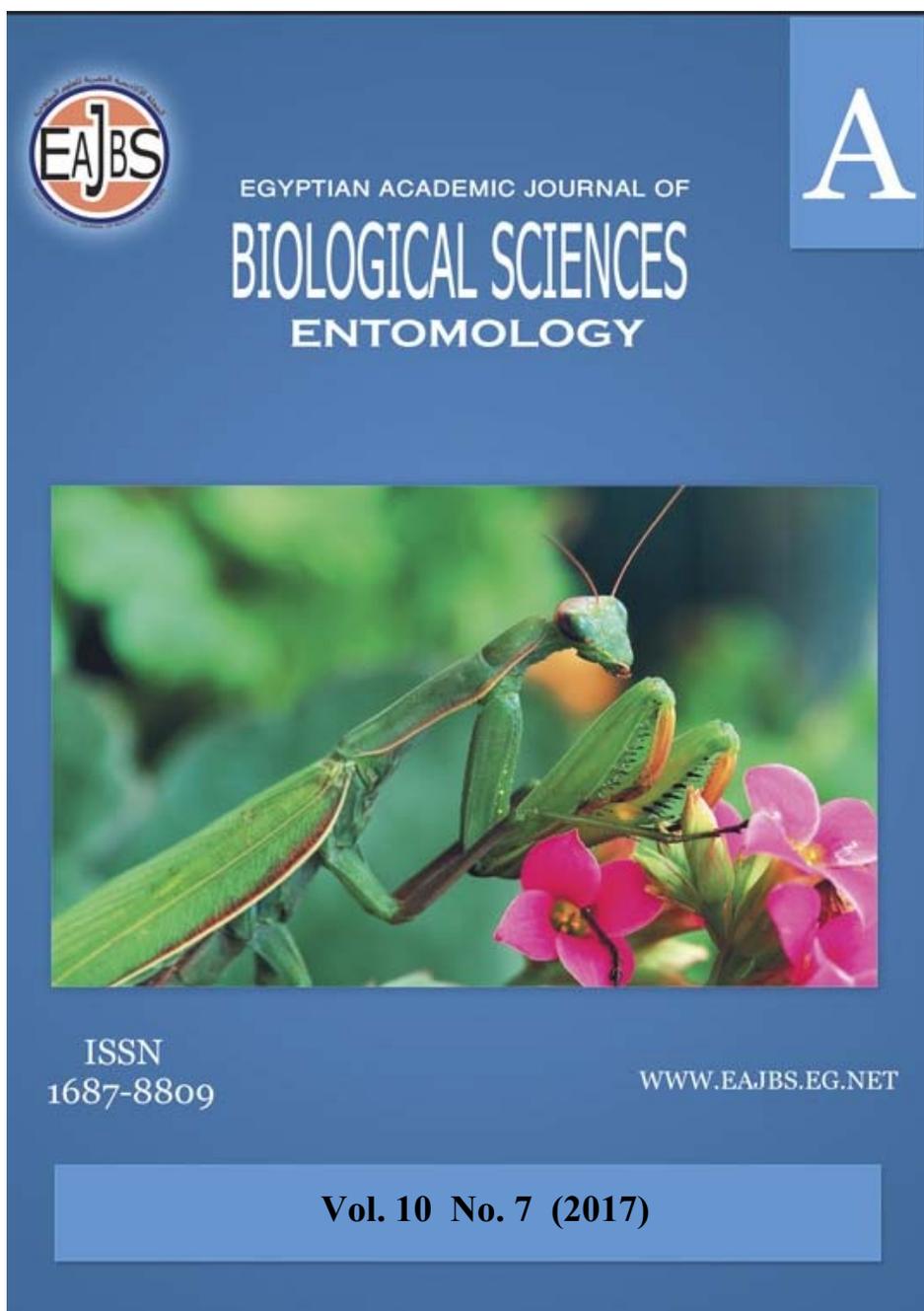


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**The Economic Importance of the Greater Date Moth, *Arenipses sabella*  
Hampson (Lepidoptera: Pyralidae)**

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**ABSTRACT**

Since the end of the twentieth century, field observations and farmers' complaint indicated that, *Arenipses sabella* (Lepidoptera: Pyralidae) became a major pest attacks the date palm trees. There is no any accurate data on the extent of economic damage and loss of yield. The aim of this study is to determine the extent of the spread of this pest and the nature of the damage and percentage of loss in the yield under El-Kharga Oasis conditions.

