OBSERVATIONS ON THE GREATER DATE MOTH (*ARENIPSES SABELLA* HMPS) IN EL-BAHARIA OASIS – EGYPT

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Abstract

Date palm is the main cash crop in the Egyptian oases and insect infestations are limiting factor in date production. Field observations in different groves in El-Baharia Oasis during 2003-2006 seasons indicated that the greater date moth (*A. sabella*) became a serious pest in the oasis causing enormous damages. The percent of impressively infested trees ranged between 41% and 100% with a general mean 60%. The first egg was observed in the beginning of March on the outer tip of the new closed male spathe. The moth lays the eggs in one batch of 3-5 eggs or in a group of 3-4 adjacent batches. 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 of its date fruits. It also attacks fruits and the lower part of the midrib in the crown and the young offshoots. Moths appeared in light traps from the first of March to mid. October. The insect overwintered as larvae or pupae. The overwintered larvae were observed between leaves in the crown, inside the dried spathes on the tree, inside the fallen dates, between the trunk fibers (sheath) or inside the leaves of the offshoots surrounding the heavily infested mother trees. The overwintered pupae were noticed inside the dried spathes or between the trunk fibers (sheath) and rarely in fallen dates.

Keywords: *A. sabella*, the greater date moth, behavior, ecology, damage, site and shape of infestation, inflorescence, spathes.

INTRODUCTION

The total area of Egypt is about one million km^2. Most of this area (95%) is desert. El-Baharia oasis is one of the most important and the biggest oases distributed in the Western Desert of Egypt. It located 365 Km to the south of Giza and 200 Km to the north of El-Farafa oasis, New Valley. Date palm is considered the main cash crop in the Egyptian oases. In Egypt there are about 10 million fruitfull date palm trees producing more than one million tons of fruits.

The red palm weevil *Rhynchophorus ferrugineus*, the greater date moth (*Arenipses sabella*), the lesser date moth (*Batrachedra amydraula*), the fig moth (*Ephestia cautella*), the date moth (*Ephestia calidella*), pomegranate fruit butterfly (*Virachola livia*) are of the main pests affecting crop quality and quantity at harvesting and during storage causing considerable losses in the farm income (Saleh 1974, Ali and Hussain 1995, Sayed 2002, Kaschef *et. al.* 2002, Attia 2003 and Abdel-Rahman *et. al.* 2005). Recently, the greater date moth (the bunch date moth) became a critical pest in El-Baharia oasis causing enormous damages. Hammad *et. al.* (1966) in Egypt described the external morphology of all the stages of *A. sabella*. Hussain (1963) in Iraq and Kahat and Greenberg (1969) in Israel gave some notes about the biology and behavior of this pest.

This work aimed to record some observations on the ecology and the behavior of the greater date moth (*A. sabella*) in El-Baharia date groves and to spot the light on the severe damages caused by it.

MATERIALS AND METHODS

This study was carried out in El-Bahria Oasis, Giza governorate, Egypt. Different date palm groves sited at El-Bawitti (El-Mataar), El-Qasr and Mandisha villages were chosen representing the main locations of the oasis. The groves were about 5-10 km. far from each other. Palm orchards were irrigated with ground water and received normal agricultural practices without any chemical pest control applications. Date palm trees of the same height and age belonging to the semidry variety (Siwe or Saidi) were selected.

Sampling and direct observations were used for surveying the insects associated with date palm trees and for monitoring their abundance and damage. Starting from March, 2003 up to October 2006 and at biweekly intervals, palm tree trunk, leaves, spathes, bunches, bunch fruits in addition to fallen dates and unopened spathes were carefully examined. Robinson light traps with 250 Watt bulb were used for surveying the nocturnal insects found in the date groves.

RESULTS AND DISCUSSION

Date palm is a dioecious species with male and female flowers being produced in clusters on separate palms. The unisexual flowers (pistillate (female) and staminate (male)) are borne in a big cluster (inflorescence) called spadix or spike, which consists of a central stem called rachis and several strands or spikelets (usually 50 - 150 lateral branches).The inflorescence, (also called flower cluster), in its early stages is enclosed in a hard covering/envelope known as spathe (Zaid and de Wet 2002). In Baharia

oasis these spikes start to appear from mid. January till the end of April and normally the male spikes become visible and split earlier than the female ones.

