

SURVEY AND POPULATION FLUCTUATIONS OF MITES AND INSECTS INFESTING MAIZE STORES AT EL DAKAHLIA GOVERNORATE

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Abstract

Numbers of insect and mite species associated with the maize stores at Dakhia Governorate were surveyed during two successive years; 2005 and 2006. Thirty three insect and mite species were recorded belonging to 13 families.

Regarding to insects, the *Tribolium castaneum* Herbst, *Sitophilus oryzae* L. and *Liposcelis bostrychophilus* Bado were found in high numbers and cause a serious damage. While, *Aliphtobus laevigatus* and *Lasioderma serricorne* and *Oryzaephilus surinamensis* L. were presented in moderate numbers. Moreover, the *Carpophilus Mutitatus* Erichson was recorded with rare numbers.

On the other hand, most of maize stored grain samples had positive mite infestations. The infestation of *Tyrophagus putrescentiae* (Schrank), *Acarus siro* L., and *Glycyphagus ornatus* (Kramer) revealed with high numbers. Also, the predaceous mites; *Cheyletus eruditus* (Schrank), *C. malaccensis* (Oud.), *Blattisocius tarsalis* (Berlese) and *B. keegani* Fox were recorded with high level and played an important role in biological control of destructive insects or mites. However, the remaining mite species were detected in moderate or few numbers.

Data of population fluctuations revealed two peaks of *Sitophilus oryzae* and *Tribolium castaneum* during two successive studied years. While, *Liposcelis bostrychophilus* recorded two peaks in the first year and one peak in the second year. Early detection and management of these infestations is critical for maintaining quality and integrity of food products.

INTRODUCTION

Maize became one of the most important cereal crops in the world where it is a staple for a large proportion of population. It is an important component of farming systems and diet of many people. This plant is subjected to many pests which in away or another resulting a great reduction of the yield. Insect and mite infestations in stored maize grain can arise from several different sources. Some species can infest grain crops either in the field or after the crop has been collected and harvested (Cogburn and Vick 1981, Dix and All, 1986). Trucks and railcars used to transport grain (Cogburn, 1973) and the immediate environmental factors around

storage facilities are also one of the important sources of infestations (Dowdy and McGaughey, 1994)

Mites and insects infesting grain that has been stored for several years all over the world causing a lot of damage, especially in the areas where temperature and humidity are high throughout the year. Mites are considered of secondary importance to insects' infestation. Although their presence in stored grain leads to a decrease in grain quality also. Thus information on the occurrence of both insect and mite species in stored grain together with data of their damage attributed to them would be useful in assessing their economic significance. Therefore, this study aimed to investigate the following points:

- 1- Species diversity of mites and insects infesting maize stores at Dakhlia Governorate.
- 2- The population fluctuations of the most important prevailing insect and mite species infesting maize stores.

MATERIALS AND METHODS

Survey and population fluctuations of mites and insects infesting maize stores were carried out during two successive years 2005&2006, throughout Dakhlia Governorate.

Experimental samples of stored food products were collected monthly from different stores during two successive years in this study where possible sample of maize, composite of 300 grams were collected from 16 untreated maize stores from different sites at Dakahlia Governorate during two successive years. The samples were placed in plastics bags, sealed and brought back to the laboratory for investigation. Mites were extracted using the modified tullgren funnels for 24 hours. The extracted mites received in Petri dishes filled with water. Living adult mites or their stages were picked by a camel hair brush no, 00. Adult mite specimens of the collected species were examined by stereomicroscope cleaned in Nesbitts solutions and then mounted in hoyers solutions on glass slides for identifications.

The adult and immature stages of insects and mites from each sample were identified by scientists in Plant Protection Research Institute and Ain shams University, Acarology and Entomology departments and the mean numbers of each species were recorded.

