

**INFLUENCE OF CERTAIN SEX PHEROMONE FORMULATIONS WITH OR WITHOUT PROFENOFOS INSECTICIDE AGAINST PINK BOLLWORM, IN RELATION TO THEIR CHARTERS ON PHNOLOGICAL AND YIELD OF COTTON PLANTS.**

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**ABSTRACT**

Field experiments were carried out at the Experimental Farm; Faculty of Agriculture, Saba Basha, Alex. University during two successive growing seasons 1999 and 2000 to evaluate the effect of three slow release pink bollworm pheromone formulations; Rope-PBW, Selibate and last flight , and / or profenofos (curacron) insecticide in special regimes against pink bollworm, *pectinophora gossypiella* (saund) . The percent infestation, phonological characters of cotton plants and fiber quality were recorded. The experiments showed the following results.

- 1- The pheromone formulations applied followed by two applications of the insecticide gave good control of the pink bollworms as compared with the insecticide in four applications according to a regular program.
- 2- The highest reduction in the cotton bolls infestation was induced by Regime( T1) [ Rope- PBW/ curacron/ selibate/ curacron] followed by Regime ( T2) [ Last flight/ Curacron/ selibate/ Curacron] and Regime( T3) [ Selibate / Curacron / Last flight / Curacron]. The least reduction in bollworms infestation was accrued in the insecticide treatment. Regarding to the cotton varieties, it is obvious that Cultivator Giza88 is superior using regime (T1) [ Rope- PBW/ Curacron/selibate/ curacron]. Throughout 1999 and 2000 seasons respectively.
- 3- The results also indicated that the pheromone/ insecticide applications reduced the yield losses, also increased the number of green bolls/Plants and gave better fiber quality as compared with the insecticide treatments.

**INTRODUCTION**

Cotton is the most important economic crop in Egypt. It is exposed annually to significant yield quantity and quality losses according to the attack by different pests ( El-Adl and Ghanem, 1986; Moawad *et al.*, 1990; Busoli, 1993 and Abdel-Meguid *et al.*, 1999) . The pink bollworms, *Pectinophora gossypiella* ( Saund.) is one of the injurious pests in cotton fields in the country. Due to the great damage caused by this insect to cotton bolls, different programs were adopted by many investigators for its control( Gaston *et al.*, 1977; El-Adl *et al.*, 1988; Gupta *et al.*, 1990; Alvarado *et al.*, 1992 and Moawad *et al.*, 1996). However the extensive use of pesticides in cotton fields led to undesirable effect on the environment and natural enemies causing outbreak of other harmful pests. Therefore, a great attention was paid to avoid the adverse influences of the conventional insecticides and to minimize

crop losses in the integrated control programs ( El-Heneidy *et al.*, 1986; Moawad *et al.*, 1992 and Al-Beltagy *et al.*, 1999).

The present investigation was conducted to evaluate the effect of four commercially registered, slow release pheromone formulations against the pink bollworm attacking cotton fields. The effects of these treatments on some parameters of plant phenology; fiber quality, cotton loss and yield were also studied.

## **MATERIALS AND METHODS**

### **1. Field trials :**

The field experiments were carried out at the Agriculture Research Farm, Faculty of Agriculture (Saba Basha), Alexandria University, Egypt. The experimental area was cultivated with three cotton varieties (cultivars); Giza70, Giza88 and Giza89, on April 1999 and 2000 seasons

The experiments were designed for evaluating three commercially registered slow release pheromone formulations and/or organophosphorous insecticide (curacron) against the pink bollworm; *Pectinophora gossypiella* (Saunders) .

### **2. Sex pheromone Treatments :**

Table (1) shows the treatments, dates and rates of application during the growing seasons of 1999 and 2000 .

#### **2.1. Treatment 1 (T1):**

- i) An application of PB-rope was applied at the rate of 300 dispensers/ feddan throughout the period from 19<sup>th</sup> June, to 5<sup>th</sup> August in season 1999 and to 8<sup>th</sup> august in 2000 season .
- ii) Profenophos (Curacron 72% E.C) was sprayed at the rate of 750 ml/ feddan as recommended.
- iii) Selibate pheromone was applied on 22<sup>th</sup> August in the season of 1999 and on 23<sup>rd</sup> August in the 2000 season . Selibate was applied at the rate of 100 rubber rings /feddan .
- iv) Spraying (curacron) profenophos at the rate of 750 ml / feddan on 9<sup>th</sup> Sept. during the 1999 and 2000 seasons.  
Treatment T1 was applied for the three cotton cultivars (Giza70, Giza88 and Giza89).