Different larval instars were observed in full activity status in the frond bases during mid-January. Unopened spadix of the date palm males recorded the earliest infestation during the last week of January. Meanwhile, slightly infestation was recorded on spathes of the females during the end of March.

Over 80% of the inspected date palm in El-Kharga Oasis was found infested with *A. sabella*. Bunch bases infestation with *A. sabella* larvae ranged between surface and/or cut damage. Cut bunch bases (CBB) caused by the pest is considered as economic injury lead to bunch base broken and cause effected damage to the fruits and affect its quality. This usually happens during August when bunches are heavy enough and then these infested bunches are unable to bear their weight.

During 2015 and 2016 seasons, the general average of the total and surface bunch bases infestations was 22.07 and 12.95% and 18.32 and 8.27%, respectively.

After examining 25 date palm groves during two successive seasons, it was observed that, the highest (CBB) per one date palm tree was 62.50%.

Throughout the first season, the cut bunch bases due to the greater date moth infestation ranged between 0.00 and 21.62% with an average of 9.12%. This ratio ranged between 3.73 and 18.61 % with an average of 10.05% during the second season. Under El-Kharga Oasis conditions, the main date palm cultivar (Saidi) suffered from *A. sabella* attacks where, the general average of the cut bunch bases was 9.58%. It can be said that, this value reflects economic damage and loss of the fruit yield.

**INTRODUCTION**

Date palm cultivation in Egypt goes back thousands of years. The earliest evidence of its presence was provided by the drawings on ancient Egyptian tombs. Date palm (*Phoenix dactylifera*) is the most important economic crop that is considered the backbone of agriculture in the New Valley Governorate. More than 1.8 million date palm trees are grown; the majority is the semi-dry variety (Saidi).

Beside the local consumption, dates are exported to foreign countries.

The greater date moth, *Aphomia (Arenipses) sabella* Hampson (Lepidoptera: Pyralidae) was recorded as an economic pest attacks date palm cultivars in several countries such as Egypt, Iraq, Saudi Arabia, Libya, Palestine, Iran and India as mentioned by Hussain, (1963); Kehat and Greenberg, (1969); Carpenter and Elmer, (1978); Bitaw and Bin Saad, (1990); Talhouk, (1991); El-Sherif, *et al.*, (1998); Elwan, (2000); Cohen *et al.*, (2010); Imam, (2012); Sudharsan, (2013); Levi-Zada *et al.*, (2014) and Al-Antary *et al.*, (2015).

The larvae cause various types of damage to the palms. Abdel-Rahman *et al.*, (2007) recorded that, the new emerged larvae move inside the inflorescence feeding on the flowers leaving black areas between the white healthy inflorescence. Larvae mine the spathes and bore at the stalk base causing the breakage of bunch stalk and loosing its date fruits. It also attacks fruits and the lower part of the midrib in the crown and the young offshoots. Sudharsan and Al-Shayji (2007) found that, certain growth abnormalities or physiological disorders such as crown bending, dwarfing and terminal shoot bud death were also observed in few tissue culture derived date palms at the stage of flowering. Laboratory studies indicated that the main cause for these physiological disorders was due to the infestation of the greater date moth *A.sabella* followed with fungal infection on the wounds made by the insect larvae. Imam (2012) recorded that the major loss is due to the larvae that chew the newly formed spathes underneath palm tree fibers and finally attack bunch stalks severely that break under the heavy weight of full ripped date fruits. Al-Antary *et al.*, (2015) recorded that, the greater date moth considered to be one of the most economically important pests in Jordan (about 45 and 55% of the bunches found infested).

Recently, since the end of the twentieth century under the New Valley conditions, field observations and farmers' complaint indicated that, *A. sabella* became major pest attacks the date trees where the rate of the infested bunches ranged between 8 and 50% as recorded by Gameel and Sayed (2009) and Gameel *et al.*, (2014).

There is no any accurate data on the extent of economic damage and loss of yield for date palms. Therefore, the aim of this study is to determine the extent of the spread of this pest and the nature of the damage and its percentage of loss in the yield under El-Kharga Oasis which cultivates the highest numbers of date palm trees (800,000 trees).

## MATERIALS AND METHODS

Field trials were conducted in El- Kharga Oasis to study the nature of injury which causing by the greater date moth in many date palm groves during 2015 and 2016 seasons.

### **Male spadix check:**

The infested and intact spadix of 100 male date palms was examined weekly from mid January to the beginning of April in the two seasons.

