

EFFECT OF WINTRY CROPS AND THEIR AGRICULTURAL PRACTICES ON INFESTATION BY PINK BOLLWORM *PECTINOPHORA GOSSYPIELLA* (SAUND.) IN THE NEXT YEAR

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Abstract

The present work was carried out during three seasons (2002, 2003, and 2004) at Farm of Sakha Agricultural Research Station, Kafr El-Sheikh Governorate to evaluate the effect of wintry crops and their agricultural practices on infestation of pink bollworm *Pectinophora gossypiella* (Saund.) in the next season. Results during the three inspection dates, and the three depths of buried cotton bolls in four crops throughout the three tested seasons of 2002, 2003, and 2004 were estimated. The mortality % of pink bollworm larvae increased when the depth of buried bolls increased, and the inspection date to be late. The highest means of mortality % were recorded in the sugar beet and faba bean crops, with slight differences between each other. The lowest averages of mortality % were recorded by the wheat and Egyptian clover crops with slight differences between them. That may be due to the agricultural practices conducted in the sugar beet and faba bean fields and neglected in the wheat and clover fields (for example, the tillage). Also, the differences of irrigation times in the four selected crops, and probably, the crops themselves may be affected the mortality % of PBW larvae. The general mean of PBW mortality % were 63.8, 62.4, 37.8, 33.4 % for sugar beet, faba bean, wheat, and clover crops fields, respectively, and 41.5, 49.3, and 57.2 % for 5, 10, 15 cm. depth, respectively. There were highly significant differences between the crops and the depths of buried cotton bolls.

Key words: Wintry crops, Agric. Practices, PBW, *Pectinophora gossypiella*, Infestation.

INTRODUCTION

The diapaused pink bollworm *Pectinophora gossypiella* (Saund.) larvae in the cotton bolls at the end of cotton season are considered the main source of infestation to the cotton plants during next seasons. Hussain and Kostandy (2002) found a positive correlation between the average numbers of pink bollworm in green cotton bolls at the end of the cotton season and the average numbers of moths emerged from diapaused larvae in the following spring. Henneberry (1986) reported that bolls destruction process are considered the backbone method for pink bollworm control by stalk shredding to enhance uniform and deep burial of shredded plant debris and winter irrigation treatments, effectively reduced the numbers of overwintering PBW

larvae. Wintry crops cultivated after cotton crop and normal agricultural practices effects on numbers of diapaused larvae in cotton bolls fall in the soil, were investigated. Results obtained by previous investigators show that the percentage of larval mortality of PBW was high in the field of berseem, broad beans and other vegetables than wheat fields (Shehata 1973, Khalifa *et al.* 1975, Henneberry and Clayton, 1983 & Hossain, 1990) . So, this work study the effects of wintry crops and their agricultural practices on the reduce of diapaused larvae of PBW, which reduce correspondently early infestation of cotton receptors in next year.

MATERIALS AND METHODS

Closed and infested cotton bolls were collected at the end of three tested experimental seasons, 2002, 2003, & 2004, and taken to the laboratory and left to be dry on the canopy. Samples of dried infested bolls by pink bollworm (diapaused larvae) were prepared (25 bolls/replicate). Four wintry crops (wheat, clover, faba bean, and sugar beet) were chosen to cultivated in fields didn't cultivate with cotton plants during the previous year. Burial the samples at three depths (5, 10, and 15cm.), twelve replicates for each tested depth. 36 replicates for each crop. Buried infested bolls/replicate were conducted at early November under each crop and were placed 50 cm. in distance between each other in each crop. The crops were received the normal agricultural practices. Four inspections or samples of each depth were picked at early of March, April, and May of every crop and kept in tightly closed polyethylene bags, then dissected and examined in the labratory, for determining the number of survival and dead larvae of PBW. Also, the developed pupae were counted in each replicate. Effect of each crop were evaluated according to their effectiveness in reducing the number of survival pink bollworm larvae.

$$\% \text{ mortality} = \frac{\text{No. of dead larvae}}{\text{Total No. of larvae (survival and dead)}} \times 100$$

The statistical analysis was conducted using the soft ware programme of MSTATC.

