

Seasonal Fluctuation of the Date Palm Fruit Stalk Borer, *Oryctes elegans* Prell (Coleoptera: Scarabaeidae), in Date Palm Plantations in Al-Qassim Region, Saudi Arabia

Mohammad Al-Deghairi

College of Agriculture and Veterinary Medicine, Qassim University, Buraydah,
P.O. Box 1482, Al-Qassim, Saudi Arabia

التذبذب الموسمي لحفار عذوق نخيل التمر - غمدية الأجنحة في منطقة القصيم
بالمملكة العربية السعودية

محمد عبدالعزيز الدغيري

الخلاصة: تعد الخنافس وحيدة القرن مثل *Oryctes elegans* و *Oryctes agamemnon arabicus* و *Oryctes boas* من ضمن أخطر آفات نخيل التمر في المملكة العربية السعودية. ينتشر حفار عذوق النخيل (*Oryctes elegans*) بشكل واسع في جميع مناطق المملكة المزروعة بالنخيل. ينتج عن الإصابات التي لا تكتشف أو لا تعامل خسائر فادحة. في هذه الدراسة تم عمل رصد لتذبذب عشائر حفار عذوق النخيل الموسمي باستخدام المصائد الضوئية في مشروع إدارة أوقاف الراجحي والذي يحوي أكثر من 200 ألف نخلة وذلك بوضع ثلاث مصائد معدلة من مصيدة روبنسون الضوئية في ثلاث مواقع متباعدة. أوضحت عملية التقصي أن المصائد الضوئية تعتبر وسيلة فعالة لاستكشاف وتوقع زيادة أعداد عشائر حفار عذوق. أكبر نشاط لحفار العذوق كان في شهر يونيو، حيث كانت مجموع أعداد الخنافس في هذا الشهر في عامي 2003 و 2004 تمثل 19.4 و 22.2%، على التوالي، من العدد الكلي للحشرات التي تم جمعها خلال هذه الفترة. وأظهرت أشهر أبريل، مايو، يونيو و يوليو أعلى نشاط للخنافس، حيث بلغت فيها نسبة الحشرات المصطادة 65%، بينما لم يكن هناك أي نشاط للخنافس في شهري يناير وفبراير من عام 2004. كما أظهرت النتائج أن أعلى نسبة من الحشرات تم جمعها أتى من المصيدة التي وضعت في مناطق مزروعة بأشجار نخيل طويلة (متوسط الطول 7.5م) وعمرها يفوق 18 عاماً حيث تم اصطياد حوالي 56.6% من العدد الكلي للخنافس. تليها المصيدة التي وضعت في منطقة تحوي نخيلاً أقصر وأصغر في العمر حيث بلغت نسبة الخنافس التي تم اصطيادها حوالي 29.6% من العدد الكلي للخنافس. وأخيراً المصيدة التي وضعت في منطقة غير مزروعة بأشجار النخيل و ملاصقة لزراعات النخيل وبلغت نسبة الخنافس التي تم اصطيادها حوالي 13.8% من العدد الكلي للخنافس.

ABSTRACT: The date palm fruit stalk borer, *Oryctes elegans*, is widely distributed in Saudi Arabia. Undetected and untreated infestations by this pest result in severe losses. Light trap studies to investigate seasonal population fluctuations of *O. elegans* were conducted in Al-Rajhi Endowment date palm plantation in Al-Qassim, Saudi Arabia, by installing three modified Robinson mercury-vapor light traps in 3 different equidistant sites. The investigation revealed that light trapping is an effective tool for the monitoring and forecasting of *O. elegans* infestations. The highest activity of *O. elegans* was witnessed from April to July, during which period 65% of adults captures were made. Peak monthly activity was observed during June, when 19.4 % and 22.2% of the catches were made during 2003 and 2004, respectively. No beetle activity was observed during January and February. The highest number of beetles (56.6% of the population) was recovered in the site with relatively old and tall palms (more than 18 years old and averaging 7.5m in height). The site with shorter and younger palms received 29.6% of the beetles, whereas the uncultivated site had the lowest number of beetles (13.8% of total).

Keywords: *Oryctes elegans*, date palm, light trap monitoring.

Introduction

More than four million date palm trees are grown in Al-Qassim region of Saudi Arabia, including some of the world's best varieties. Rhinoceros beetles (Coleoptera: Scarabaeidae), such as *Oryctes elegans* Prell, *O. agamemnon arabicus* Fairmaire, and *O. boas* Fabricius, are among the most notorious pests of date palms in Iraq, Pakistan, Iran and Saudi Arabia (Talhok 1984, 1991; Martin, 1967, Gharib, 1970; Carpenter and Elmer, 1978). Infestations by these beetles usually remain undetected for a long period. Untreated infestations result in severe losses manifested in lower yields, lower date quality, and death of trees, especially young transplants.

The Date Palm Fruit Stalk Borer, *O. elegans* is the most common *Oryctes* species in Saudi Arabia (Walker and Pittaway, 1987) and is widely distributed throughout all date palm growing areas in the Kingdom. Adults feed on tender leaves, inflorescences and the fruit stalk of the fruit bunches of date palms. Males and females probe and feed on bases of fronds and fruit stalks, thus sometimes causing wilting of these parts and/or production of lower quality dates due to the lower supply of nutrients and water reaching them (Kadous *et al.*, 1983; Talhok, 1984).