RESULTS AND DISCUSSION

1- Survey and diversity of insect and mite species infesting maize stores at Dakhlia Governorate:

Revealed data in tables (1&2) listed thirty three insect and mite species belonging to thirteen families were collected from maize stores during two studied years (2005&2006). Regarding to insect species associated with maize stores at Dakhlia Governorate, seven insect species representing 6 families and two orders were collected among the maize stores. These species included 6 Coleoptera, and 1 Psocoptera (Table 1). The most abundant species were *Tribolium castaneum* Herbst, *Sitophilus oryzae* Linnaeus and *Liposcelis bostrychophilus* Bado. While, *Aliphtobus laevigatus* and *Lasioderma serricorne* and *Oryzaephilus surinamensis* Linnaeus were found in moderate numbers. Moreover, the *Carpophilum mutitatus* Erichson was recorded with rare numbers.

The number of stored-product insects collected from the stores we surveyed was fewer than those collected by Platt *et al.*, (1998) and Arbogast *et al.*, (2000), whereas, Arbogast *et al.* (2000) collected eight stored-product beetles. Platt *et al.*, (1998) captured 13 insect species. Differences in species composition among different studies may be a result of the types of food products held in the stores and the level of sanitation, pest management practiced and environmental factors (Roesli *et al.*, 2003). Generally, Coleopteran pests are usually of minor importance in pre harvest maize, and grain losses start to increase after 4-5 month of storage (Borgemeister *et al.*, 1998)

On the other hand, most of maize stored grain samples had positive mite infestations. The infestation of *Tyrophagus putrescentiae* (Schrank), *Acarus siro* and *Glycyphagus ornatus* (Kramer) revealed high numbers. However, *Tyrophagus longior* (Gervais) reported moderate numbers (table, 2).

In the present study, predaceous mites were normally distributed. Table (2) indicated that *Cheyletus eruditus* (Schrank), *Cheyletus malaccensis* (Oudemans), *Blattisocius tarsalis* (Berlese) and *B. keegani* Fox were recorded with high levels. While, species of the genera *Cheletomorpha*, *Hemicheyletus*, *Androlaelaps* and *Proctolaelaps* were observed with moderate abundance. The remaining mite species, included in table (2), were detected in few or rare numbers.

Tyrophagus, *Acarus* and *Glycyphagus* are considered the most important granary mite; they cause direct injury by feeding and losing weight of stored grains and contaminating with old skins and dead bodies. Also, they multiply in dry grain and feed in storage fungi, so infested materials became unstable and their eating cause digestive troubles (Sinha *et al.*, 1962; Sinha, 1964).

Similarly, several authors recorded these species associated with maize stores (Wafa *et al.*, 1966; Fawzy, 1996; El Sanady, 2005).

The presence of predatory mites herein; *Cheyletus malaccensis* and *C. eruditus* and others might be of great benefit in the biological control and keep the populations of destructive insect and mite pest populations. Biological studies on these genera were carried out by many authors (Saleh *et al.* 1986) who reared *C. malaccensis* on different destructive pests. Besides, Baker (1967) revealed that predatory mite; *Blattisocius* sp fed eggs of different grain beetles: *T. castaneum*, *T. confusum* and *O. surinamesis*. Also, Fawazy (1996) & El Sanady (2005) reared this genus on different acarine pests. Therefore, the biotic predatory potential of these species is very important in biological control section and needs further research.

2- Population fluctuations of prevailing insects:

Fig. (1) revealed that the population dynamics of *Tribolium castaneum* varied considerably throughout the course of the year during the two considered years at Dakhliya Governorate. Regarding infestation levels, this insect recorded with two peaks during the two successive years. The population density of insect infestation gradually increased from January recording the first peak in May and then decreased gradually in June and increased gradually recording the second peak in September then the population density decreased gradually to the end of the year, during 2005&2006 years. This annual pattern of infestation indicated that the infestations levels fluctuated among years, thus weather conditions and other unconsidered factors greatly influenced the level of infestations.

Population fluctuations of *Liposcelis bostrychophilus* represented in this study by Fig. (2) The insect numbers during 2006 greatly exceed the number during 2005. Three peaks were recorded in 2005; the highest peak was recorded in September, while the first and second peaks were detected in May and July, respectively. Moreover data showed that; two peaks were recorded in 2006 during May and October.

The infestations of the maize stores at Dakhliya Governorate during two considered years by *Sitophilus oryzae* was illustrated by Fig. (3) Where during 2005, three peaks were observed the higher one was recorded in Nov. while the others found in June and Sep. in the second year; 2006, also three peaks were recorded in June, September and Nov., respectively.

