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STUDIES ON THE POPULATION DENSITY OF CERTAIN LEPIDOPTEROUS INSECT PESTS IN CABBAGE FIELDS

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ABSTRACT

An experiment on the population fluctuation of the diamondback moth; *Plutella xylostella* (L.) and the cabbage looper; *Trichoplusia ni* (Hubner) on cabbage was carried out at El-Manawat village, Giza Governorate along two successive seasons; 2001-2002 and 2002-2003. Results revealed that the diamondback moth was abundant during fall and the beginning of winter, while the cabbage looper occupied summer and fall seasons throughout the two seasons of study. Two high peaks of the former pest population (eggs, larvae and pupae) occurred from the second week of September to the last week of November, as compared with three peaks for *T. ni*; in the second half of July, along September and from the second half of October to the first half of November. The two insects were rare through January and February.

Keywords: cabbage, population fluctuation, *Plutella xylostella, Trichoplusia ni.*

INTRODUCTION

Cruciferous crops are attacked under field conditions by many insect pests in Egypt as well as in many countries in the world. Several species of lepidopterous insects represent the most important pest group infesting these crops. The diamondback moth *Plutella xylostella* (L.) and the cabbage looper *Trichoplusia ni* (Hubner) are of highly economic importance, where they cause considerable damage to crucifers, especially under high densities of their populations which leads to complete defoliation and / or lessens the marketable value of these crops, especially cabbage and cauliflower (Kirby and Slosser, 1984, Stewart and Sears, 1988, Walangululu and Mushagalusa, 2000). Field experiment was conducted to add some knowledge on the population density of these two insect pests populations under ecosystem conditions of the cabbage fields at Giza Governorate.

MATERIALS AND METHODS

The present study was conducted along two successive seasons; 2001-2002 and 2002-2003 at El-Manawat village, Giza Governorate. In mid April, about 1/8 feddan was cultivated with cabbage seedlings at 40 and 80cm between hills and rows, respectively.

One month later, another 1/8 feddan was cultivated adjacent to the first area and a third planting was similarly established one month after the second cultivation. By this method, a continuous cabbage ecosystem was maintained all over the whole year. All agricultural practices were normally applied. No chemical control was used.

From may, 2001 until March, 2003 twenty five randomized plants at weekly intervals were visually examined in the field for all immature stages of

P. xylostella and *T. ni* (eggs, larvae and pupae). Small pieces of leaves with each of the three immature stages were cut and put into paper bags with suitable size and were taken to the laboratory. Number of individuals per-plant was calculated. Obtained data were statistically analyzed according to Snedecor, 1980.

RESULTS AND DISCUSSION

1- Population fluctuations of *Plutella xylostella* (L.):

Data presented in figure 1 (A and B) indicate the population density of *P. xylostalla* (L.) on cabbage plants throughout two successive seasons 2001-2002 and 2002-2003.

1.1- Egg population:

From the date of cultivation in mid April and through 12 weeks, egg count did not exceed 1.7 eggs / plant in the two seasons, then gradually increased to the 1st peak in the 2nd and the 3rd week of September with averages of 5.2 and 6.5 eggs / plant in the two seasons, respectively. Another high peak took place in the 1st and the 2nd week of November with averages of 12.4 and 11.2 eggs / plant in the two seasons, respectively. Egg count declined and continued at very low level till harvest in the first week of March.

1.2- Larval population:

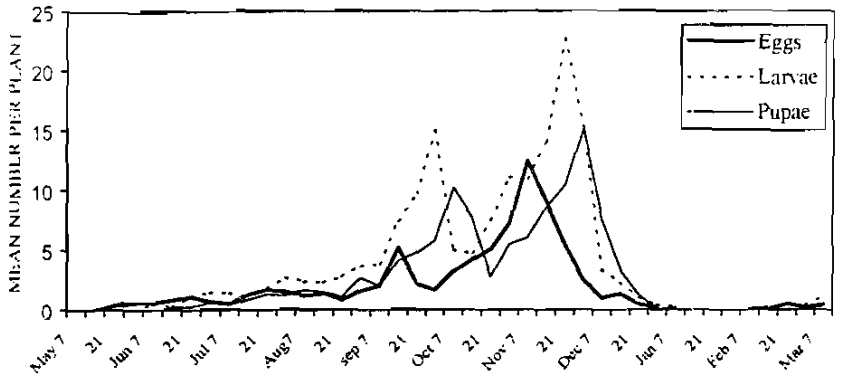
Population fluctuations of larvae had a similar trend of egg population. Two high peaks were observed every season 1-2 weeks after that of eggs. The 1st peak averaged 15.0 and 12.7 larvae / plant in the last week of September and the 1st week of October in the two seasons, respectively. The 2nd peak took place during November with averages of 22.7 and 19.6 larvae / plant in the 3rd week of that month for the two seasons, respectively. Gradual decrease in larval count occurred during December then sharply declined until the end of each season in March.