As the spike became visible, it was subjected to be attacked by the moth laying its eggs on the outer top surface of the closed spathe or on the inner spiklets of the newly opened inflorescence. The eggs may be laid in one batch of about 16 eggs per spathe (field observation). Under laboratory conditions the moth laid the eggs in one batch or in a group of 3-4 adjacent batches each of 3-5 eggs. These observations are differed from those noticed by Hussain (1963) in Iraq, who stated that eggs are laid singly. Both male and female spathes are subjected to moth's attack and egg laying. Male inflorescence infestation seemed to be more dangerous as the spiklets of one infested male inflorescence may be distributed among numerous female inflorescences during fertilization process. Once egg hatched, after about 5 days of its deposition (lab. observations), small newly hatched light brown larvae were observed penetrating spathes' tips, moving between the spiklets feeding on its flowers. The infested inflorescence area (eaten flowers and their strands) turned dark brown with silken threads surrounding and crossing it making a white silken web where the larva hid inside (Fig. 1-A & B). This web has more than one entrance and agreeing with the larval nervous behavior, the web was wide enough to give the larva the ability to turn and move fast inside it. Numerous pellets of larval frass were attached to the threads of the web or distributed in between. More than ten larvae of different ages may be found in one spike.

As the spathe opened and the larvae grew up, it became more active, nervous and dark brown in color and to avoid direct light it started to move downward toward the base of the bunch. During this down migration the larvae ate thin layers from the surface of the fruit stalk (mining surface galleries) leaving surface yellowish brown remarks that may extend along the whole length of the fruit stalk (Fig. 2-A) or fed on the base of bunch strands making small galleries which finally turned to black brown cavities (Fig. 2-B). These symptoms seemed to be with no economic harmful values and considered as unimpressive infestation. As the larva reached the base area of the spike (which is sheathed with the fibers and hidden between leaves in the palm crown) it began to bore in the central stem of the fruit bunch (rachis) causing holes with different shapes which gave the impressive infestation symptoms (Fig. 2-C). At that time the infestation was invisible to the farmer as it was hidden between the fibers, but as the time passed the stalk of the fruit bunch grew and elongated it became out of the fibers and the infestation became visible. The holes may have different shapes (Table 3) and may be found in different levels from the bunch base

(Table 2). By the end of April some of the larvae (different stages) were observed to aggregate in the inner side of the opened spathe feeding on its surface tissues.

As larva grew and became closer to maturation, it turned darker, less nervous and somewhat lazier in its movement than before and they hide between the fibers near the bunch base spinning an elongated white cocoon where it pupated. This pupation may be occurred by the end of May and the beginning of June where pupae can be noticed near the stalk bases among the fibers of the palm crown. The adult moths of this generation were observed in the groves from June to Mid October and peaked during September.

Some of the mated moths put their eggs on the immature fruits in the bunch. The others may lay their eggs on the frond midrib of the tender leaves in the palm crown, the tender leaves in the offshoots or on the unopened spikes which came later in the growing season. The larvae of the second generation attacked bunch fruits at the end of the kimri or the beginning of the khalaal stages when the fruits turned yellow. The larva spun its silken web between 3-4 adjacent fruits, hid inside feeding on their outer flesh. The color of the fruits in this infested area turned to light brown as the fruits developed to their rutab stage (Fig. 1-C) and after a while these fruits dropped down on the ground. Larvae of this second generation were observed in fallen dates by the end of June and beginning of July consuming its flesh as well as its stone. At the end of season, they were observed as full grown larvae in fallen dates that characterized with silken tunnels extending from the date sheathed with sand particles, and the hard stone inside the fruit was destroyed due to larval consumption. These larvae developed to pupae inside the fruits or survived the winter as full grown larvae inside the fallen fruits. The larvae which attacked frond midrib in the palm crown or the offshoots or those found in the unopened spikes made galleries in the base of the midrib or inside the unopened spikes feeding on their tissues and spinning their silken threads. Some of these larvae survived in their places and over wintered as larvae inside these webs or developed to pupae and over wintered as pupae. Others leaved their place to the adjacent fiber area, spun their white elongated cocoon, developed to pupae and over wintered as pupae. On the following spring, mature larvae developed to pupae then to moths which attacked the new spikes. On the same time, the immature larvae became active, moved from their hidden places in the palm crown attacking the new spikes. Overwintered pupae developed to moths that attacked the new spikes. This may explain the reason of observing more than one larva from different larval stages inside one spike.