These fluctuations in the total number of adults of all insect species found in stores cleared that there is different factors were responsible for total number of insect species found among stores. These differences among the maize stores in the types and numbers of insects found may be related to how the food products were

inspected and managed, stores dimensions, environment and other factors, and these aspects were beyond the scope of our study. The results recorded are in harmony with those achieved by (Roesli *et al.*, 2003).

Table 1. Survey of insects infesting maize stores at Dakahlia Governorates.

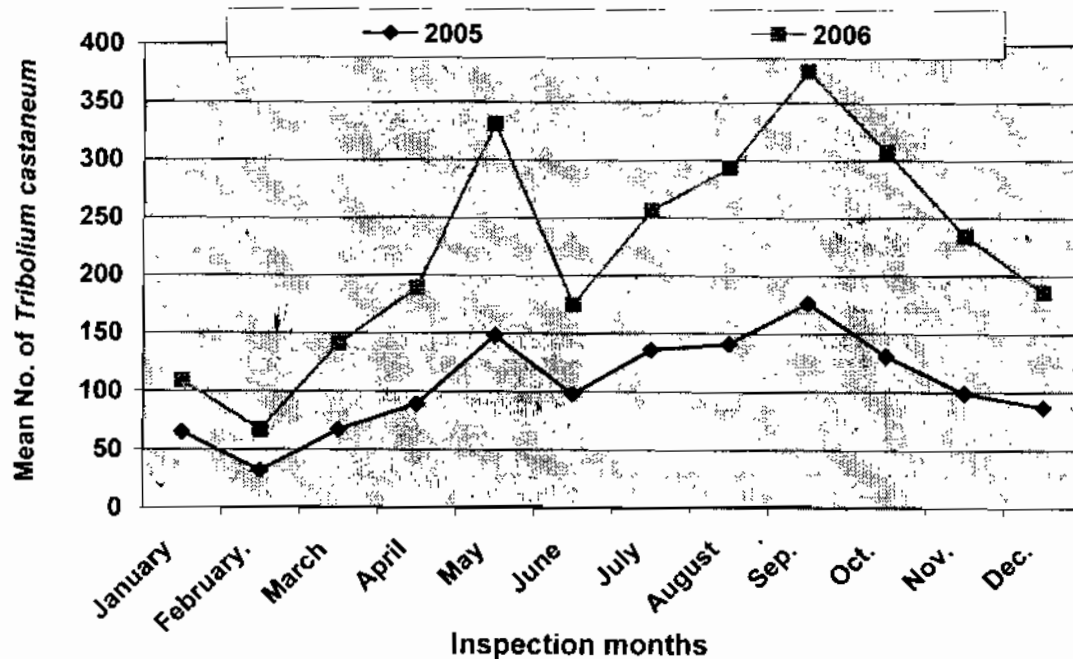
Order	Family	Scientific name	Common name	Density
Coleoptera	Tenebrionidae	<i>Tribolium castaneum</i> (Herbst)	Rust Red flour beetle	High
		<i>Aliphtobus laevigatus</i> (Fabricius)	Black fungus beetle	Moderate
	Curculionidae	<i>Sitophilus oyrzae</i> (Linnaeus)	Rice weevil	High
	Silvanidae	<i>Oryzaephilus surinamensis</i> (Linnaeus)	Saw-grain beetle	moderate
	Anobiidae	<i>Lasioderma serricorne</i> (Fabricius)	Cigarette beetle	moderate
	Nitidulidae	<i>Carpophilus mutitatus</i> Erichson	Sap Beetles	rare
Psocoptera	Liposcelididae	<i>Liposcelis bostrychophilus</i> Bado	Book lice	High

Table 2. Survey of mite pests, predacious and oribatid mites collected from maize stores at Dakahlia Governorates.

