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Monitoring Flight Activity of Phycitine Moths in the Warehouse by Using Pheromone Traps

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ABSTRACT. Seasonal flight activities of *Ephestia cautella* (Walker), *Ephestia calidella* (Geunee), *Ephestia figulilella* (Gregson), *Ephestia elutella* (Hubner), *Ephestia Kuehniella* (Zeller) and *Plodia interpunctella* (Hubner), were monitored with pheromone traps during 1985/1986, 1986/1987, 1987/1988 and 1988/1989. Results revealed that all *Ephestia* species occurred simultaneously in the date warehouse and their adult populations fluctuated in the same manner. In all storage periods, the flight activity for all *Ephestia* species in addition to *Plodia interpunctella* was relatively high in October at the time where the dates were brought to the warehouses for storage. Thereafter, the flight gradually decreased in late November untill it reached zero catches from December to March. It was then followed by an increase in activity again in early April, peaked in mid-April to mid-May and ended in September during 1986 and in July during the other years, after the dates had been completely marketed. However, the zero catches during winter months may have resulted from the extreme cold temperature or due to the larvae of all species entering diapause. Data from pheromone traps may be useful in determining the proper time of application of insecticides in date warehouses.

The phycitine moths *Ephestia cautella* (Walker), *Ephestia calidella* (Guenee), *Ephestia figulilella* (Gregson), *Ephestia elutella* (Hubner) and *Ephestia kuehniella* (Zeller), are the serious threat pests to field and stored date fruits in Iraq. They cause great economical losses and difficulties to dates exported to foreign countries or used for local consumption (Buxton 1920, Hussain 1974, Ahmad 1985, 1987). Surveillance of these species in the field and warehouses is basic to an integrated control program. With development of a synthetic attractant for these species (Kuwahara *et al.* 1971, Brady and Nordlund 1971, Brady and Daley 1972), the sex attractant traps hold a great promise as a practical means for such surveillance. However, the monitoring of these species with the sex attractant in

Iraq has not been previously investigated. This investigation was therefore made to estimate the populations of these species for purpose of monitoring sterile-male-release programs or to implement other control measures.

Materials and Methods

Occurrence and seasonal dynamics of the phycitine moths were investigated in two date warehouses in Baghdad region during 1985/1986, 1986/1987, 1987/1988 and 1988/1989.

The moths were trapped on corrugated plastic delta traps baited with rubber septa impregnated with 2.0 mg of the synthetic pheromone of *Ephestia cautella*, *E. calidella*, *E. elutella*, *E. figulilella* and *E. kuehniella*, in addition to *plodia interpunctella* (Wolfson Unit of Chemical Entomoloyy, University of Southampton, U.K.). The pheromone traps were spaced not less that 10 m apart, no more than 2.0 m above the floor behind the walls. Traps were randomly distributed in the warehouses. Captures of males on each trap were removed and recorded weekly. Sticky surfaces were replaced if it became contaminated with dust or debris, and traps were rebaited with fresh septa every 4 weeks.

Results and Discusion

The mean weekly captures of phycitine moths in the warehouses from October through September of 1985/1986, 1986/1987, 1987/1988 and 1988/1989 are illustrated in (Fig. 1). The results indicated that the five common species of stored products moths belonging to the genus *Ephestia*, occurred simultaneously in the warehouses. In addition, their flight activity seems to be similar. The weekly catches of *E. calidella*, *E. figulilella* and *E. cautella*, were relatively high in October, 1985-1988 comparing with those of *E. elutella* and *E. kuehniella*. Few trapped males, not exceeding one male/trap/week, were recorded for *E. cautella* in 1988. Likewise, on trapped males were recorded in October for *E. kuehniella*. This may be attributed to the delay in installation of traps in the warehouse, as the lure of *E. kuehniella*. was received from the supplier late in April, 1987. The flight activity of all species gradually decreased in November till it reached zero catch from December to late March. However, single males were sporadically caught during this period in the season of 1985/1986 for *E. elutella*. Therefore, the maximum catches were less than 0.5 male/trap/week.