### **Female spathe check:**

The infested and intact spathe of 100 female date palms (Saidi variety) were examined weekly from mid February to the mid of April in both seasons.

### **Date palm bunches check:**

Twenty five farms of Saidi variety (semi-dry cultivar) represented about 30×10 Km were used. Ten date palm trees were checked in every grove (one date palm

equal one replicate). In the case of bunch infestations, all bunches / one date palm from ten replicates was examined. Inspection times were conducted at two weeks interval from the beginning of April until the harvest time (**Abdel-Rahman, et al., 2007**). The nature of bunches infestation was divided into 1: surface infestation which does not cause any yield losses but it expresses the presence and activity of the pest. 2: cut bunch bases (CBB) which happen when the larvae of greater date moth attack bunch stalks severely that break under the heavy weight of full ripped date fruits.

#### **Direct fruit infestations check:**

In the case of fruit infestations, samples size 10 strands / one date palm was taken at random from ten replicates. In each assessment fruit having symptoms of *A. sabella* infestation.

## RESULTS AND DISCUSSION

### **1- Field observations:**

Field observations in the date palm groves indicated that, different larval instars were observed in full activity status in the frond bases during mid January.

### **2- Spadix damage:**

In the case of infested spadix of the date palm males, data in Table 1 indicated that, the highest infestation ratio with *A. sabella* (17.5 and 33.33%) were recorded during last week of January on unopened spadix in 2015 and 2016 seasons, respectively. On the other hand, the lowest rate of infestations (0.15 and 1.88%) were observed during the second weeks of March of the two successive seasons, respectively.

Table( 1): Male spadix infestation with *A. sabella* in El-Kharga Oasis during 2015 and 2016 seasons.

Inspection dates	Season 2015			Season 2016		
	No. of inspected male spadix	No. of infested male spadix	Infestation (%)	No. of inspected male spadix	No. of infested male spadix	Infestation (%)
Jan.,15	0	0	0.00	0	0	0.00
22	33	0	0.00	24	0	0.00
29	40	7	17.50	117	39	33.33
Feb.,5	125	0	0.00	200	45	22.50
12	234	10	4.27	453	100	2.20
19	347	0	0.00	655	0	0.00
26	846	16	1.89	693	0	0.00
Mar.,5	732	11	1.50	731	0	0.00
12	653	1	0.15	742	14	1.88
19	485	5	1.03	966	0	0.00
26	165	1	0.60	210	0	0.00
Apr.,2	101	0	0.00	190	0	0.00

### **3- Spathe damage:**

Concerning the infested spathe of date palm females, low infestation was observed during study time. Only two infestation ratios (1.83 and 1.52%) were recorded on unopened spathe during the last and third weeks of March of 2015 and 2016 seasons, respectively (Table2).

**Table( 2): Female spathe infestation with *A. sabella* in El-Kharga Oasis during 2015 and 2016 seasons.**

Inspection dates	Season 2015			Season 2016		
	No. of inspected female spathe	No. of infested female spathe	Infestation (%)	No. of inspected female spathe	No. of infested female spathe	Infestation (%)
Feb.,19	38	0	0.00	44	0	0.00
26	407	0	0.00	315	0	0.00
Mar.,5	420	0	0.00	375	0	0.00
12	618	0	0.00	470	0	0.00
19	980	0	0.00	720	11	1.52
26	300	18	1.83	350	0	0.00
Apr.,2	110	0	0.00	171	0	0.00
9	35	0	0.00	45	0	0.00
16	5	0	0.00	8	0	0.00

The current results indicate that, the activity of this insect begins early in mid-January and is different from that recorded by Saleh (1974) at the same location, where he recorded the activity of this insect begins in the spring. This is may be due to the difference in climatic conditions from the beginning of 1970s until now. This requires further studies on the extent of the effect of change in climatic conditions on the hibernation period of this pest.

Also, from the present results it could be observed that, the pest induced the first infestation during the last week of January on the spadix male of the palm. The same results obtained by Bitaw and Bin Saad (1990) where they mentioned that, *A.sabella* occurred in most date palm growing area where larvae feed on the tips of spadix before and after opening as well as on flowers and fruits. Elwan (2000) found that, the earliest infestation was recorded by late January on the tips of unopened spathes.

#### **4- Bunches damage:**

Data in Table 3 indicate that, all tested groves were found infested with *A. sabella* with different levels. The rate of infestation ranged between 20.00 and 100.00% with an average of 81.60% in 2015 season.