The larvae of *O. elegans* (locally known as "Al-Angara") thrive on decomposing dung and decaying plant matter such as the stumps and trunks of dead or weak palms. Larvae are also known to feed on the roots of date palms.

Light traps have been introduced by many researchers as means of monitoring beetle populations, as well as a method of physical control (FAO, 2002; Dillon and MacKinnon, 2002). In this current study, light traps were used as a monitoring tool to detect the time of appearance of adult *O. elegans* in Al-Qassim date palm plantations and to provide data regarding associated adult activity (mating, egg laying), the size of the population, and the number of generations. In addition, the traps were expected to serve as a physical means of reducing densities of mating beetles (FAO, 2002; Dillon and MacKinnon, 2002).

It is anticipated that the results of this investigation will facilitate improved management of *O. elegans*, which will be reflected in increased yields and healthier stands of date palms.

Materials and Methods

Al-Rajhi Endowment, the largest date palm plantation in Al-Qassim Region, with an area of 200 ha and with more than 200,000 cultivated palm trees, was used as the site of this study. Three modified Robinson light traps (2 m high, supplied with mercury-vapor light, collecting funnel about 25 cm dia., and insect collection jar half filled with diesel) were installed at three different sites. Light trap #1 was situated in the middle of an area in which Barhi, Sukari, Khlas and Nabtat Ali date palm lines were grown. Trees were 8-9 years old with an average height of 2.5 m. Light trap #2 was located in an empty central area (containing stores, refrigerated rooms and other buildings) between areas in which traps # 1 and #3 were situated. Light trap #3 was situated in an area under trees of the Razizi, Maktumi, Shagra and Nabtat Ali lines, which were more than 18 years old, and with an average height of 7.5 m.

The light traps were operated daily from sunset to sunrise, for a whole year, from June 2003 until June 2004. Collected insects were removed from traps on a daily basis. Catches were sorted out and positively identified *O. elegans* were separated out and counted. Catches of *O. elegans* per trap were pooled monthly.

Results and Discussion

Oryctes elegans was the dominant beetle, compromising more than 95% of all beetles captured in light traps during the study period. Table 1 outlines the monthly catches of *O. elegans* adults in the three light traps. The number captured each night varied in the three light traps throughout the study period. Windy and rainy conditions reduced beetle flight. However, no meteorological data were available to correlate with catches of *O. elegans*. The effective light range of light traps also varied substantially with the intensity of moonlight, such that on dark nights traps caught more beetles. The mean catching rate ranged from 11.8 to 85.5 beetles/trap/week, which can be considered to be indicative of a high infestation rate. The total number of *Oryctes* beetles captured in the three traps was 5559. Presuming a sex ratio of 1:1, this gives 2780 laying females.

While no beetle activity at all was observed during January and February 2004, no evidence exists that

Table 1. Mean number of *Oryctes elegans* adults captured in 3 light traps during the period of June 2003 to June 2004 in a large date palm plantation in Al-Qassim, Saudi Arabia. See methods for description of sites.

Month	Number of <i>Oryctes</i> adults captured in		
	Trap 1	Trap 2	Trap 3
June 2003	245	119	527
July	136	55	469
August	101	45	233
September	89	25	92
October	22	21	78
November	50	0	62
December	17	0	48
January 2004	0	0	0
February	0	0	0
March	34	0	21
April	215	97	492
May	97	130	817
June	639	273	310
Total	1645	765	3149
Grand total = 5559			
Monthly average	126.54	58.85	242.23
Percent of all captures	29.60	13.80	56.60

O. elegans goes into hibernation in the adult stages during the winter months (from mid-December to mid-March). Beetles showed up gradually in small numbers until April 2004 when a sudden outbreak was evident, the total number captured during this month in the three light traps was 804 beetles, comprising about 14.5% of the total catch of the year. April, May, June and July witnessed the highest activity of *O. elegans*, with 65% of the total yearly catch made during this period. Peak activity of *O. elegans* was observed during the month of June, when 16 and 22% of the population was collected during 2003 and 2004, respectively. Similar results were reported by Talhouk (1982) who stated that in Al-Kharj and Al-Houfouf in Saudi Arabia *O. agamemnon* becomes active in April and reaches its peak activity from June to August. This

same species was active from the end of April to the end of September in Wadi Qurayat in northern Oman, with a peak in June (Mokhtar *et al.*, 2000).

Among the three trap sites, the highest number of beetles was recovered in light trap # 3, in the area under tall palms over 18 years old, where 56.6% of the total yearly catch was caught. Next in percentage of catches was light trap #1 in the area of shorter and younger palms. This trap caught 29.6% of all beetles. Trap #2 in the uncultivated area, caught the lowest percentage of *O. elegans* (13.8%).

It is possible that *O. elegans* has a preference for older palms. In more mature plantations, decomposing organic matter and weak dying palms are expected to be more plentiful. These can be hypothesized to provide a good source of food for the beetle's progeny and to supply good oviposition sites for adult beetles. It is documented that the eggs of *O. elegans* are laid in decomposing matter, and weak palm trees with decaying moist parts provide beetle larvae (Martin, 1967; Hussein, 1974; FAO, 2002) with a good food source.

Another explanation for the differences in *O. elegans* catches among the three traps is variability in the degree of darkness among the three sites. The degree of darkness was highest in the area of light trap # 3 (tall, old palms), followed by trap # 1 (short, young palms), and then trap #2 (uncultivated field). This perhaps explains why the trap catches were consistently biased in favor of light trap # 3.

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