

## EFFECT OF HORTICULTURAL ,MECHANICAL AND LOCAL CHEMICAL TREATMENTS ON *Chlorophorus varius* INFESTATION AND YIELD PRODUCTION IN PEACH ORCHARDS.

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### ABSTRACT

The wasp Beetle, *Chlorophorus varius* Mull. (Coleoptera: Cerambycidae) is a serious pest on peach trees (*Prunus persica* L.) in Egypt in new reclaimed lands as well as in old valley lands. To eliminate the environmental pollution and magnifying the biological control agents, horticulture (dormant and summer pruning) , mechanical (worming) and local chemical (local painting and spraying treatments) were evaluated. Trials were carried out at El-Khatatba district Menofia governorate during three successive years (1994/95, 1995/96 and 1996/97). The respective percentages reduction in the borer infestation were 18.47 , 8.83 and 22.91% due to dormant pruning, summer pruning, dormant and summer pruning, 6.49% due to worming, 62.98 and 64.80% due to local painting and local spraying as well as 79.05 and 84.37% due to pruning, worming and local painting treatments and pruning, worming and local spraying treatments when applied for only one year. Applying the previous treatments for two successive years the average percentages reduction of the infestation resulted 36.39 , 12.63 , 46.33 , 10.47 , 75.46 , 78.17 , 92.71 and 95.76%, respectively .The accumulative effect the previous treatments for three successive years the percentages reduction of infestation were 56.6,19.3 ,65.5,14.5,84.8,86.2,96.6 and 98.6% , respectively . Dormant pruning increased the yield production by 23.8-39.3 %yet summer pruning either reduced the yield by 2.7% in the second season or increased the yield by 2.3% in the third season . However, dormant and summer pruning increased the yield production by 40.0-44.2% .The quality of fruits was improved as the mean number of fruits / tree and the mean number of fruits/kg were reduced by 35.3-38.0 % and 55.1-55.7%, respectively .

### INTRODUCTION

In Egypt ,peach trees (*Prunus persica* L.) as well as several fruit, wood and ornamental tree species are subjected to *Chlorophorus varius* infestation. Beetles started to emerge in peach orchards from April to October ( Tadros,1994). Eggs are laid in cracks in the stem and branches, and larvae bore their destructive tunnels inside the heart-wood of the trees, and the insect has only one generation each year (Tadros,1993).

Trials to control *C. varius* ravages in fruit orchards were mainly directed to chemical treatments (Tadros,1982) . Chemical control treatments, however ,pollute the environment and adversely affect the biological control agents (Predators, parasitoids and pathogens).

Ryugo (1988) stated that although any pruning will reduce yield, at least in the following season, yet it improves the yield of fruit (sound quality, better colour, suitable size, free from diseases and easily harvested). Also, Marini (1986) compared the influence of dormant and summer pruning on time of leaf abscission, bloom date, cold hardiness of flower buds and the onset and duration of terminal reset of peach trees.

Therefore, the aim of the present study is to evaluate the effects of alternative safe treatments on the reduction of *C. varuis* infestation and on the yield production in peach orchards.

## **MATERIALS AND METHODS**

Trials were conducted on peach trees (*P. persica*) in the new reclaimed lands with drip irrigation system at El-Khatatba district, Menofia governorate during three successive years (from November to October, 1994/95, 1995/96 and 1996/97).

A peach orchard infested with *C. varuis*, 10 feddans and 7 years old, variety "Florida Prince" budded on "Nemagaurd" rootstock with 4×4 meters apart was selected. Trees were trained according to vase form (open center) with 4 main branches.

The following 9 treatments were evaluated using completely randomized design (10 trees "replicates" each treatment):

### **A- Horticultural Treatments:**

- 1- Dormant pruning : During November, the regular horticultural winter pruning was carried out as follows:-
  - One) removing the infested branches and stubs (characterized with exit holes) using a sharp saw.
  - Two) Keeping the tree center opened by removing water sprouts and thinning one year old branches.
- 2- Summer pruning: During July, after fruit harvesting thinning and removing the inside twigs to prevent shading of the tree center and also removing the infested branches and stubs.
- 3- Dormant and summer pruning : Treatments number 1 and 2 were conducted together.

### **B- Mechanical Treatment:**

- 4- WORMING : During winter ( December) and summer ( July), branches and stubs infested with the borer ( with exit holes ) were scraped and the tunnels inside were ruined with a Jack knife to reveal the larval tunnels to biological control agents (predators and parasitoids ) and somehow kill the larvae.