In the seasons 1985/1986 and 1986/1987, the flight activity started again in early March for *E. cautella* and in early April for the rest of the species. Moreover,

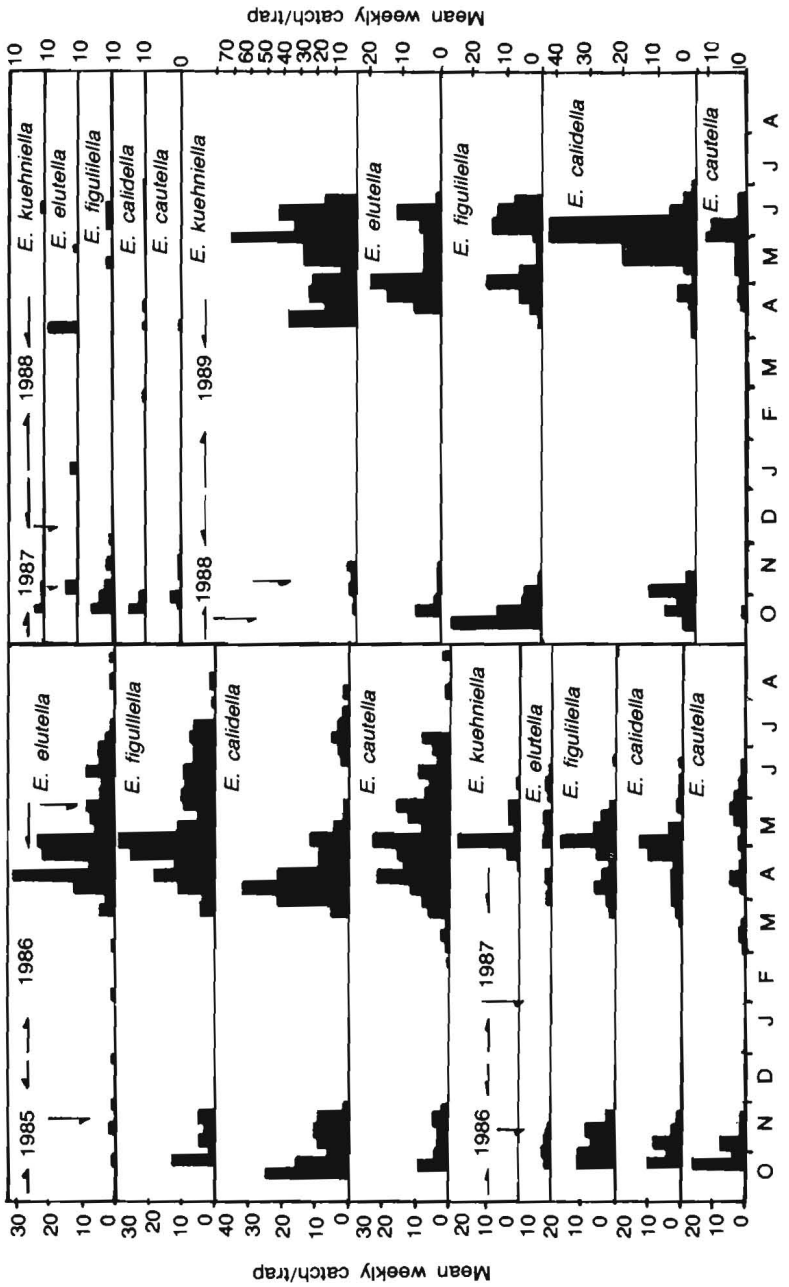

Fig. 1. Seasonal dynamics of catches of *Ephestia cautella*, *Ephestia calidella*, *Ephestia figulilella*, *Ephestia elutella* and *Ephestia kuehniella* males in pheromone traps exposed in the date warehouses, Baghdad. Iraq 1985-1989. The vertical arrow indicates time of chemical treatment.

in the season 1985/1986, the highest peak of flight activity occurred in mid-April for *E. calidella* and *E. elutella* and in mid-May for *E. figulilella* and *E. cautella*. A gradual decrease in the number of moths caught was observed in late May and early June. This was followed by a sharp decrease in the catch in early August and no moths were caught in September. During the season 1986/1987 the highest peaks for *E. calidella*, *E. figulilella*, *E. elutella* and *E. kuehniella* were in early May, and in late May for *E. cautella*. While in the season 1988/1989, the highest peak of flight activity was reached in early May for *E. figulilella* and *E. elutella* and in early June for the remaining species of Ephestia. The moths of all species were caught early in July after the stored dates were marketed locally or in foreign countries. Since the marketing operation usually starts from late November to June, it is possible therefore, that the decrease in moth catches may largely be due to the marketing operation. However, the relatively low catches of all species of moths between April and July of the season 1987/1988 might be attributed to the early marketing operation and to the little amounts of dates brought to the warehouses for storage. Results also show that the seasonal fluctuation of *Plodia interpunctella* was similar to that of *Ephestia* species, with the highest peak of flight activity in late May (Fig. 2). The highest catch of moths in October of all seasons, at the time where the dates are brought for storage, indicates that the date palm orchards may be the source of infestation to the warehouses.