1.3- Pupal population:

Pupal count was closely correlated with that of larvae, where its peaks took place one week after larval peaks. Two peaks of pupae occurred every season; 10.2 and 15.1 pupae / plant in the 1st week of October and the 3rd week of November, respectively in the first season. In the second season, the two peaks came to 8.3 and 13.7 pupae / plant in the 2nd week of October and the 3rd week of November, respectively. Afterwards, pupal population sharply declined and continued at very low level till the 1st week of March, where harvest had been completed.

As indicated in table 1, a total of 1958 eggs, 3940 larvae and 2746 pupae of the diamondback moth were collected in the first season and 2145, 3949, and 2263 of eggs, larvae and pupae, respectively were obtained in the second season. The period September to November had the greatest portion of the three respective stages representing 76.7, 80.6 and 75.7 % and 76.8, 75.0 and 78.9% of the total collected numbers for the two respective seasons. Both July and August altogether ranked the second, while the period January- March had rare count of this insect population.

A



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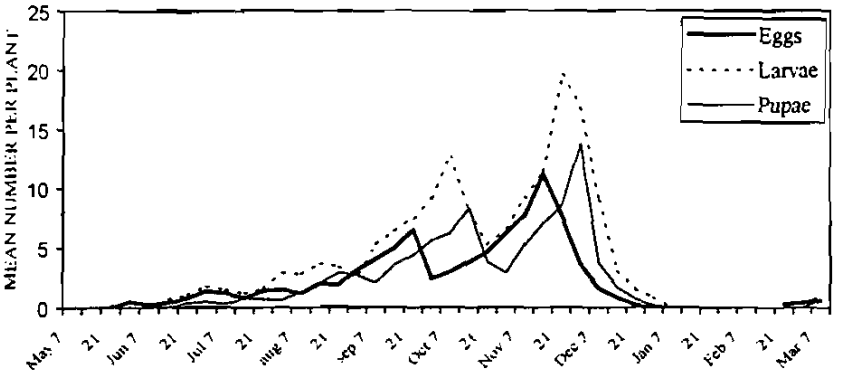


Fig (1). Population fluctuations of eggs, larvae and pupae of the diamondback moth *Plutella xylostella* (L.) in the cabbage fields at El-Manawat village, Giza Governorate along 2001-2002 (A) and 2002-2003 (B) seasons.

Table (1): Monthly abundance of the diamondback moth *Plutella xylostella* (L.) in cabbage field at El-Manawat village, Giza Governorate along the two successive seasons 2001-2002 and 2002-2003.

MONTH	TOTAL NUMBER OF INDIVIDUALS					
	2001-2002			2002-2003		
	EGGS	LARVAE	PUPAE	EGGS	LARVAE	PUPAE
MAY	23	0	0	13	0	0
JUNE	81	85	27	70	90	24
JULY	125	177	71	122	184	60
AUGUST	125	281	200	208	317	222
SEPTEMBER	277	900	417	455	717	392
OCTOBER	493	707	657	443	820	529
NOVEMBER	732	1570	1004	749	1426	864
DECEMBER	73	176	316	65	363	157
JANUARY	0	7	14	0	0	0
FEBRUARY	20	10	0	17	9	0
MARCH	9	27	10	16	23	15
L.S.D. 5%	68.85	106.36	85.56	56.53	99.50	69.04
L.S.D. 1%	93.71	144.76	116.44	76.95	135.42	93.96

2- Population fluctuations of the cabbage looper *Trichoplusia ni* (Hubner):

Data in figure 2 (A and B) indicate that the cabbage looper T. ni (Hubner) was abundant during late summer and during autumn. Three peaks of eggs, larvae and pupae were obtained along the two seasons of study.