RESULTS AND DISCUSSION

Depth of 5 cm. and its effect on the PBW mortality

Inspection of early March

Data in Table (1) show the means of mortality % of PBW larvae per 100 buried bolls in faba bean, sugar beet, wheat, and clover fields. Mortality % were (41.2, 36.8, and 35.5 %), (37.0, 33.3, and 37.5), (18.0, 23.2, and 21.5 %) and (17.9,

Table 1. Average mortality % of pink bollworm larvae / 3600 bolls buried under four crops at different depths during 2002, 2003 & 2004 seasons at Sakha, Kafr El-Sheikh Governorate.

Season	Crops & Depth Dates	Mortality in Sugar beet (%)			Mortality in Wheat (%)			Mortality in Clover (%)			Mortality in Faba bean (%)		
		5 cm.	10 cm.	15 cm.	5 cm.	10 cm.	15 cm.	5 cm.	10 cm.	15 cm.	5 cm.	10 cm.	15 cm.
2002	7/3	37.0	57.1	74.6	18.0	20.6	25.8	17.9	24.5	25.5	41.2	57.3	66.7
	9/4	60.3	73.2	80.7	34.8	35.2	39.6	26.9	34.4	41.4	63.6	71.2	81.0
	12/5	81.2	91.1	94.0	54.7	40.2	51.1	39.1	47.1	55.4	79.1	92.7	96.7
Average %		59.5	73.8	83.1	35.8	32.0	38.8	28.0	35.3	40.8	61.3	73.7	81.5
2003	1/3	33.3	57.7	53.4	23.2	25.7	25.4	15.1	27.5	25.0	36.8	47.2	76.8
	1/4	50.0	72.2	75.9	31.9	34.8	34.7	19.8	36.2	33.8	50.9	66.0	66.7
	1/5	73.7	87.3	87.0	41.1	48.4	55.9	31.6	48.5	54.4	69.0	76.8	85.1
Average %		52.3	72.4	72.1	32.1	36.3	38.7	22.2	37.4	37.7	52.2	60.3	76.2
2004	1/3	37.5	36.4	50.0	21.5	30.3	44.4	14.1	25.3	34.0	35.5	48.0	44.9
	1/4	46.3	44.6	61.5	28.2	36.5	51.4	27.0	31.0	39.5	35.6	55.7	60.3
	1/5	70.1	66.1	75.5	35.3	46.2	63.4	35.6	31.2	59.5	57.0	65.7	66.7
Average %		51.3	47.0	62.3	35.5	37.7	53.1	25.6	29.2	44.3	42.7	56.5	57.3