No males were captured between November and April, more likely due to unfavorable conditions for adult flight. In Iraq, the average monthly temperature and light period at that time ranged from 8 to 20°C and 10 to 12 hrs light, respectively. This unfavorable conditions may induce the larvae of all species to enter diapause. According to Alrubeai (1987) the larvae of *E. calidella* enter diapause at 15°C/12L. Donohoe *et al.* (1949) stated that, in California, larvae of *E. figulilella* first enter diapause in October and that adult emerge in April. The incidence of diapause is always given much consideration in any control program, as it may play a role in the protection of larvae from pesticides applied for their control. Bell and Glanville (1973) reported that *E. elutella* diapause larvae were more resistant to methyl bromide and phosphine than non-diapause larvae. Therefore, fumigation of dates with phostoxin on November 21, 1985, on November 15 and January 30, 1986 and on November 15 and December 12, 1987 and with methly bromide on October 18 and November 18, 1988, did not always affect the immature stages. Hence, the catches did not fall to zero values soon after treatment. In addition, male catches in April were relatively higher than those of October of the previous year.

Our investigation preformed in the warehouse demonstrates that the pheromone traps can provide useful data for reflecting the seasonal fluctuation of these pests, for accurate timing of chemical control or of implementing other control measures.

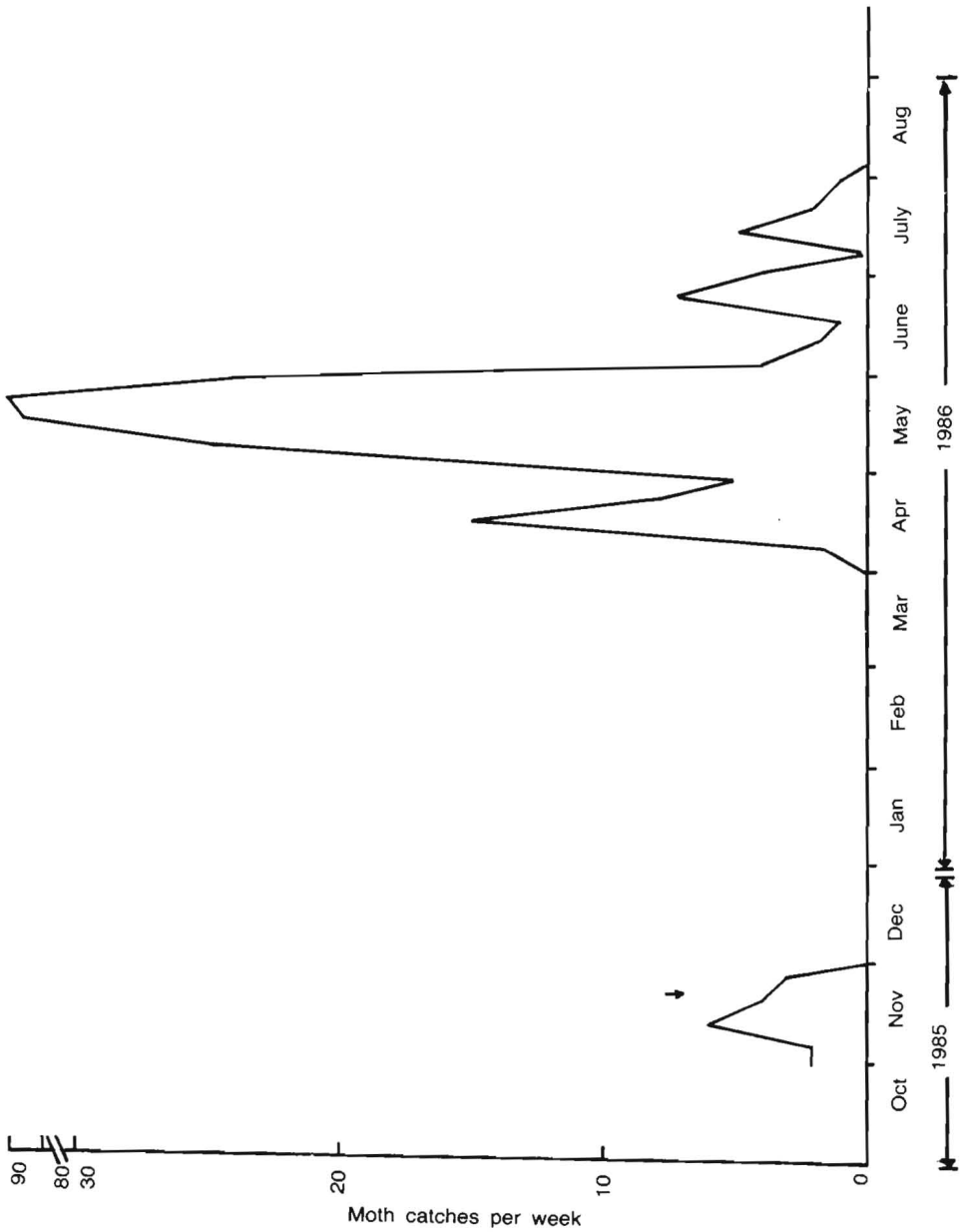

Fig. 2. Seasonal dynamics of catches of*Plodia interpunctella* males in pheromone traps exposed in the date warehouses Baghdad, Iraq 1985/1986. The vertical arrow indicates time of chemical treatment.

