybug, *Icerya aegyptiaca* on the ornamental plants. *(Bull. Ent. Soc. Egypt, Econ Ser., 29: 137-149).*

MARSHALL, G. E. (1955): Apple mite populations under six control programs. *(J. Econ. Entomol., 48: 23-24).*

SIEBURTH, P. L.; W. J. SCHOEDER AND R. T. MAYER (1998): Effect of oil and oil-surfactant combinations on silver leaf whitefly nymphs (Homoptera: Aleyrodidae) collard. *(Flora. Entomol., 81: 446-452).*

SIEBURTH, P. L.; W. J. SCHOEDER AND R. T. MAYER (1998): Effect of oil and oil-surfactant combinations on silver leaf whitefly nymphs (Homoptera: Aleyrodidae) collard. *(Flora. Entomol., 81: 446-452).*

WAHAB, A. E. A; YOUSEF, A. A. AND HEMEDA, H. M. (1974): Biological studies on the tydeid mite, *Tydeus californicus* (Banks) (Acarina: Tydeidae). *(Bull. Soc. ent. Egypte, 58: 344-353).*

WAHAB, M. L. (1976): Studies on the tydeid mites. *(Unpublished Ph. D. Thesis, Fac. Science, Ain-Shams Univ., 119 pp.).*

YASSIN, E. M. A. (2004): Studies on some tydied mites in Egypt. *(Unpublished Ph. D. Thesis, Cairo Univ., 319 pp.).*

ZAHER, M. A. (1986): Survey and ecological studies on phytophagous, predacious and soil mites in Egypt. II-A: Predacious and non-phytophagous mites. *(PL. 480 Program USA Project No. EG-ARS-30. Grant No. FG-EG-139).*

ZAHER, M. A. AND K.K. SHEHATA (1963): Biological studies on *Tydeus californicus* (Banks) in Egypt (ARE) (Acarina: Tydeidae).*(Bull. Soc. ent. Egypt, 47: 297-300).*

ZAHER, M. A.; Z. R. SOLIMAN and G. S. EL-SAFI (1973): Survey and population studies on mites associated with deciduous fruit trees in Giza, Egypt. *(Bull. Soc. ent. Egypte, 57: 425-433).*