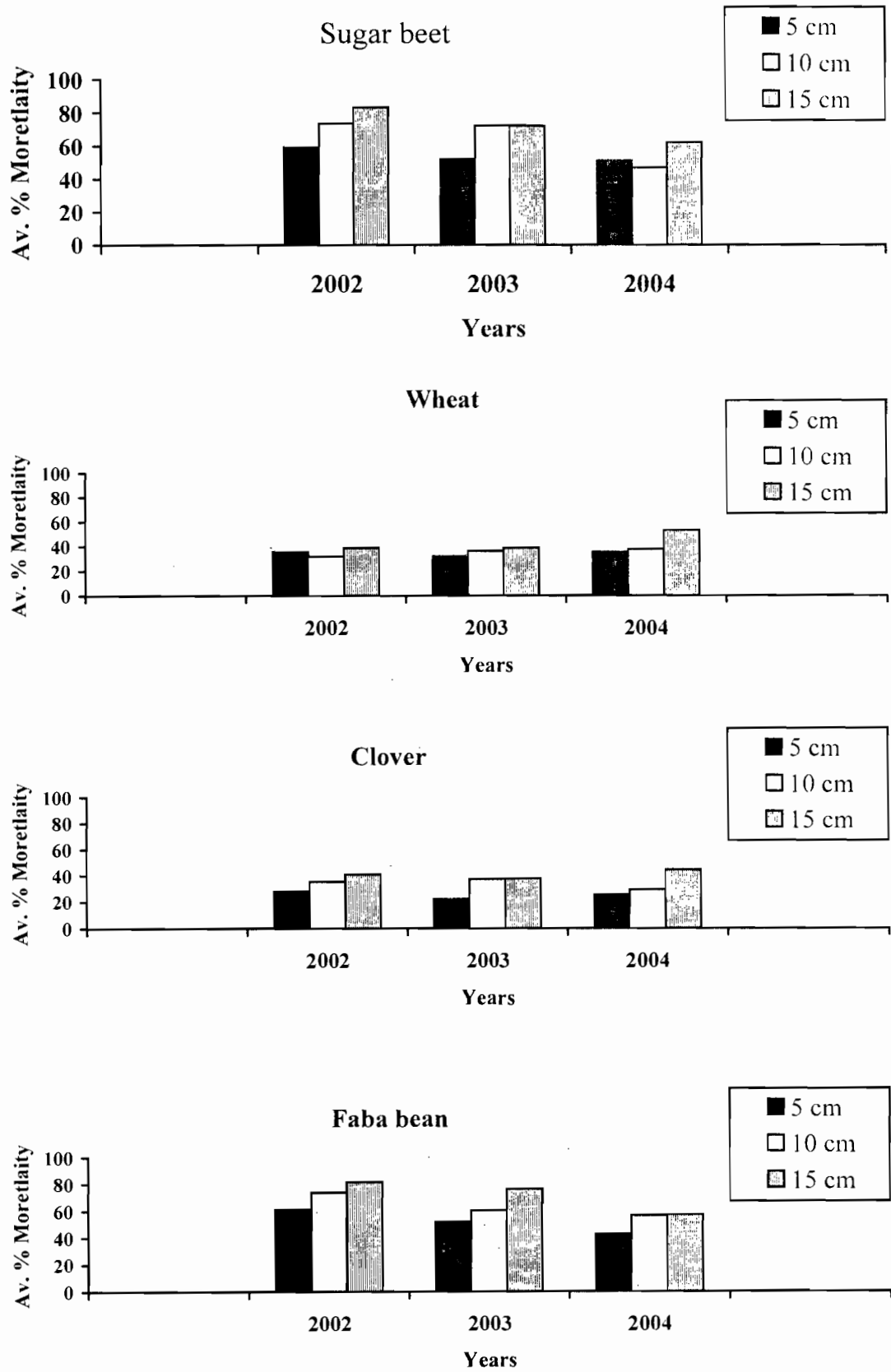


Fig. 1. Average mortality % of pink bollworm larvae/bolls buried under four crops at different depth (5, 10, and 15 cm.) during 2002, 2003 & 2004 seasons at Sakha, Kafr El-Sheikh Governorate.

15.1, and 14.1 %) for the forementioned crops, during 2002, 2003, and 2004 seasons, respectively. The least mean % of mortality was estimated by 15.1 % in clover fields at 5 cm depth.

Inspection of early April

Data in Table (1) show the means of mortality % of PBW larvae per 100 buried bolls in faba bean, sugar beet, wheat, and clover fields. Percentage recorded were (63.6, 50.9, and 35.6 %), (60.3, 50.0, and 46.3), (34.8, 31.9, and 28.2 %) and (26.9, 19.8, and 27.0 %) per crop, during 2002, 2003, and 2004 seasons, respectively.

Inspection of early May

Results in Table (1) show the means of mortality % of PBW larvae per 100 buried bolls in sugar beet, faba bean, wheat, and clover fields and were (81.2, 73.7, and 70.1 %), (79.1, 69.0, and 57.0 %), (54.7, 41.1, 35.3 %) and (39.1, 31.6, and 35.6 %) per crop during 2002, 2003, and 2004 seasons, respectively. The highest mean % of mortality occurred during May in sugar beet fields at 5 cm depth. It was estimated by 81.2 % during the three seasons of experiments.

Depth of 10 cm. and its effect on the PBW-mortality

Inspection of early March

Results in Table (1) show the means of mortality % of PBW larvae per 100 buried bolls in faba bean, sugar beet, clover and wheat fields and were (57.3, 47.2, and 48.0 %), (57.1, 57.7, and 36.4 %), (24.5, 27.5, and 25.3 %) and (20.6, 25.7, and 30.3 %) per crop during 2002, 2003, and 2004 seasons, respectively. The highest average mean of mortality % was estimated in faba bean (50.8 %), while the lowest was in clover (25.5 %) in the 3 experiment seasons.