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مراقبة النشاط الطيراني لبعض أنواع العث التي تصيب التمور في المخازن باستخدام المصائد الفرمونية

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قسم وقاية النبات ـ مركز البحوث النووية ـ ص . ب : ٧٦٥ ـ بغداد ـ العراق

الغاية من هذا البحث هو دراسة تأثير بعض أنواع العث على التمور المخزّنة، وبالتالي إمكانية حفظ التمور بعيداً عن مؤثرات هذه الأنواع من العث.

من أجل ذلك تمّت مراقبة خمسة أنواع من جنس الأفستيا وهي : كوتيلاّ، كاليديلاّ، فايغوليلاّ، إيلوتلاّ، كوهنيلاّ، بالإضافة إلى عثة الطحين الهندية. وذلك باستخدام المصائد الفرمونية خلال الأعوام: ١٩٨٥ ـ ١٩٨٦، ١٩٨٦ ـ ١٩٨٧، ١٩٨٧ ـ ١٩٨٨، ١٩٨٨ ـ ١٩٨٩ وفي مخزنين لحفظ التمور في منطقة بغداد.

وقد تبيّن بنتيجة الدراسة أن الأنواع الخمسة من جنس الأفستيا وعثة الطحين قد ظهرت بنفس الوقت تقريباً في مخازن التمور، وكان نشاطها الطيراني متشابهاً. وبالتحديد فقد كان النشاط الطيراني لـ : الكاليديلاّ والفايغوليلاّ والكوتيلاّ مرتفع نسبيّاً في شهر تشرين الأول (أكتوبر) لعام ١٩٨٥ ـ ١٩٨٦ وذلك بالمقارنة مع ظهور الإيلوتلاّ والكوهنيلاّ في نفس الفترة، وهذه هي الفترة التي توافق إدخال التمور إلى المخازن. ثمَّ بدأ النشاط الطيراني بالإنخفاض التدريجي في نهاية تشرين الثاني (نوفمبر) إلى أن انعدم من كانون الأول (ديسمبر) إلى آذار (مارس). ولكن هذه الأنواع استعادت نشاطها مرة ثانية في شهر نيسان (أبريل) ما عدا نوع الكوتيلاّ فقد استعاد نشاطه في شهر آذار (مارس). وبلغت ذروة نشاطها الطيراني من منتصف نيسان (أبريل) إلى منتصف آيار (مايو)، وانعدم نشاطها في أيلول

(سبتمبر) من عام ١٩٨٦ وفي تمّوز (يونيه) من الأعوام الأخرى. وفي هذه الأشهر يكون قد تم تسويق التمور. ويُعزى السبب في عدم ظهور الأنواع المذكورة من العث خلال أشهر الشتاء إلى الإنخفاض الشديد في درجات الحرارة (إن درجة الحرارة في بغداد تنخفض شتاءً في المخازن إلى ٨° مئوية) أو لدخول يرقات كافة الأنواع في فترات السكون.

وبالنتيجة فقد بينت دراستنا على هذه المخازن أنه يمكن للمصائدالفرمونية أن تجنب هذه المخازن التأثيرات الموسمية المتذبذبة للحشرات المذكورة وذلك بتحكمٌ كيميائي أو باستخدام وسائل تحكم أخرى.