### **C- Local chemical Treatments:**

- 5- Local painting : Stemex insecticide ( 3% Anthracine +18 % Nafthalin ) was used to paint the stem, main branches and the

infested sites four times each season at monthly intervals (May, June, July and August).

- 6- Local spraying : Basudin 60% EC and Cidial L 50% EC each at the rate of 300 cc/100 liters water were sprayed alternatively four times each season at monthly intervals (May, June, July and August). Spraying was mainly directed towards the stem, branches as well as the other infested sites.

**D-Combined Treatments:**

- 7- Pruning, worming and local painting : Treatments number 3,4 and 5 were conducted all together.  
8- Pruning, worming and local spraying : Treatments number 3,4 and 6 were conducted all together.

**E- Untreated:**

- 9- Untreated (Check) : Check trees were left untreated for control.

The previous treatments were conducted from November, 1994 to October, 1995. In the next season (Nov., 1995 – Oct., 1996), the same previous treatments were repeated in another area of the orchard with the same technique for confirmation. In the meantime, the same previous treatments were carried out on the same last year trees to evaluate the effect of the treatments for two successive years. During the third season (Nov., 1996 – Oct. 1997) the same treatments were carried out in another area of the orchard for confirmation and on the same last two year trees to evaluate the effect of 2 and 3 successive year treatments.

Treatments were evaluated by counting the newly emerged beetles indicated by the new exit holes on the trees during the next season (new exit holes were continuously counted by painting after each year treatment).

The efficiency of treatments was based on the percentage of reduction of the borer infestation as follow :-

$$\% \text{ reduction of infestation} = \frac{C - T}{C} \times 100$$

where :

C: The mean number of new exit holes in the untreated trees.

T: " " " " " " " " " " " " treated " .

Grouping of treatments was based on ANOVA and " Least Significant Difference ".(Snedecor and Cochran, 1990)

## RESULTS AND DISCUSSION

### 1st. Effect Of One Single Year Treatments :

#### 1- Effect of horticultural treatment alone:

Data in Table (1) indicated that dormant pruning alone reduced the borer infestation between 17.76 and 19.24% with an average of 18.47% each year. This low percentage was due to the concentration of larval infestation in the stem and main branches which mostly did not included in the regular

horticultural dormant pruning. However pruning the stubs somewhat reduced the borer infestation because infestation exist mostly deep inside the wood .

Much lower degree of borer reduction of infestation ranged between (7.89 and 9.35% with an average of 8.83%) was noticed after summer pruning than dormant pruning (Table, 1) Summer pruning directed only towards the new shoots and same older infestation sites .

Table (1) showed that when dormant and summer pruning were applied together resulted in higher borer reduction of infestation (between 21.93 and 24.37% ; mean , 22.91%). This multiple effect is better than applying each treatment alone.

**2- Effect of mechanical treatment:**

Worming treatment was the least effective and ranged between (5.26 and 7.48%; with the mean of, 6.49%), Table (1). This was due to the deep boring of the larvae inside the wood.

**3- Effect of local chemical treatments:**

The local painting with effective insecticides (such as Stemex) resulted in considerable reduction of the borer infestation (61.34 – 64.04% , mean; 62.98%),Table (1) .The success of this treatment depends on precise painting of infested parts on the stem, main branches, stubs and larger branches.

**Table (1) : Effect of one single year treatments on the reduction of *C.varius* infestation in peach orchards during 1994/95 , 1995/96 and 1996/97 seasons.**

No	Treatment	% reduction of infestation			
		1994/95	1995/96	1996/97	Mean
	<b>1-Horticultural Treatments:</b>				
A	Dormant pruning	18.42	17.76	19.24	18.47
b	Summer pruning	7.89	9.35	9.24	8.83
c	Dormant & summer pruning	21.93	22.43	24.37	22.91
	<b>2- Mechanical Treatment:</b>				
a	Worming	5.26	7.48	6.72	6.49
	<b>3- Local Chemical Treatments:</b>				
a	Local painting	64.04	63.55	61.34	62.98
b	Local spraying	66.67	62.17	65.55	64.80
	<b>4- Combined Treatments:</b>				
a	Pruning + worming +local painting	78.07	77.57	81.51	79.05
b	Pruning + worming +local spraying	85.96	80.37	87.39	84.73
	<b>5- Untreated:</b>				
a	Untreated (check)	-	-	-	-

Table (1) indicated that the highest percentage reduction of the borer infestation was achieved when local spraying with effective insecticides was applied on the stem, main branches stubs and larger branches ranging between (62.17 and 66.67% ; with the mean 64.80%).