Inspection of early April

Results in Table (1) show the means of mortality % of PBW larvae per 100 buried bolls in sugar beet, faba bean, wheat and clover fields and were (73.2, 72.2, and 44.6 %), (71.2, 66.0, and 55.7 %), (35.2, 34.8, and 36.5 %) and (34.4, 36.2 and 31.0 %) per crop during 2002, 2003 and 2004 seasons, respectively. The highest average mean of mortality % during the 3 seasons was estimated in faba bean crop (64.3 %) in contrast clover caused the lowest % of mortality (33.8 %).

Inspection of early May

Results in Table (1) show the means of mortality % of PBW larvae per 100 buried bolls in faba bean, sugar beet, wheat and clover fields and were (92.7, 76.8 and 65.7 %), (91.1, 87.3, and 66.1 %), (40.2, 48.4, and 46.2 %) and (47.1, 48.5, and 31.2 %) per crop during 2002, 2003, and 2004 seasons, respectively.

In conclusion, the highest mortality % of PBW diapaused larvae was recorded in sugar beet during May on 10 cm depth (average mean 81.5 %), while the lowest was estimated during March of the 3 seasons in wheat crop (25.5 %).

Depth of 15 cm. and its effect on the PBW-mortality

Inspection of early March

Data in Table (1) show the means of mortality % of PBW larvae per 100 buried bolls in sugar beet, faba bean, wheat and clover fields and were (74.6, 53.4, and 50.0 %), (41.2, 36.8 and 35.5 %), (25.8, 25.4, and 44.4 %) and (25.5, 25.0, and 34.0 %) per crop during 2002, 2003, and 2004 seasons, respectively.

Inspection of early April

Data in Table (1) show the means of mortality % of PBW larvae per 100 buried bolls in faba bean, sugar beet, clover, and wheat fields and were (81.0, 66.7, and 60.3 %), (80.7, 75.9, and 61.5 %), (41.4, 33.8, and 39.5 %), and (39.6, 34.7, and 51.4 %) per crop during 2002, 2003, and 2004 seasons, respectively.

Inspection of early May

Data in Table (1) show the mean of mortality % of PBW larvae per 25 buried bolls in faba bean, sugar beet, clover, and wheat fields were (96.7, 85.1, and 66.7 %), (94.0, 87.0, and 75.5%), (55.4, 54.4, and 59.5 %) and (51.1, 55.9, and 63.4%) per crop during 2002, 2003, and 2004 seasons, respectively. In conclusion, the highest % of mortality occur on 15 cm depth during May of the 3 seasons with average of 85.5 % in sugar beet crop.

Reviewing the above mentioned results during three inspection dates, and the three depths in four crops during the three seasons as shown in Table (1) & Fig. (1). The mortality % of PBW larvae increased, when the depth of buried bolls increased, and the inspection date to be late as well as the late inspection. The highest means of mortality % of PBW larvae were recorded in the sugar beet and faba bean fields and there were slight differences between the results of sugar beet and faba bean crops. The lowest of mortality percentage of PBW larvae were detected in the wheat and clover crops, and also, there were slight differences between the results of wheat and

clover crops. It could be proved high differences between the two groups of crops to some agricultural practices which were found in the sugar beet and faba bean crops, and not found in the wheat and clover crops i.e, the tillage, and differences in numbers and/or periods in the four crops. Probably the crops themselves are affected the mortality % of PBW larvae. Accordingly, the percentage of larval mortality was high in the fields of sugar beet followed by faba bean & clover than wheat. Otherwise the majority of survivals was obtained when the land was cultivated with clover at the three depth of burial bolls. This result is in agreement with those of El-Sayed (1965) who stated that the access of soil moisture followed by an increase in % of PBW pupation and moth emergence. In contrast, % of mortality increased gradually when land was cultivated with sugar beet & brood bean. This result is in agreement with those of Shehata 1973, Khalifa *et al.* 1975 & Hossain 1990.