#### **2.2 Treatment (T2):**

- A. The Last flight pheromone was applied in form of drops on the top of cotton leaf at the rate of 300 drops / feddan during the two seasons.
- B. Selibate pheromone was applied first followed by profenophos at the rate of 750 ml/feddan on the 29<sup>th</sup> August, for the two seasons. Treatment t2 was applied for the three cultivars.

**2.3 Treatment (T3)**

Selibate was applied at the rate of 100 rings / feddan then the insecticide at the rate of 750 ml / feddan on 25<sup>th</sup> July of the two seasons. Finally profenophos was sprayed on 29<sup>th</sup> August of 1999 and 2000 seasons. This treatment was applied for the 3 cultivars of cotton ( Giza70, Giza88 and Giza89).

**2-4 Treatment (T4):**

Profenophos at a rate of 750ml/ feddan was sprayed on July, 10<sup>th</sup> and 31<sup>st</sup>, on August 19<sup>th</sup> and Sept., 4<sup>th</sup> during the two growing seasons. This treatment was applied for the 3 cultivars of cotton.

**2-5- Treatment (T5):**

Check untreated: neither pesticide nor pheromone was incorporated during the study.

**Table (1). Treatments and rate of application in field trials.**

Treatment and dates	Application No. (Date – Rate of application / feddan)			
T1 1999 2000	Rope- P8W 300 dispensers 19-6 19-6	Profenophos72%E.C 750ml 5-8 8-8	Selibate 100 rings 22-8 23-8	Profenophos72% EC 750ml 9-9 9-9
T2 1999and 2000	Last-Flight 300 drops 19-6	Profenophos72%E.C 750ml 25-7	Selibate 100 rings 13-8	Profenophos72% EC 750ml 9-9
T3 1999 and 2000	Selibate 100 rings 19-6	Profenophos72%E.C 750 ml 25-7	Last-Flight 300 drops 13-8	Profenophos72% EC 750ml 29-8
T4 1999 and 2000	Profenophos72%E.C 750 ml 10-7	Profenophos72%E.C 750 ml 31-7	Profenophos72%E.C 750 ml 19-8	Profenophos72%E.C 750 ml 4-9
T5 Check Untreated	-	-	-	-

**3. Estimation of cotton bollworms infestation :**

The infestation levels of the studied pest was determined by taking random samples of green bolls. Sampling lasted for a period of 12 weeks.

The samples were examined externally before dessection and internal inspection. Infestation records were based on the existence of injury symptoms regardless the presence of larvae.

Analysis of variance using "F" and "L.S.D" tests was used for the comparisons among treatments.

**4. Estimation of loss in cotton yield and the plant properties:**

In each treatment, ten guarded plants were taken at random from each five locations per treatment to estimate the average bolls/ plant and the average number of buds/ plant.

The loss percent of cotton yield caused by the bollworms infestation was determined at the end of each season. The randomized samples of 100 plants each from each treatment, were taken to estimate the percentage of loss of the yield according to Abd El- Rahman (1999).

**5- Determination of fiber quality :**

At the end of each season a sample of 0.25-0.50kg. of cotton sample from each replicate was ginned and transferred to the laboratory of "Textile Consolidation Fund Development Center" To determine the following .  
Properties of fiber quality by using (H,V.I) instrument.

- A. Lint length.
- B. Cotton fineness ( the micronaire reading )
- C. Lint tenacity ( strength), elongation and uniformity.

**RESULTS AND DISCUSSION**

**1- Effect of some successive programs of sex pheromone on the pink bollworm infestation .**

The data in Tables (2 and 3) show the estimated levels of green boll infestation in the treatments along twelve weeks of inspection during the growing seasons of 1999 and 2000 . The results indicated that there are significant differences between the seasonal mean numbers of pink bollworm larvae in the insecticide treated area (T4), the treatments with pheromone insecticide (T1, T2 and T3) and the untreated check. It was obvious that Rope PBW curacron / selibate / curacron (T1) treatment is the most effective to protect the bolls from infestation showing the least seasonal mean numbers of inspected pink bollworm Larvae (2.50 & 2.53 larvae / 100 bolls) . This treatment followed by last flight / Curacron / Selibate Curacron (T2), Selibate / Curacron / Last flight / Curacron (T3) and Curacron (T4) Treatments (2.94 & 3.20, 3.19 & 3.25 and 4.08 & 5.05 larvae / 100 bolls, respectively while untreated check T5 gave 6.28 & 6.78 larvae / 100 bolls in both seasons, respectively .