**4- Effect of combined treatments :**

Table (1) clarified that 77.57–81.51% (mean ,79.05%) reduction of the borer infestation was achieved due to applying dormant and summer pruning,

worming and local painting together. The combined effect of the four treatments together gave these good result.

The advantages of the dormant and summer pruning, worming and local spraying accumulated and resulted in satisfied percentages reduction of infestation (80.37–87.39% ; mean, 84.73%) (Table ,1).

**B-Effect of Two and Three Successive Year Treatments (The Cumulative Effect):**

**1- Effect of horticultural treatments :**

After two successive years of dormant pruning , the reduction in *C.varius* population increased to 35.94 – 36.84% ; mean, 36.39%. These percentages increased to 56.55% after three successive years (Table, 2).

Summer pruning showed low percentage reduction of the borer infestation each year, yet two and three successive years of treatments increased the effect to 11.72-13.53% ; mean , 12.62% and 19.31% reduction, respectively .

Remarkable decrease in the borer infestation was achieved when the trees were pruned in winter then in summer for two and three successive years showing 44.53-48.12%; mean , 46.36% and 65.52%, respectively, Pruning treatment could be of good value if applied yearly for several years .

**2-Effect of mechanical treatment :-**

Although undetectable decrease in the borer infestation was noticed due to worming treatment, yet slightly increasing in the reduction of borer infestation was seen year after another showing 10.53-10.94; mean, 10.73% after two successive years and 14.48% after three successive years.

**Table (2):Effect of two and three successive year treatments (accumulated) on the reduction of *C. vairus* infestation in peach orchards 1994/96 and 1995/97 and 1994/97 seasons, respectively.**

No	Treatment	% reduction of infestation			
		Two years		Three years	
		1994/96	1995/97	Mean	1994/97
	<b>1-Horticultural Treatments:</b>				
A	Dormant pruning	35.94	36.84	36.39	56.55
b	Summer pruning	11.72	13.53	12.63	19.31
c	Dormant& summer pruning	44.53	48.12	46.33	65.52
	<b>2- Mechanical Treatment:</b>				
a	Worming	10.94	10.53	10.74	14.48
	<b>3-Local Chemical Treatment:</b>				
a	Local painting	74.22	76.69	75.46	84.83
b	Local spraying	78.13	78.20	78.17	86.21
	<b>4- Combined Treatments:</b>				
a	Pruning+worming+local painting	92.19	93.23	92.71	96.55
b	Pruning+worming+local painting	94.53	96.99	95.76	98.62
	<b>5- Untreated:</b>				
a	Untreated (check)	-	-	-	-

**3-Effect of local chemical treatment :**

Good percentage reduction in the borer infestation was achieved when local painting was applied for two and three successive years resulting in 74.22-76.69, mean, 75.48% and 84.83% reduction of infestation , respectively.

Local spraying treatment is the best especially when applied for two and three successive years . The result is promising showing 78.13-78.20%; mean, 78.17% and 86.21%, respectively.

**4- Effect of combined treatments:**

Dormant and summer pruning ,warming and local painting showed satisfactory control of the borer when applied two successive years the reduction of infestation were 92.19-93.23% ;mean , 92.72% or three successive years(96.55%).

Also , satisfactory control of the borer was achieved when dormant and summer pruning , worming and local spaying treatments were applied for two successive years (94.53-96.99; mean;95.79%) or three successive years (98.62 % reduction of infestation).

From the aforementioned results, it can be concluded that the regular horticultural dormant pruning which obligatory applied each winter should include the infested branches and stubs. Summer pruning was of scant value. Worming treatment was not effective because of the unique behavior of *C. varius* larvae which bore deep inside the wood .Insecticides should be limited to magnify the role of the biological control agents; therefore, local treatments by painting or spraying are preferable than complete coverage spray . In the meantime , these treatments gave sufficient control .Statistical analysis and grouping of treatment concluded that there was significant differences between the following treatments and classified as shown in : (Table 3) to three categories

**superior group :(84.73-98.62%)**

- Pruning , worming and local spraying for one, two or three year applications .
- Pruning , worming and local painting for two or three year applications.
- Local spraying for three year applications.
- Local painting for three year applications.

**Moderate group: (56.55-79.05%)**

- Pruning , worming and local painting for one year application.
  - Local spraying for one or two year applications.
- Local painting for one or two year applications.
- Dormant and summer pruning for three year applications.
- Dormant pruning for three year applications .