The highest bunch bases infestation (38.29%) was obtained on the date palm of El-Mansora grove. Meanwhile, the lowest rate (1.75%) was observed in El-Salam region. The general average of the total infestation was (22.07 %).

The total bunch infestation was divided into two sections, 1: surface infestation which does not cause any yield losses but it expresses the presence and activity of the pest. 2: cut bunch bases ( CBB ) this happen when the larvae of greater date moth attack bunch stalks severely, that break under the heavy weight of full ripped date fruits.

The cultivated date palm of Bagawat, El-Byadat and El-Mansora recorded the maximum rate of surface bunch infestations (28.15, 27.58 and 26.95%),respectively. On the other hand, the low infestation rates (0.00%) were observed on the date palm of Ganah, El-Bohoth and El-Salam. The general surface infestation was (12.95%)

Concerning the cut bunch bases (CBB) which lead to loss the bunch fruits and express about the economic damage, the high rates of cut bunch bases (21.62 and 20.31%) were obtained from the date palm of El-Bohoth and El-Kharga2 farms, respectively.

Zero CBB was observed from different date palm locations such as Ein-Elsheikh, El-Byadat and El-Bleda 2&3. The general average of the cut bunch bases infestation was (9.12%).

The highest rate of CBB per one date palm (62.50%) was recorded in Mahkama grove. Concerning the direct fruit infestation in general slightly rates of the damage were obtained on Saidi cultivar except El-Salam region when the pest caused highly reduction in the direct fruit infestation (70.15%) with an average of (2.90%).

Table (3): Infestation ratios with *A. sabella* on Saidi date palm cultivar in El- Kharga Oasis during 2015 season.

Experimental locations	Date palm infestation (%)	Bunch bases infestation (%)				Fruit infestation (%)
		Total infestation	Surface infestation	Cut bunch bases	Max. cut bunch bases/one date palm	
Ain-Galal	90.00	29.73	15.94	13.79	55.55	0.00
El-Sherka 55	100.00	25.31	17.72	7.59	25.00	0.00
Zerzara	100.00	30.09	13.77	16.32	33.33	0.00
El-Mounera	100.00	23.19	8.28	14.91	35.29	0.00
El-Baramody	100.00	30.18	15.09	15.09	49.15	0.00
El-Mounera 2	90.00	28.36	11.34	17.02	43.75	0.00
El-Sabat	100.00	27.61	10.44	17.16	36.36	0.00
El-Sabat 2	90.00	17.61	7.95	9.65	33.33	0.00
Ganah	80.00	16.40	0.00	16.40	33.33	0.00
El-Kharga2	100.00	31.24	10.93	20.31	41.66	0.00
El-Bohoth	100.00	21.62	0.00	21.62	35.29	0.24
El-Mansora	100.00	38.29	26.95	11.34	35.00	2.12
El-Bohoth2	70.00	18.36	9.18	9.18	38.46	0.00
El-Bleda	80.00	25.86	21.55	4.31	25.00	0.00
El-Salam	20.00	1.75	0.00	1.75	10.00	70.15
Terwan	70.00	14.93	10.34	4.59	33.33	0.00
El-Kharga1	100.00	31.52	31.52	0.00	0.00	0.00
Bagawat	100.00	30.09	28.15	1.94	13.33	0.00
Mahkama	90.00	23.89	6.31	17.58	62.50	0.00
El-Bohoth3	80.00	16.66	13.09	3.57	35.71	0.00
Ein-Elsheikh	40.00	8.62	8.62	0.00	0.00	0.00
El-Byadat	90.00	27.58	27.58	0.00	0.00	0.00
Abo-Salem	100.00	27.18	23.30	3.88	13.33	0.00
El-Bleda2	20.00	2.46	2.46	0.00	0.00	0.00
El-Bleda3	30.00	3.44	3.44	0.00	0.00	0.00
Average	81.60	22.07	12.95	9.12		2.90

During 2016 season as recorded in Table 4, all examined date palm groves were infested with the greater date moth. This infestation ranged between 40.00 and 100.00% with an average of 87.20%.

The maximum of the total bunch infestation (36.03%) was recorded on the date palm of El-Sabat5 grove. Meanwhile, the lowest rate of bunches damage (3.93%) was obtained from Ganah1 with an average of 18.32%. The highly surface bunch bases damage (21.62 and 21.39 %) were recorded in El-Sabat 5&1, respectively.

The greater date moth caused the maximum damage (cut bunch bases) (18.61,17.45 and 16.38%) in El-Sabat7, El-Mansora and Mahkama regions respectively. The low CBB rates (3.73, 3.78 and 3.93%) were recorded in Ganah 6, Ain-Galal and Ganah1, respectively.