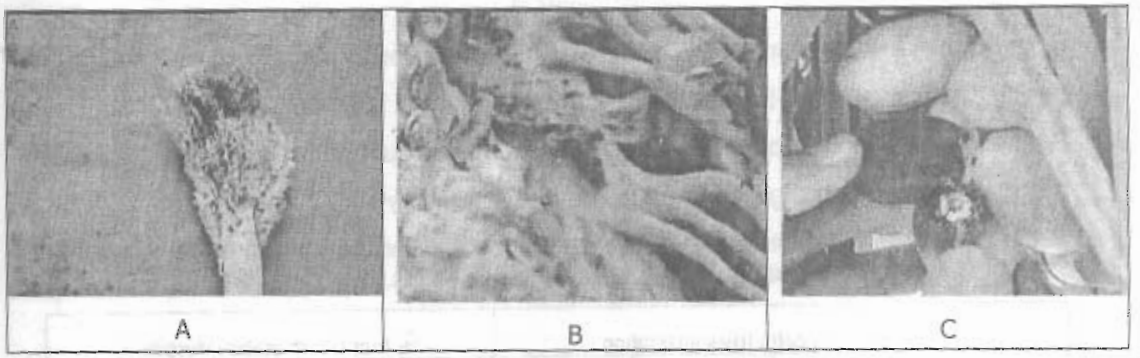


Fig. 1. Symptoms of male spike (A & B) and bunch dates (C) infestations.

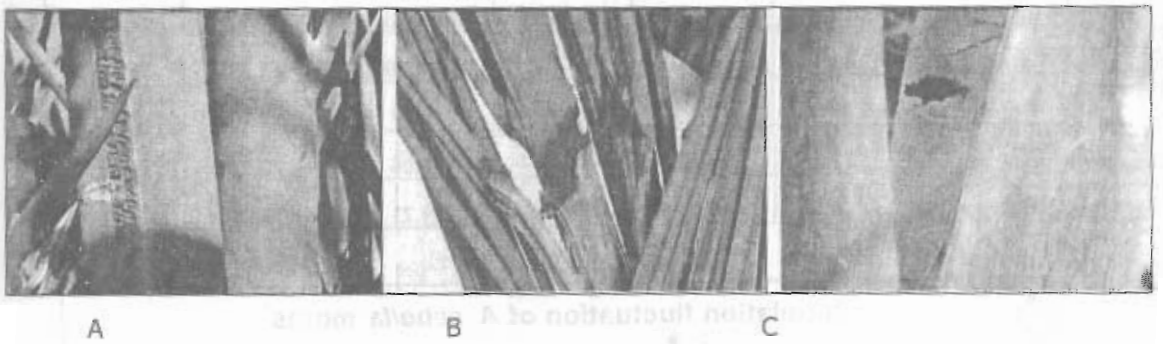


Fig. 2. Symptoms of impressive (A & B) and unimpressive (C) infestation of *A. sabella* on date bunch stalks.

Damages caused by *A. sabella* infestation

The bunch date moth (*A. sabella*) became a serious pest in El-Baharia oasis causing enormous damages. According to the locality, Table (1) showed that infestation ranged between 85.71% and 88.89% among palm trees and between 23.56% and 28.27% among bunches. In some fields as in El-Mataar area 100% of the trees were infested and some of the trees were with more than 75% damaged bunches. The infestation seemed to be localized and related to the infested trees as when a tree was infested, infestation will be associated with it for many seasons with increasing in the number of infested bunches in the tree from year to another. Hussain (1996) said that the greater date moth, *A. sabella* is considered as one of the major insect pests threatening date palms in Baharia oasis and Giza governorate in general and that out of 50 date bunches examined, about 25 bunches (50%) were injured by insect larvae.

This pest seems to be an early season pest. Moths appeared in light traps from the first of March to mid. October with two main peaks in April-May and August-September (Fig. 3) giving the idea that under field conditions, this pest has two main generations.. The larvae were observed from March and early April attacking spathes, bunches and fruit stalks and were seen in fallen dates from mid June and peaked from mid September (Fig. 4). Kehat and Greenberg (1996) showed that continuous rearing

of the insect in laboratory at 27° C showed that three or four generations developed during the period April-September. All the larvae that hatched after the middle of September developed normally but did not pupate and undergo a period of diapause then pupation and emergence of adults started in January.

Table 1. Mean infestation by the bunch date moth *A. sabella* in different locations of El Baharia Oasis during 2004-2006 growing seasons.