**Least group: (6.49 – 46.33%)**

- Dormant and summer pruning for two year applications.
- Dormant and pruning for one or two year applications.
- Dormant and summer pruning for one year application .
- Summer pruning for one , two or three year applications.

-Worming for one , two or three year applications.

**Table (3): Grouping of dormant (D) and summer (S) pruning; worming , local painting and local spraying treatments applied singly or in combination as means of integrated control of *C. varius*.**

No	Treatment	Mean no- of alive larvae	%reduction of infestation	Groupin g
1	D&S pruning+worming+local spraying (3)	0.18	98.62	A
2	D&S pruning+worming+local painting (3)	0.44	96.55	A
3	D&S pruning+worming+local spraying (2)	0.55	95.76	A
4	D&S pruning+worming+local painting (2)	0.94	92.71	AB
5	local spraying (3)	1.76	86.21	AB
6	local painting (3)	1.94	84.83	AB
7	D&S pruning+worming+local spraying (1)	1.95	84.73	AB
8	D&S pruning+worming+local painting (1)	2.67	79.05	BC
9	local spraying (2)	2.83	78.17	BC
10	local painting (2)	3.18	75.46	BC
11	Dormant pruning+summer pruning (3)	4.41	65.52	C
12	local spraying (1)	4.47	64.80	C
13	local painting (1)	4.73	62.98	C
14	Dormant pruning (3)	5.55	56.55	CD
15	Dormant pruning+summer pruning (2)	6.95	46.33	DE
16	Dormant pruning (2)	8.24	36.39	EF
17	Dormant pruning+summer pruning (1)	9.83	22.91	EF
18	Summer pruning (3)	10.31	19.31	F
19	Dormant pruning (1)	10.44	18.47	F
20	Worming (3)	10.93	14.48	F
21	Summer pruning (2)	11.32	12.63	F
22	Worming (2)	11.57	10.74	F
23	Summer pruning (1)	11.63	8.83	F
24	Worming (1)	11.93	6.49	F

L.S.D (0.05) : 2.08

(0.01) : 2.86

(1),(2) or (3) : applied for one, two or three years, respectively.

### C. Effect of Dormant and Summer Pruning on the Yield of Peach:

Table (4) showed that dormant pruning positively increased the yield of the tree ( and subsequently the yield of the unit area, feddan) by 31.25,39.34 and 23.84% during the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> season, respectively .Also ,dormant pruning positively increased the quality of fruits as the mean number of fruits / kg and the mean number of fruits / tree were decreased by 49.85 and 34.18, 51.80 and 32.87 and 50.42 and 36.25% during the 1<sup>st</sup> , 2<sup>nd</sup> and 3<sup>rd</sup> season , respectively .

Summer pruning didn't affect the yield as it scantily reduced the yield of the second season by 2.65%and increased the third season by 2.25%. However, there was a positive effect on the quality of the fruits as the mean number of fruits /kg and the mean number of fruits/tree were reduced by 10.25 and 12.67% and 14.21 and 12.26% during the second the third season, respectively (Table, 4).

Horticulturally, there was a noticeably effect of the dormant and summer pruning on the quantity and quality of the yield and fruits. The quantity of the yield was much increased during the second the third seasons (44.23 and 40.01% , respectively). The quality of fruits was also increased as the mean number of fruits/kg and the mean number of fruits/tree were

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decreased by 55.12 and 35.31% and 55.71 and 37.98% during the second and third season, respectively (Table , 4).





## REFERENCES

- Marini, R.P. (1986) : Defoliation , flower bud, cold hardiness, and bloom date of peach as influenced by pruning treatments . Amer . Soc.Hort. Sci., III (3) :391-394.
- Ryugo,K. (1988) : Fruit culture : its science and art . John Wiley & Sons & New York & U.S.A. pp. 43-56.
- Snedecor, W. and Cochran, A. (1990): Statistical methods . The Iowa State Univ., Press Ames. Iowa, USA.
- Tadros ,A.W.(1982):Biological ,ecological and control studies on *paropta paradoxa* (Lep.:Cossidae ) and *Chlorophorus varius* (Col. : Cerambycidae ) on grapevine trees in Egypt .Ph.D thesis ,Fac.Agric., Cairo Univ.
- (1993): the life –eycle of the wasp beetle, *Chlorophorus varius* (Col.:Cerambycidae) on peach in Egypt .Egypt .J. Agric. Res.,71 (2) : 429 –435.
- (1994): Monitoring the population of *Chlorophorus varius* (Col. :Cerambycidae) on peach and its hosts in Egypt .Egypt .J. Agric. Res . 72 (1) : 103-115..