On the other hand, there were no significant differences between the seasonal mean numbers of pink bollworm larvae in the cotton cultivars, Giza 70, Giza 88 and Giza 89 .

**Table (2): Mean numbers of *P.gossypiella* ( Saund.) larvae at the different treatments in the three cultivars during 1999 season.**

Treatments	Variety			Mean Treatments
	Giza70	Giza88	Giza89	
Rope PBW/Curacron/Selibate/ Curacron(T1)	2.33	2.08	3.08	2.50 a
Last-flight/Curacron/Selibate/ Curacron(T2)	2.75	2.92	3.17	2.94b
Selibate/Curacron/Last.Flight/ Curacron(T3)	3.17	3.08	3.33	3.19 b
Curacron(T4)	3.92	4.00	4.33	4.08 c
Untreated Check(T5)	6.25	6.08	6.50	6.28 d
Mean cultivar	3.68	3.63(a)	4.08(b)	

Treatments:  $F = 87.54^{***}$   
L.S.D 0.05= 0.435

**Table (3): Mean numbers of *P.gossypiella* (Saund.) larvae at the different treatments in the three cultivars during 2000 season.**

Treatments	Variety			Mean Treatments
	Giza70	Giza88	Giza89	
Rope PBW/Curacron/Selibate/ Curacron(T1)	2.67	2.08	2.83	2.53a
Last-flight/Curacron/Selibate/ Curacron(T2)	3.17	3.17	3.25	3.20b
Selibate/Curacron/Last.Flight/ Curacron(T3)	2.92	3.17	3.67	3.25b
Curacron(T4)	5.25	4.92	5.00	5.05c
Untreated Check(T5)	6.58	6.75	7.00	6.78d
Mean cultivar	4.11(a)	4.00(a)	4.35(a)	
Treatments: $f= 139.71^{***}$		Var. : $F= 4.083$		
L.S.D 0.05= 0.41		L.S.D 0.05= 0.537		

Generally, it was concluded that the evaluated sex pheromones are promised agents to be applied in the control program of the cotton pink bollworm, where these agents can reduce insecticide application by eliminating unnecessary applications. This conclusion agreed with those reported by El-Fateh *et al.* (1988), Nackache *et al.* (1993) and Moawad *et al.* (1994).

**2- Effect of pheromone / insecticide and/or insecticide alone treatments on cotton yield properties .**

The results in Tables (4 and 5) show there are significant differences between the mean numbers of counted bolls / plant in pheromone / insecticide treatments, and untreated check in the two seasons . The highest mean number of bolls/plant (25.1 & 26.0) was recorded in T1 followed by T2 (24.1 & 24.63), T3 (23.7 & 24.38) and T4 (20.13 & 21.48), for 1999 and 2000 seasons, respectively. The least mean numbers of bolls / plant were obtained in the untreated treatment (17.97 & 18.25) in the both seasons respectively . The mean number of buds / plant for pheromone / insecticide and/or insecticide treatments showed that the highest mean numbers of buds/ plant were recorded post application of T1 (12.08 & 12.55), T2 (11.68 & 12.17), T4 (11.57 & 11.98), T3 (11.50 & 11.92) then T5 (10.65 & 10.37) in both seasons respectively .

These results were confirmed by yield losses. It was found that significant differences between the percentages of yield losses in different pheromone / insecticide and/or insecticide treatments. The highest percentages of yield losses were (7.89 & 9.22%) were observed in T5 (untreated check) The lowest yield losses (1.29 & 1.31%) were obtained with T1 followed by T2 (1.56 & 1.80%), T3 (1.77 & 1.81%) and T4 (2.66 & 2.72%) treatments in both seasons, respectively.