Locality	% palm trees infestation			% fruit bunch stalks infestation		
	Unimpressive infestation	Impressive infestation	General infestation	Unimpressive infestation	Impressive infestation	General infestation
Mandisha	67.42	50.562	86.52	11.59	13.82	25.32
El-Qasr	39.29	75	85.71	8.57	19.70	28.27
El-Mataar	22.22	66.67	88.89	1.05	22.51	23.56
El-Baharia	57.94	57.14	86.51	9.71	16.24	25.89

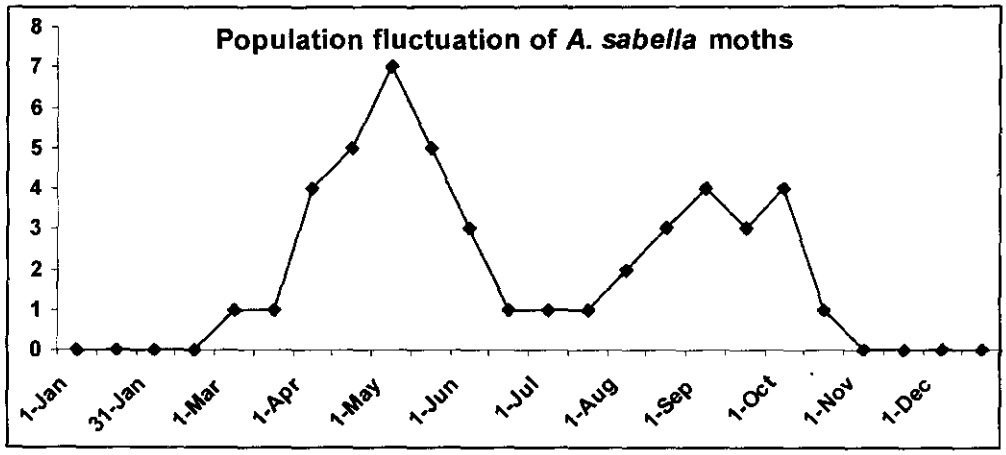


Fig. 3. Population fluctuation of *A. sabella* moths

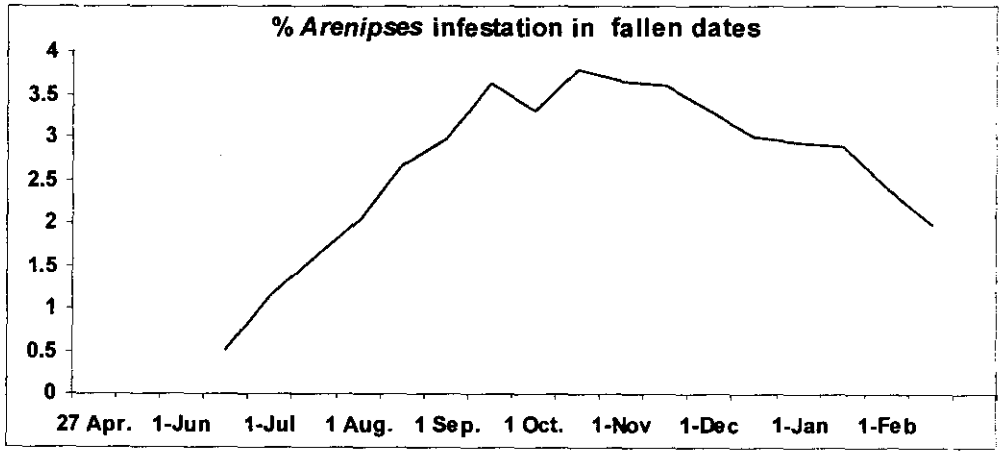


Fig. 4. Percent of fallen date infestation with *A. sabella.*

Site and shape of infestation

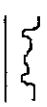
As presented in Table (2) most infestations noticed to be near the base of the bunch stalk in the first 25 cm far from the fibers area and the frequency was reduced as the hole far from the base to reach its minimum value at the bunch stalk apex.