Also, Bariola (1984) found that the buried of diapaused PBW larvae reduced the survival rate below that of larvae didn't buried. The earlier burial causing greater reduction in survival than the later burials one, and also found that, the early irrigation significantly reduced survival and emergence of moths than in the late irrigation in buried bolls in laboratory. Henneberry (1986) also, found in USA farms that, the stalk shredding and deep burial of debris shredded plant, and winter irrigation treatments, effectively reduced the numbers of overwintering pink bollworm, and the most effective, practical tillage has been deep plowing that results in turning over the soil to a depth of 15 cm. In addition, El-Nemaky (2000) found that, the adult emergence of the PBW decreased, when the depth of buried bolls increased, and the soil was irrigated at interval periods of 21 days in the laboratory, and no adult emergence was obtained when the bolls buried at depths of 35 and 45 cm. either in irrigated or non-irrigated soil. In the present study the average of mortality % of PBW larvae were 63.8, 62.4, 33.4, and 32.5 % for sugar beet, faba bean, wheat, and clover crops, respectively. It was 41.5, 49.3, and 57.2 % at the depth of 5, 10, and 15 cm., respectively. There were highly significant differences the crops and between the depths and there were interaction effects between the crop type and word depth on the mortality of PBW as following in Table (2).

1700 EFFECT OF WINTRY CROPS AND THEIR AGRICULTURAL PRACTICES ON INFESTATION BY PINK BOLLWORM *PECTINOPHORA GOSSYPIELLA* (SAUND.) IN THE NEXT YEAR

Table 2. Combined analysis of variance for three depth of examination and four crops over three years for % mortality of pink bollworm diapause larvae.

S. O. V.	d. f.	% mortality of pink bollworm diapause larvae/25 bolls
Years (Y)	2	1058.04**
Error	9	105.69
Depth (D)	2	2808.52 **
D X Y	4	76.10
Error	18	57.97
Crops (C)	3	10085.82**
C X Y	6	548.12 **
C X D	6	41.26
C X Y X D	12	154.11*
Error	81	73.23
C. V. %		17.26

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تأثير المحاصيل الشتوية والعمليات الزراعية التي تتم فيها على الإصابة بدودة اللوز القرنفلية (*Pectinophora gossypiella* (Saund.) في العام التالي.

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أجريت هذه التجارب خلال ثلاث مواسم ٢٠٠٢، ٢٠٠٣، ٢٠٠٤ في مزرعة محطة بحوث سخا - محافظة كفر الشيخ بهدف دراسة تأثير المحاصيل الشتوية والعمليات الزراعية التي تتم فيها على الإصابة بدودة اللوز القرنفلية في العام التالي، أشارت النتائج إلى أن مواعيد الفحص المختلفة لثلاث أعماق تم دفن لوز مصاب فيها في أربع محاصيل شتوية خلال الثلاث سنوات. وأوضحت النتائج أن نسبة الموت لديدان اللوز القرنفلية زادت كلما زادت أعماق اللوز المدفون، وكذلك توقيت الفحص المتأخر سجلت أعلى نسبة موت في محاصيل بنجر السكر والفول البلدى مع وجود اختلافات بسيطة بين نتائج المحصولين ، وأن النسب الأقل من متوسطات نسب الموت في محصول القمح والبرسيم. وذلك لوجود بعض العمليات الزراعية في محصولي بنجر السكر والفول البلدى ولا توجد في محصولي القمح والبرسيم (مثلا عملية العزيق)، كذلك وجود اختلافات في معدل الري في الأربعة محاصيل. ومن المحتمل أن المحاصيل نفسها أثرت على نسبة الموت ليرقات دودة اللوز القرنفلية. بلغ متوسط نسبة الموت ليرقات دودة اللوز القرنفلية ٦٣,٨ ، ٦٢,٤ ، ٣٧,٨ و ٣٣,٤ % لمحاصيل بنجر السكر و الفول البلدى و القمح والبرسيم على التوالي. كما سجلت نسب الموت ٤١,٥ ، ٤٩,٣ ، و ٥٧,٢ % لأعماق ٥ ، ١٠ ، ١٥ سم على التوالي.