Table( 4): Infestation ratios with *A. sabella* on Saidi date palm cultivar in El- Kharga Oasis during 2016 season.

Experimental locations	Date palm infestation (%)	Bunch bases infestation (%)				Fruit infestation (%)
		Total infestation	Surface infestation	Cut bunch bases	Max. cut bunch bases/one date palm	
Ganah6	70.00	8.29	4.56	3.73	14.28	0.00
El-Boboth1	60.00	12.60	5.61	7.00	27.27	0.33
Zerzara	90.00	15.06	8.90	6.16	21.42	0.00
Zerzara2	80.00	6.01	0.00	6.01	13.33	0.00
El-Baramody	80.00	14.87	5.78	9.09	25.00	0.00
Ganah1	50.00	3.93	0.00	3.93	8.33	0.00
Ganah2	80.00	14.28	0.00	14.28	23.07	0.00
El-Boboth2	90.00	21.86	9.30	12.56	33.33	0.00
El-Sabat	100.00	27.80	21.39	6.41	28.57	0.00
El-Sabat 2	100.00	21.11	7.33	13.78	28.57	0.00
El-Boboth3	80.00	24.29	10.93	13.36	36.84	0.00
Ain-Galal	90.00	12.45	8.67	3.78	14.28	0.00
El-Mounera	100.00	16.07	5.95	10.12	22.22	0.21
El-Sabat3	90.00	20.62	12.69	7.93	26.66	0.00
El-Sabat 4	100.00	13.14	3.28	9.86	7.14	0.00
El-Sabat5	100.00	36.03	21.62	14.41	25.00	0.00
El-Kharga2-1	90.00	25.40	15.57	9.83	25.00	0.00
El-Kharga2-2	90.00	16.54	6.47	10.07	33.33	0.00
El-Sabat6	100.00	23.80	15.87	7.93	20.00	0.00
El-Sabat7	100.00	28.13	9.52	18.61	33.33	0.00
El-Kharga1-1	100.00	17.90	11.19	6.71	16.66	0.11
El-Mansora	100.00	25.20	7.75	17.45	40.00	0.00
El-Kharga1-2	100.00	24.58	10.65	13.93	37.50	0.00
Mahkama	100.00	19.20	2.82	16.38	25.00	0.00
El-Kharga1-3	40.00	9.00	0.90	8.10	34.78	0.00
Average	<b>87.20</b>	<b>18.32</b>	<b>8.27</b>	<b>10.05</b>		<b>0.03</b>

The general average of the cut bunch bases infestation was (10.05%). The maximum average of CBB per one date palm was 40.00% in El-Mansora date palm farm.

In case of direct fruit infestation in general light rates of the damage was recorded on Saidi cultivar where it ranged between 0.11 and 0.33 with an average of (0.03 %).

From the above results, it can be seen that, the greater date moth infested all examined groves and more than eighty percentage of the date palm were infested with *A. sabella*. This shows the extent of the spread of this pest in the palm groves of El-Kharga Oasis. Many researchers found the same trend of results about this pest where, Hussain (1963) recorded that, 70% of the date palm trees were infested in Basra in Iraq and in Siwa Oasis. Abdel-Rahman *et al.*, (2007) found that, the infested trees ranged between 41% and 100% with a general mean of 60%.

The maximum bunch infestations (38.29 and 36.03%) were recorded in 2015 and 2016 seasons, respectively. Hussain (1963) found that, 49% of the date palm bunches were infested in Iraq. In the New Valley, the rate of the infested bunches ranged between 8 and 50% as recorded by Gameel and Sayed (2009) and Gameel *et al.*, (2014).

In many date palm groves, the cut bunch bases (CBB) which lead to loss the bunch fruits and express about the economic damage, the high rates of cut bunch bases were more than 20% and the general CBB ranged between 9.12 % in 2015 and 10.05% in 2016 season with an average of 9.58%. This happens as a result of the feeding behavior of this pest, where larvae of the greater date moth mine the spathes

and bore at the stalk base causing the breakage of bunch stalk and losing its date fruits (Abdel-Rahman *et al.*, 2007 and Imam, 2012). Data of the two seasons showed that the maximum damage (cut bunch bases) caused by this insect to one palm tree was 62.50%. Light direct fruits infestation was recorded in this study.