The infestation symptoms showed different shapes depending on the place and the way the larvae bore in the stalks (Table 3). The V shape was the most frequent symptom where a small portion from one side of the fruit stalk base was eaten leaving a V shape cavity or the eating area extended for a large distance in the stalk center giving the U shape or the bracket shape symptom which came as the third frequent sign. The second frequent symptom was the gunshot hole where the larva bored in the stalk base causing a small centered hole passing through it to the other side. In high harmful infestations, the stalk may have more than one hole of impressive symptoms. 10.5% of the examined bunch stalks had two bores at their base. Larval feeding may be so extensive that they may destroy the stalk base leaving broken bunches. On the same direction, as the unbroken stalks grew and due to its heavier weight, their bases may be broken at these week area and the farmer completely lost the entire bunch. Even if the infested bunches survived to the end of the growth season, the infestation reduced or prevented fruit feeding and the strands (spikelets) in the infested side of the stalk held shriveled or invaluable undersized fruits. To reduce the loss, Abdel-Rahman (2007) used a piece of wooden stuck in setting of infested bunches (as a splint) which gave acceptable results in preventing the breaking of heavy infested bunches.

Table 2. Site of *Arenipses* infestations on the bunch stalks.

Site far from the base	frequency
Near the fibers - 1/4 m.	82
1/4 - 1/2 m.	50
1/2 – 3/4 m.	18
3/4 m. – 1 m.	3
Bunch stalk apex	1

Table 3. Different shapes of Arenipses infestations of bunch stalks.

Shape	frequency	Remarks
	85	Like V Shape
	40	Like a gunshot hole
	21	Like U shape
	15	Completely destroyed bunch stalk base
	12	Broken bunch stalk base
Died bunch	6	

This study proved that:

1. The greater date moth *A. sabella* had two generations per year.
2. The insect overwintered as larvae or pupae.
3. The overwintered larvae were observed between leaves in the crown, inside the dried spathes on the tree, inside the fallen dates, between the trunk fibers (sheath) or inside the leaves of the offshoots surrounding the heavily infested mother trees.
4. The overwintered pupae were noticed inside the dried spathes or between the trunk fibers (sheath) and rarely in fallen dates.
5. Most of the damages were due to the first generation and to the survived and over wintered larvae and pupae of the second generation.

6. More than ten larvae of different larval stages may be found in one spathe.

7. Most of the damages were due to bunch stalk infestations rather than bunch date infestations.

8. Sanitation and cleaning the field by collecting fallen dates, old bunches and spathes, fibers and shoot shrubs are very important in reducing infestations in the following season.

9. Using a piece of wooden stuck in setting of infested bunches (as a splint) gave good results in preventing breaking heavy bunches and reduce the loss.

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ملاحظات على فراشة البلح الكبرى (*Arenipses sabella*) بالواحات البحرية – مصر

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نخيل البلح هو المحصول الرئيسى فى الواحات المصرية. و تعتبر الإصابات الحشرية عامل محدد فى إنتاج البلح. دلت الفحوصات الحقلية لمختلف المزارع بالواحات البحرية خلال المواسم ٢٠٠٣ – ٢٠٠٦ على أن فراشة البلح الكبرى (ثاقبة العراجين *A. sabella*) قد أصبحت آفة خطيرة فى الواحة مسببة أضراراً ملموسة حيث تتراوح نسبة الاشجار المصابة إصابات مؤثرة بين ٤١% – ١٠٠% بمتوسط عام ٦٠%. تمت أول ملاحظة للبيض فى بداية مارس على القمة الخارجية لغلاف الطلع المذكر قبل تفتحه حيث تضع الأنثى البيض فى صورة لطعة واحدة مكونة من ٣–٥ بيضات أو فى صورة مجموعة متجاورة من ٣–٤ لطع. تنتقل اليرقات الحديثة الفقس إلى الأزهار داخل الطلع لتتغذى عليها تاركة منطقة سمراء تتخلل الأزهار السليمة البيضاء اللون. تحفر اليرقات فى العراجين و تثقب قاعدة العزق مسببة كسر السوباطة و فقد ثمار البلح الموجود عليها. تهاجم اليرقات أيضا الثمار و الأجزاء السفلية بالجريد على رأس النخلة و كذلك الفسائل. تتواجد الفراشات بالمصائد الضوئية فى الفترة من أول مارس و حتى منتصف أكتوبر. تقضى الحشرة موسم الشتاء كيرقة أو عذراء. تقضى اليرقات موسم الشتاء بين الأوراق بقمة النخلة – داخل الثمار المتساقطة – داخل الطلع الجاف على النخلة – داخل الليف الموجود على الساق أو داخل أوراق الفسائل النامية حول الأشجار شديدة الإصابة. خلال فصل الشتاء تتواجد العذارى داخل الطلع الجاف أو بين الليف الموجود على الساق و نادرا ما تتواجد داخل الثمار المتساقطة.