**Table (4): The effect of pheromone/insecticide treatments and/ or insecticide alone on some yield properties during 1999 and 2000 growing seasons.**

**1999**

Treatments	Mean No. of bolls/ plant	Mean No. of buds/ plant	% loss
T1	25.1 d	12.08 c	1.29 a
T2	24.1 c	11.68 b	1.56 b
T3	23.7 c	11.50 b	1.77 c
T4	20.13 b	11.57 b	2.66 d
T5	17.97 a	10.65 a	7.89 e
F	92.03***	20.09***	12331.60***
L.S.D 0.05	0.95	0.36	0.0767

**2000**

Cultivar	Mean No. of bolls/ plant	Mean No. of buds/ plant	% loss
G 70	21.06 a	11.46	2.890 a
G 88	22.94 b	11.59	2.868 a
G 89	22.60 b	11.46	3.340 b
F	16.89 ***	N.S	484.05**
LSD0.05	0.74		0.0734

**Table (5): The effect of different treatments on some yield properties during 1999 and 2000 growing seasons.**

**1999**

Treatments	Mean No. of bolls/ plant	Mean No. of buds/ plant	% loss
T1	26.00d	12.55b	1.31 a
T2	24.63 c	12.17b	1.80b
T3	24.38 c	11.92b	1.81 b
T4	21.48 b	11.98b	2.72 c
T5	18.25 a	10.37	9.22 d
F	173.02***	24.22***	6631.1***
L.S.D 0.05	0.71	0.52	0.125

**2000**

Cultivar	Mean No. of bolls/ plant	Mean No. of buds/ plant	% loss
G 70	22.02a	11.63	3.29a
G 88	23.77 c	11.89	3.25 a
G 89	23.06 b	11.87	3.57 b
F	23.25 ***	N.S	159.21***
LSD0.05	0.55		0.0852

**3- Effect of pheromone/insecticide and insecticide treatments on fiber properties .**

Date in Tables (6 & 7) showed the effect of pheromone / insecticide and insecticide alone applications on certain parameters of fiber quality during the two seasons of evaluation .

**1- Cotton fiber length :**

It is obvious that in 1999 season, T2 increased fiber length while there was no significant difference between T2, T1 and untreated check T5

treatments . On the other hand, the T3 and T4 treatments significantly decreased this parameter compared to T5 . Cotton fiber length significantly is increased in variety Giza 70 compared to Giza 88 and Giza 89 . In season 2000 there was no significant differences between treatments. However, there were significant differences between cotton varieties . This parameter increased in Giza 70, Giza 88 and Giza 89 (34.80, 34.33 and 32.5, respectively).

#### **2- Fiber Tenacity**

In season 1999, fiber tenacity was significantly affected by pheromone / insecticide applications, where the highest values (38.18, 37.98 and 37.7) were detected in T1, T2 and T3 respectively . Moreover, the insecticide alone treatment (T4) showed the lowest value (33.92) . There were significant differences between the cotton varieties, where the highest value (39.84) was related with Giza 88, followed by 38.34 for Giza 70 and the lowest value (32.65) was obtained for Giza 89 . In addition, there were significant differences among treatments and varieties. In 2000 season, all treatments of pheromone / insecticide and untreated check were higher than T4 (insecticide only), while the highest value was obtained in T1. The difference between varieties was also significant and the highest values were 40.19 for Giza 88, and 38.02 for Giza 70 and the lowest value (32.82) was recorded to Giza 89.

#### **3- Fiber Uniformity :**

In 1999 season, fiber uniformity was significantly affected by the treatments, where the highest values of this parameter were recorded in T1, T2 and T4 . There were no significant differences between treatments and varieties towards this parameter. In 2000 season, there was a significant difference between treatments. The highest value of fiber uniformity (50.27) was recorded in T1, followed by T2, T4 and T3, treatments . On the other hand, the lowest value was recorded in T5 (untreated check) .

#### **4- Fiber Elongation :**

In 1999 season, fiber elongation was significantly affected by pheromone / insecticide treatments, where the highest value was recorded in T2. Moreover, in pheromone / insecticide treatments, the values recorded were higher than that recorded in T4 insecticide alone. In 2000 season, there were insignificant differences between treatments and/or varieties. It was found that there was a significant difference between treatments and varieties in Giza 88 .

#### **5- Micronaire Reading :**

In both seasons of evaluation, the lowest micronaire reading was recorded in T2, while it was no significant difference between the remaining treatments. On the other hand, there was no significant difference between varieties . In 2000 season, the micronaire reading was higher in Giza 88 and Giza 70 varieties .