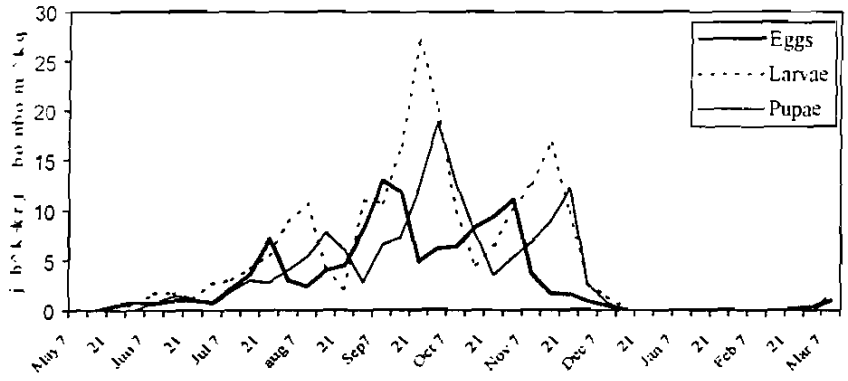
2.1- Egg population:

The first presence of eggs occurred 3-4 weeks after cultivation in the two seasons, where the population was low until the first week of July, after which it obviously increased to the 1st peak with averages of 7.2 and 5.1 eggs / plant in the 3rd and the 2nd week of July in the two seasons, respectively. Slight fluctuation occurred for several weeks before the population arose to the 2nd and the 3rd peaks; 13.0 and 11.1 eggs / plant on September, 7 and October, 28, respectively in the first season and 8.7 and 12.6 eggs / plant on September, 14 and October, 21,respectively in the second season. Egg population decreased then sharply declined since December till the end of the season in the first week of March.

2.2- Larval population:

Larval count had the same trend of eggs. It reached its peaks 2-3 weeks after egg peaks. Three peaks of larval population took place every season with averages of 10.7, 27.2 and 16.8 larvae / plant on August, 7, September, 21 and November, 14, respectively in the first season and 10.5, 16.7 and 22.5 larvae / plant on August, 7, September, 28 and November, 14, respectively in the second season. Larval population decreased to the least level along the period from the second half of December until complete harvest in the beginning of March for the two seasons of study.

A



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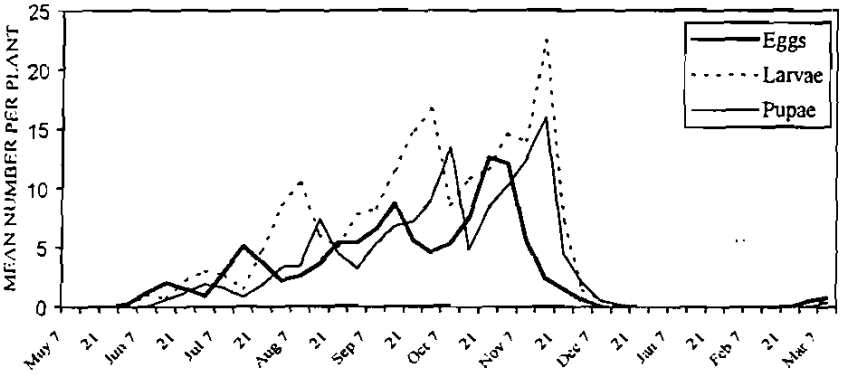

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Fig. (2). Population fluctuations of eggs, larvae and pupae of the cabbage looper *Trichoplusia ni* (Hubner.) in the cabbage fields at El-Manawat village, Giza Governorate along 2001-2002 (A) and 2002-2003 (B) seasons.

2.3- Pupal population:

Population of pupae closely followed the larval one. Along the two seasons, every peak of pupae took place one week after that of larvae. Three peaks took place every season with averages of 7.8, 18.9 and 12.2 pupae / plant on August, 14, September, 28 and November, 21, respectively in the first season and 7.4, 13.5 and 16.0 pupae / plant on August, 14, October, 7 and November, 14, respectively in the second season. During winter, pupal count declined to the least level and continued so until complete harvest in the first week of March for the two seasons of study.