In the New Valley, the previous studies carried out by Saleh in 1974 not considered this insect as a serious pest on comparison with the lesser date moth, *Batrachedra amydraula* Meyrick; the pomegranate fruit butterfly, *Virachola livia* (Klug.); *Cadra (Ephestia) cautella* Walker and *Cadra calidella* (Guenee). Meanwhile, Gameel *et al.*, (2014) found that the infestation with the lesser date moth was light if compared with the greater date moth. This encourages further studies on the factors affecting the change in the degree of dominance of insects, whether bio or not.

Finally it could be confirmed that, larval instars of the greater date moth were observed in full activity status in the frond bases during mid January. The pest induced the first infestation during the last week of January on unopened spadix. *A.sabella* infested all tested date palm groves. Light direct fruits infestation was recorded in this study. The maximum bunches infestation was 38.29 %. The maximum damage (cut bunch bases) caused by this pest per one palm tree was 62.50%. The highest cut bunch bases (economic damage) per one grove was 21.62%.

Under El-Kharga Oasis conditions, the main date palm cultivar (Saidi) suffered from *A.sabella* attacks, where the general average of the cut bunch bases was 9.58%. It can be said that, this value reflects economic damage and loss of the fruit yield. Under the issuance of a decision of the Ministry of Agriculture in 1995 prohibits the use of traditional pesticides in the fight against agricultural pests in the New Valley, the current control measures to combat the greater date moth must be different. This requires more integrated control procedures which include (a) Mechanical control could be achieved by the collection and destruction of fallen dates, old bunches, spathes, leaves, fibers, and other residues, (b) Release of egg parasitoid *Trichogramma. evanescens* for one time (beginning of May) by the rate of about 20,000 capsules/feddan (ten cards) gave a good results to control *A. sabella* (Gameel *et al.*, (2014). and (c) Use the protective spray (Treatment the date palm during 1 and 22 November) with alternative pesticides to reduce the population density of *A. sabella* larvae which will be enter as overwintering larvae or pupae then, the population density of the emergence adults will be low during the next season as recorded by Gameel and Sayed (2009). All combat operations should include date palm males and the cereal cultivar (Mantor) because they are considered sources of renewed injury.

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## ARABIC SUMMARY

## الأهمية الاقتصادية لدودة الطلع الكبرى

صلاح محمود محمد جميل

معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقي – الجيزة- مصر

أفة ثاقبة العراجين ( دودة الطلع الكبرى) واحدة من أهم الآفات التي تهاجم نخيل البلح تحت ظروف محافظة الوادي الجديد.

أثناء فحص قواعد الجريد في منتصف شهر يناير لوحظ وجود مختلف الأعمار اليرقية لهذه الحشرة بحالة نشاط كامل. تم تسجيل أول إصابة بهذه الحشرة على الطلع المذكر الغير متفتح في الأسبوع الأخير من شهر يناير. تم تسجيل إصابات خفيفة على الطلع المؤنث غير المتفتح في نهاية شهر مارس.

أظهرت النتائج أن أكثر من 80% من النخيل المفحوص بواحة الخارجة كان مصابا بدودة الطلع الكبرى. تراوحت إصابة السباطات ببقرات هذه الحشرة ما بين سطحية وقطع لحامل السباطة. ويعتبر قطع حوامل السباطات هو الضرر الاقتصادي الذي تسببه هذه الحشرة حيث يؤدي إلى كسر حوامل السباطات مما يؤدي إلى فقد المحصول وهذا يحدث عادة خلال شهر أغسطس عندما تكون العزوق ثقيلة وغير قادرة على حمل الثمار.

وجد أن متوسط الإصابة الكلية و السطحية خلال موسمي الدراسة هو 07,22 و 12,95 و 18,32 و 8,27% على التوالي. بفحص 25 حقل من حقول نخيل البلح خلال موسمي 2015 و 2016 لوحظ أن أعلى معدل قطع لسباطات نخلة واحدة هو 62,50%.

خلال موسم الدراسة الأول تراوحت نسب قطع السباطات ما بين 0,0 و 21,62% وبمتوسط عام 9,12%. تراوحت هذه النسبة ما بين 3 و 73,18% و 61,18% وبمتوسط عام 10,05% وذلك خلال الموسم الثاني من الدراسة. تحت ظروف واحة الخارجة عانى الصنف الصعيدي من الاصابه بحشره دوده الطلع الكبرى حيث بلغ المتوسط العام لكسر السباطات 58,9% وهذه القيمة تدل غالبا على نسبه الفقد في المحصول.