Table (6): The influence of Gossypure / insecticide on fiber quality properties in 1999 season.

Property	Treat Var.	T1	T2	T3	T4	T5	Mean V	F & LSD 0.05
Mic	G70	4.35	4.20	4.45	4.50	4.70	4.44a	Treat: F = 9.472**
	G88	4.65	4.30	4.55	4.85	4.60	4.59a	LSD0.05 = 0.18
	G89	4.90	4.35	5.10	4.65	4.85	4.77a	Var.: NS
Mean Treat.		4.63b	4.28a	4.70b	4.67b	4.71b		
Str	G70	41.45a	39.30b	38.15c	37.70c	35.10d	38.34b	Treat: F=88.7***LSD0.05=0.57
	G88	40.40b	40.85ab	41.65a	33.80c	42.50a	39.84c	Var.: F=690.58**
	G89	32.70b	33.80a	32.30b	30.25c	34.20a	32.65a	LSD0.05=0.878
Mean Treat.		38.18c	37.98c	37.37b	33.92a	37.27b		TreatxVar.=F=52.85*** LSD0.05=1.04
Leng.	G70	34.75ab	35.35a	34.9ab	34.5b	34.55b	34.81c	Treat: F=34.9***LSD0.05=0.43
	G88	34.8bc	35.4c	34.1b	33.25a	34.15b	34.34b	Var.: F=273.87**LSD0.05=0.4
	G89	33.35b	33.70b	32.0c	30.35d	34.3a	32.74a	TreatxVar.=F=10.85**
Mean Treat.		34.30c	34.81c	33.67b	32.7a	34.33c		LSD0.05=0.79
Unf.	G70	50.95a	49.4b	47.65c	49.05bc	46.7c	48.75a	Treat: F=29.14***
	G88	49.75ab	50.5a	48.9b	49.15ab	50.25a	48.81a	LSD0.05=0.547
	G89	49.5a	49.55a	47.55b	50.0a	47.45b	49.69a	Var.: F=14.13LSD0.05 = 0.85
Mean Treat.		50.06b	49.81b	48.03a	49.4b	48.1a		TreatxVar.=F=9.79*** LSD0.05 = 1.0
Elg	G70	5.25	5.75	5.15	5.15	5.70	5.4a	Treat: F=2.93
	G88	6.05a	6.2a	5.55ab	5.2b	5.05b	5.61b	LSD0.05 = 0.34
	G89	5.55b	5.9ab	6.35a	6.35a	5.55b	5.94c	Var.: F=2222.999***, LSD0.05=0.035
Mean Treat.		5.61ab	5.95b	5.68ab	5.57ab	5.43.a		TreatxVar.=F=5.31** LSD0.05 = 0.63



Table (7): The influence of Gossypure / insecticide on fiber quality properties in 2000 season.

Property	Treat Var.	T1	T2	T3	T4	T5	Mean Y	F & LSD 0.05
Mic	G70	4.4	4.2	4.4	4.45	4.7	4.43a	Treat: F = 4.198*
	G88	4.6	4.25	4.5	4.85	4.5	4.54a	LSD0.05 = 0.26
	G89	4.85	4.35	5.05	4.6	4.8	4.73b	Var.: F=48.79*
Mean Treat.		4.62b	4.26a	4.65b	4.63b	4.67b		LSD0.05 = 0.133
Str.	G70	41.5a	39.35a	38.0ab	37.55ab	33.65b	38.02b	Treat:F=5.37***LSD0.05= 0.57
	G88	40.5a	42.5a	41.7a	33.75b	42.5a	40.19c	LSD0.05= 2.53
	G89	33.45	33.7	31.95	30.3	34.2	32.82a	Var.: F= 0.411** LSD0.05=1.137
Mean Treat.		38.51b	37.38b	33.38b	33.87a	36.78b		Treat:Var.:F=48.79* LSD0.05=4.65
Leng.	G70	34.8	35.3	34.95	34.45	34.50	34.80b	Var: F=22.47***
	G88	34.85	35.4	34.05	33.25	34.1	34.33b	LSD0.05 = 0.78
	G89	31.3	33.15	31.45	32.3	34.3	32.50a	Treat: NS
Mean Treat.		33.65	34.61	33.48	33.33	34.3		
Unf.	G70	50.85	49.45	48.55	48.60	46.66	48.81	Treat:F=3.8*
	G88	49.65	50.25	48.9	49.1	50.1	49.60	LSD0.05=1.46
	G89	50.3	49.85	48.0	49.9	47.4	49.09	Var.: NS
Mean Treat.		50.27b	49.85ab	48.48ab	49.2ab	48.0a		
Elg	G70	5.2	5.8	5.2	5.1	5.6	5.38	Treat: NS
	G88	6.05a	6.15a	5.55ab	4.7b	5.0b	5.49	Var.: NS
	G89	5.6	5.9	6.35	6.3	5.5	5.93	Var.:xTreat=F=3.32*
Mean Treat.		5.62	5.95	5.70	5.37	5.37		LSD0.05 = 0.86

