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BIOCONTROL STUDIES ON MAIZE BORERS IN EGYPT

1. The parasitism of *Bracon brevicornis* Wesm. (Braconidae : Hymenoptera) on the hibernating larvae of *Ostrinia nubilalis* Hbn. (Pyraustidae: Lepidoptera).

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ABSTRACT

The population fluctuations of the hibernating larvae and pupae of *O. nubilalis* in maize stubble and crop remains were studied at Sakha region, Kafr El-Shekh Governorate throughout the two successive hibernation seasons 1983/84 and 1984/85. Population level was comparatively higher during the former season than during the latter one. Larval population was more or less stable during winter (December - February) then decreased gradually in March and April and larvae disappeared by mid-May at most. Pupae began to occur in February and their number increased gradually reaching a peak by early May. Moth emergence occurred mainly during May.

For both seasons of investigation, *B. brevicornis* was the sole insect ectoparasite emerged from the hibernating larvae. The rate of its parasitism was low during winter (1-10%) and high in March (34%) and April (80%). A maximum parasitism of 96% was recorded by mid-May 1984. Mass production and supervised field release of *B. brevicornis* during spring and not later than mid-April are speculated as a possible approach for suppressing the population of *O. nubilalis* larvae hibernating in maize stubble and crop remains.

INTRODUCTION

The European corn borer, *Ostrinia nubilalis* Hbn. (Pyraustidae : Lepidoptera), is one of the insect pests threatening maize (*Zea mays* L.) in Egypt. Full-grown larvae hibernat in stuble and crop remains. El-Saadany (1965) and El-Sherif (1965) reported that larval hibernation starts in November and ends by June while Ismail (1968) mentioned that it may begin as early as of mid-August. Moths emerging from hibernating larvae are the main source of new infestation (Isa et al., 1969 and Mostafa, 1981).

Several biomortality factors may act upon the hibernating larvae of *O. nubilalis* throughout hibernation period. As a matter of fact, local literature on such an aspect of the insect's biology seems to be very few and rather scanty. Thompson and Parker (1928) recorded *Bracon brevicornis* as parasite on the hibernated larvae in Hungary. Barker et al. (1949) observed that parasitism by *B. brevicornis* on hibernating larvae in U.S.A. reached 62%. Platia and Maini (1976) reported *Lydella thompsoni* Herting, *Eriborus terebrae*, Grov. *Diadegma terebrance*, *Chelonus annalipes* Wesm., *Lampoplex alkae* Ellinger & Bacht taken (= *Sinophorus alkae*) and *Bracon hebitor* Say. as responsible for a combined parasitism of 19% on the hibernation generation in Italy.

In 1983, the Supreme Council of Egyptian Universities funded a research program on the biological control of maize borers (Grant No. 830101 Mini). The role of biocontrol agents on the hibernating larvae was among the objectives of that program. This paper presents the knowledge achieved from a two-season investigation on population changes of the hibernating larvae and pupae of *O. nubilalis* and the associated ectoparasite *B. brevicornis*.

MATERIALS AND METHODS

Work was carried out at the Agricultural Research Station. at Sakha, Kafr El-Shikh governorate during the two successive hibernation seasons 1983/84 and 1984/85. For every season, (November - May) maize stalks heavily infested with *O. nubilalis* were collected in November. Bunches of 100 stalks each, were heaped outdoors and leaf exposed to nature. Starting from December, one bunch (100 stalks) was randomly taken from the heap and dissected for larvae and/or pupae of *O. nubilalis*.

Such dissections were repeated twice a month until the end of May. Collected larvae and/or pupae were individually introduced into 1x3" glass vials blocked with cotton wool then kept for observation under laboratory conditions. Vials were examined daily to record normal pupation and moth emergence as well as the emergence of the parasites.

RESULTS

1. Population fluctuation of hibernating larvae and pupae :

The numbers of the hibernating larvae and pupae of *O. nubilalis* collected from the dissected maize stalks in 1983/84 and 1984/85 hibernation seasons are shown in Table (1). This table clearly indicates the general trend of a relatively higher population level in the former season than in the latter one.

In 1983/84, larval count slightly oscillated between 622 and 778/100 stalks during the period early December-early February. Larval population decreased gradually thereafter until mid-April. Pupation was first recorded in February then increased steadily to a peak of 75/100 stalks by early May. Decrease in larval population was rather sharp after mid-April and continued until only 78 larvae/100 stalks were collected by mid-May. Moth emergence began in May and was accompanied by a subsequent decline in pupal population to 18/100 stalks by the middle of the same month.

The pattern of change in larval and pupal populations of *O. nubilalis* in 1984/85 was more or less similar to that of 1983/84. During the winter months (December - February), larval count varied from 350 to 528/100 stalks and a single pupa was recorded in February. Larval population decreased gradually thereafter to 330-300, 250-140 and zero/100 stalks in March, April and May, respectively. Pupation rate was markedly low all the season round as 1-3 and 5-15 pupae/100 stalks were collected in March and April, respectively.