Data presented in table 2, revealed that a total of 3039 eggs, 5217 larvae and 3613 pupae were collected along the first season, of which 64.9, 71.0 and 72.5 %, respectively were obtained through September to November. In the second season, the collected individuals totaled 2784 eggs, 4932 larvae and 3135 pupae, where 65.8, 72.0 and 77.5 % of which were obtained during the previous mentioned period. Populations of the three stages were rare or nil along winter until the beginning of March for the two seasons.

Table (2): Monthly abundance of the cabbage looper Trichoplusia ni (Hubner) in cabbage field at El-Manawat village, Giza Governorate along the two successive seasons 2001-2002 and 2002-2003.

MONTH	TOTAL NUMBER OF INDIVIDUALS					
	2001-2002			2002-2003		
	EGGS	LARVAE	PUPAE	EGGS	LARVAE	PUPAE
MAY	33	17	0	7	0	0
JUNE	103	182	101	140	174	92
JULY	400	530	293	348	438	189
AUGUST	475	699	554	425	736	461
SEPTEMBER	898	1863	1128	637	1286	706
OCTOBER	881	776	727	939	1140	853
NOVEMBER	196	1066	763	255	1126	871
DECEMBER	12	21	21	0	15	12
JANUARY	0	0	0	0	0	0
FEBRUARY	15	10	4	13	0	0
MARCH	26	39	22	20	17	9
L.S.D. 5%	85.9	161.1	125.8	74.6	165.5	116.2
L.S.D. 1%	117.8	220.7	172.3	102.1	226.7	159.1

Results of the present study agree with findings of, Toba et al., 1973, Annamalia et al., 1988, and Bell and McGeoch, 1996, who recorded 2-3 peaks a year of the diamondback moth and the cabbage looper in cruciferous fields. In addition, Liu et al., 1985, Sparks and Liu, 1999, and Haseeb et al., 2001, reported that the highest population of the two insects occurred during the fall. On the other hand, Taleker and Lee, 1985, and Vial et al. 1991, mentioned that the cabbage and cauliflower fields were free from the cabbage looper through January and February.

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دراسات على الكثافة العددية لآفات حشرية معينة من حرشفية الأجنحة فى حقول الكرنب

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أجريت دراسات على الكثافة العددية للأطوار غير الكاملة (البيض واليرقات والعذارى) لكل من الفراشة ذات الظهر الماسى *Plutella xylostella* (L.) وفراشة الكرنب نصف القياسة *Trichoplusia ni* (Hubner) فى حقول الكرنب بمحافظة الجيزة فى الموسمين المتتاليين ٢٠٠١-٢٠٠٢ ، ٢٠٠٢-٢٠٠٣ ، وقد أوضحت النتائج تواجد الآفة الحشرية الأولى بوفرة فى الخريف وأوائل الشتاء ، بينما تواجدت الآفة الثانية فى أواخر الصيف وطوال الخريف، كما سجلت قمتان لتعداد اليرقات فى كل موسم للفراشة ذات الظهر الماسى وذلك فى الأسابيع الرابع من سبتمبر، الثالث من نوفمبر للموسم الأول، على التوالى، وفى الأسابيع الأول من أكتوبر ، الثالث من نوفمبر للموسم الثانى، على التوالى، أما فراشة الكرنب نصف القياسة فقد سجل لها ثلاث قمم للتعداد وذلك فى الأسابيع الأول من أغسطس ، الثالث من سبتمبر ، الثانى من نوفمبر للموسم الأول، على التوالى، وفى الأسابيع الأول من أغسطس ، الرابع من سبتمبر ، الثانى من نوفمبر للموسم الثانى، على التوالى. ومن ناحية أخرى فقد أظهرت النتائج سلامة حقول الكرنب من الاصابة بالحشرتين فى الفترة من النصف الثانى من ديسمبر الى نهاية موسم النمو فى الأسبوع الأول من مارس، حيث توقف نشاطهما أو تواجدتا بأعداد نادرة، وعلى ذلك فالخريف هو أنسب الأوقات لتنفيذ أى برنامج لمكافحة هاتين الآفتين على النباتات الصليبية نظرا لتواجدهما بأعلى كثافة فى هذه الفترة.