تأثير المعاملات البستانية والميكانيكية والكيميائية على الإصابة بحفار ساق الخوخ  
ذو القرون الطويلة والإنتاج في حدائق الخوخ  
على يسرى حمزة حلوة و انطون ولسن تادرس  
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يعتبر حفار ساق الخوخ ذو القرون الطويلة *Chlorophorus varius* آفة شديدة الخطورة في حدائق الخوخ في مصر في الأراضي الجديدة المستصلحة وأراضي الوادي القديمة ، وللحد من التلوث البيئي وتعظيم دور عناصر المكافحة البيولوجية فقد تم تقييم فاعلية المعاملات البستانية (وتشمل التقليم الشتوي والصيفي) والمعاملات الميكانيكية (وتشمل قتل اليرقات داخل إنفاقها) والمعاملات الكيماوية الموضعية ( الدهان والرش الموضعي بالمبيدات ) . أجريت التجارب في منطقة الخطاطبة محافظة المنوفية خلال ثلاثة أعوام متتالية ( من نوفمبر إلى أكتوبر أعوام 95/1994، و96/1995، و97/1996) . وقد بلغ متوسط النسبة المئوية لخفض الإصابة بالحفار نتيجة معاملات التقليم الشتوي والتقليم الصيفي وكلاً من التقليم الشتوي والصيفي معاً، و قتل اليرقات داخل أنفاقها والدهان الموضعي والرش الموضعي بالإضافة إلى معاملات التقليم والقتل والدهان الموضعي معاً ومعاملات التقليم والقتل والرش الموضعي معاً 18.47 ، 8.83 ، 6.49 22.91 ، 62.98 ، 64.80 ، 79.05 ، 84.37 ، على التوالي ، عند إجراء هذه المعاملات لمدة عام واحد فقط . وعند إجراء هذه المعاملات لمدة عامين متتاليين ارتفع متوسط النسبة المئوية لخفض الإصابة إلى 36.39 ، 12.63 ، 46.33 ، 10.47 ، 75.46 ، 87.17 ، 92.71 ، 95.76 % على التوالي . اظهر التأثير التراكمي لتطبيق هذه المعاملات لمدة ثلاث سنوات متتالية 56.55 ، و19.31 ، و65.52 ، و14.48 ، و84.83 ، و86.21 ، و96.55 ، و98.62 % ، على التوالي . أدى التقليم الشتوي إلى زيادة في المحصول بلغت 23.84 – 39.34 % في حين أدى التقليم الصيفي إلى تقليل المحصول قليلاً ( 2.65 % في الموسم الثاني ) أو زيادة المحصول قليلاً ( 2.25 % في الموسم الثالث ) ، في حين أدى إجراء التقليم الشتوي والصيفي معاً إلى زيادة المحصول 40.01 – 44.23 % . كذلك تحسنت جودة الثمار حيث انخفض متوسط عدد الثمار للشجرة ( 35.31 – 37.98 % ) ومتوسط عدد الثمار للكيلو جرام الواحد ( 55.12 - 55.71 % ) .

**Table (4): Effect of dormant and summer pruning on the quantity and quality of peach production during three seasons , 1994/95,1995/96 and 1996/97.**

Treatment	1 <sup>st</sup> Season 1994 /95				2 <sup>nd</sup> Season 1995 / 96				3 <sup>rd</sup> Season 1996/97			
	Mean no. of fruits per tree	Mean no. of fruits per kg	Mean yield		Mean no. of fruits per tree	Mean no. of fruits per kg	Mean yield		Mean no. of fruits per tree	Mean no. of fruits per kg	Mean yield	
			Tree kg	Feddan kg			Tree kg	Feddan kg			Tree kg	Feddan kg
Dormant pruning	918.6	17.1	53.7	13.967	941,7	17,4	54.1	14071	964.9	17.8	52.2	13575
Summer Pruning	-	-	-	-	1225.0	32.4	37.8	9831	1327.9	30.8	43.1	11210
Dormant and summer Pruning	-	-	-	-	907.5	16.2	56.0	14565	938.6	15.9	59.0	15348
Untreated	1395.7	34.1	40.9	10642	1402.8	36.1	38.8	10098	1513.5	35.9	42.2	10961

**L.S.D (0.05): 3.12**