Data in Table (1) lead to the conclusion that the population of *O. nubilalis* hibernating larvae in maize stubble and crop remains keeps more or less stable throughout winter months (December - February), by early spring, *i.e.* starting from March, pupation begins and a gradual decrease in larval population occurs until the larvae disappear by mid-May at most. Data further refer that few pupae were formed in March and the bulk of pupation takes place between early April and early May.

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Table (2) : Percentages of parasitism * by *B. brevicornis* on the hibernating larvae of *O. nubilalis* during 1983/84 and 1984/85 hibernation seasons.

Date of Sampling	Winter Samples		Spring Samples	
	% parasitism		% parasitism	
	1983/84	1984/85	1983/84	1984/85
December	0.00	3.50	4.94	5.49
	0.26	2.00	2.30	12.54
January	0.38	10.30	1.05	34.24
	0.16	8.14	13.46	64.23
February	0.48	7.30	69.63	22.05
	2.64	10.16	96.15	00.00

* Based on larval populations shown in Table (1).

2. The rate of parasitism by *B. brevicornis* on hibernating larvae:

For both seasons of this investigation, the ectoparasite *Bracon brevicornis*. (Braconidae : Hymenoptera) emerged from the hibernating larvae of *O. nubilalis*. No other insect parasites could be recorded from either larvae or pupae. The halfmonthly rates of parasitism by *B. brevicornis* on larvae during 1983/84 and 1984/85 hibernation seasons are given in Table (2).

In 1983/84 season, parasitism was relatively low till early April 1-3%, then jumped to 13% by the end of that month. In May the rate of parasitism increased progressively to 96%. As for 1984/85 season, parasitism during winter ranged 2-10% then increased to 34% and 80% in March and April, respectively.

Such results infer that *B. brevicornis* may act as an active and efficient ectoparasite on *O. nubilalis* larvae throughout hibernation period. The parasite seems to be less active during winter while in spring it consumes a significant portion of larvae (80-96%). Such findings seem to agree with Temerak (1976) who reported *B. brevicornis* as a parasite on the hibernating larvae of *O. nubilalis* from October till February.

From an applied point of view, attempts to promote the efficacy of *B. brevicornis* in spring (March-May) through mass-production and supervised field-releases appear as an effective possible approach to cut down the population of the hibernating larvae of *O. nubilalis* in maize stubble and crop remains left in the field or stored on the roofs of farmers houses and subsequently, minimize new infestations by the pest. The appropriate timing for such releases is speculated to occur no later than mid-April.

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دراسات على المكافحة الحيوية لثاقبات الذرة في مصر

١- تطفل الطفيل Bracon brevicornis على اليرقات
الباشته لدودة الذرة الأوروبية Ostrinia nubilalis

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تصاب نباتات الذرة الشامية في مصر بدودة الذرة الأوروبية Ostrinia nubilalis من عائلة Pyraustidae التابعة لحرشية الأجنحة . وتتبع ثقبات تعداد اليرقات الباشته والعذارى في أحطاب الذرة الشامية خلال موسمي البسات الشتوي ١٩٨٣/١٩٨٤ ، ١٩٨٤/١٩٨٥ بمنطقة سخط بمحافظة كفر الشيخ كان تعداد اليرقات الباشته خلال الموسم الأول أعلا نسبيا منه خلال الموسم الثاني . وصفت عامة كان تعداد اليرقات الباشته ثابتا تقريبا خلال شهور الشتاء (ديسمبر - فبراير) ثم تناقص تدريجيا في الربيع خلال شهور مارس وأبريل إلى أن امتنعت اليرقات من الأحطاب تماما قبل منتصف مايو . وقد بدأ تكوين العذارى خلال شهر فبراير ، وتزايدت أعدادها تدريجيا حتى أوائل مايو في حين خرجت أغلب الفراشات خلال شهر مايو .

ولوحظ أن الطفيل Bracon brevicornis من عائلة Braconidae التابعة لرتبة غشائية الأجنحة هو الطفيل الحشري الوحيد الذي خرج من اليرقات الباشته خلال موسمي الدراسة وقد بلغ معدل تطفل هذا الطفيل أثناء شهور الشتاء إلى ١٠% ، ثم ازداد هذا المعدل إلى ٣٤% خلال شهر مارس و ٨٠% خلال شهر أبريل وبلغ حده الأقصى ٩٦% في منتصف مايو ١٩٨٤ .

وتوحى النتائج المتحصل عليها بأن الاهتمام بالانتاج الموسع الحقل للطفيل B. brevicornis خلال موسم الربيع وقبل منتصف أبريل على الأكثر يمكن أن يكون أسلما مقبولا للمكافحة يؤدى لخفض تعداد اليرقات الباشته في الأحطاب أثناء فترة البسات الشتوي ومن ثم إلى تقليل مستوى الإصابة بالحشرة في الموسم التالي .



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