The above results concerning the effect of pheromone curacron insecticide and curacron alone on plant phenology and fiber quality of the cotton, the plant treated with pheromones in consequence with insecticide induced better growth and higher rate of squares, blooms and bolls and better fiber quality. These results are, generally, in agreement with those obtained by Surulivela (1985), Byrd and York (1988), Chamberlain *et al.* (1992) and Moawad *et al.* (1991).

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تأثير بعض تجهيزات الفرغونات مع أو بدون استخدام مبيد الـبروفينوفوس ضد دودة اللوز القرنفلية وعلاقة ذلك بالخواص الفينولوجية والإنتاجية لنبات القطن السيد حسن نايب\*، ابراهيم جلال محمد\*\*، خليفة احمد عبد الرحمن\*\*، عادل عبد السلام مبروك\*\* \* كلية الزراعة ساها باشا ، جامعة الإسكندرية. \*\*معهد بحوث وقاية النباتات-مركز البحوث الزراعية.

- أجريت التجارب الحقلية الخاصة بهذه الدراسة في مزرعة كلية الزراعة ساها باشا - جامعة الإسكندرية على محصول القطن خلال موسمي ١٩٩٩ ، ٢٠٠٠ لدراسة تأثير ثلاثة تجهيزات تجارية من الفرغونات الموصى بها تجاه دودة اللوز القرنفلية بالتكامل مع رشتين من مبيد الـبروفينوفوس ( كوراكرون ) على كل من معدلات الإصابة بدودة اللوز القرنفلية والخواص الفينولوجية لنبات القطن وخواص التيلة وكذلك نسب الخسارة في الانتاج ، ومقارنتها ببرنامج استخدام ٤ رشات من مبيد الـبروفينوفوس فقط وأوضحت الدراسة النتائج الآتية :
- ١- استخدام التجهيزات التجارية للفرغونات بالتكامل مع رشتين من مبيد الـبروفينوموس ( الكوراكرون) سببت أعلى انخفاض في معدل الإصابة بدودة اللوز القرنفلية بالمقارنة باستخدام المبيد فقط .
  - ٢- أن أعلى انخفاض في معدل الإصابة بدودة اللوز القرنفلية تحقق من التتابع في المعاملة الأولى والتي تكون من ( بي .بي. روب ، يليه الكوراكرون يليه السليبت ثم الكوراكرون) يليها المعاملة الثانية ( لاست فلايت يليه الكلورلكرون يليه السليبت ثم الكوراكرون ) ، ثم المعاملة الثالثة ( السليبت يليه الكوراكرون يليه اللاست فلايت ثم الكوراكرون ) ، أما أقل انخفاض في معدل الإصابة بدودة اللوز القرنفلية فكان في المعاملة الرابعة والتي استخدم فيها المبيد فقط ، بالمقارنة بين الأصناف المختلفة للقطن يتضح أن أحسن الأصناف هو صنف جيزة ٨٨ وذلك عند استعمال المعاملة الأولى ( بي .بي. روب / كوراكرون / سليبت / كوراكرون ) وذلك خلال موسمي ١٩٩٩ ، ٢٠٠٠ على الترتيب .
- أوضحت النتائج أيضاً أن استخدام الفرغونات بالتعامل مع المبيدات أعطت أقل نسبة خسائر في محصول القطن وزيادة في إعداد اللوز الأخضر لكل نبات . كما أظهرت النتائج فروقاً معنوية تشير إلى تحسين خواص التيلة من حيث الطول ، نسبة استطالة شعرة القطن وكذلك نمومة الشعرة وذلك بالمقارنة باستخدام برنامج المبيدات فقط.