suborder	family	Scientific name	Density
Astigmata	Acaridae	<i>Tyrophagus putrescentiae</i> (Schrank)	High
		<i>Tyrophagus longior</i> (Gervais)	moderate
		<i>Tyrophagus</i> sp	
		<i>Acarus siro</i> l.	high
		<i>Aleuroglyphus ovatus</i> (Troupeau)	rare
		<i>Caloglyphus berlesii</i> (Micheal)	few
	Glycyphagidae	<i>Glycyphagus ornatus</i> (Kramer)	high
		<i>Glycyphagus domesticus</i> (De Geer)	few
		<i>Glycyphagus</i> sp	rare
	Ctenoglyphidae	<i>Ctenoglyphus plumiger</i> (Koch)	rare
	Pyroglyphidae	<i>Dermatophagoides farinae</i> Hughes	few

Table 2. Continued

suborder	Family	Scientific name	Density
Prostigmata	Cheyletidae	<i>Cheyletus eruditus</i> (Schrank)	high
		<i>Cheyletus malaccensis</i> (Oudemans)	high
		<i>Cheyletus</i> sp	few
		<i>Cheletomorpha lepidopterorum</i> (Shaw)	moderate
		<i>Hemicheyletus</i> sp	moderate
	Bdellidae	<i>Spinidella bifurcata</i> Atyeo	few
Mesostigmata	Pyemotidae	<i>Pyemotes herfsi</i> (Oudemans)	few
	Cunaxidae	<i>Cunaxa</i> sp	rare
	Ascidae	<i>Blattisocius tarsalis</i> (Berlese)	high
		<i>Blattisocius keegani</i> Fox	high
	Lealapididae	<i>Androlaelaps casalis</i> (Berlese)	moderate
		<i>Hypoaspis sardoa</i> (Berlese)	few
	Ascidae	<i>Lasioseius</i> sp	few
		<i>Proctolaelaps pygmaeus</i> (Muller)	moderate
Cryptostigmata	Oribatuloidae	<i>Scheloribates</i> sp	Rare

Fig. (1) Population fluctuation of *Tribolium castaneum* during two years; 2005-2006

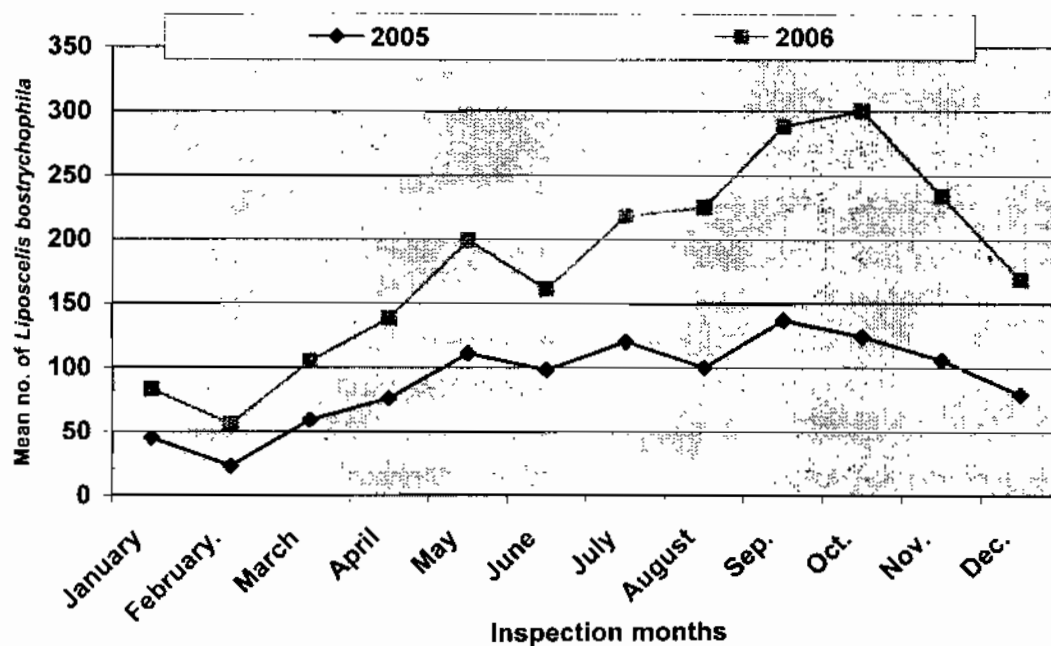


Fig. (2) Population fluctuations of *Liposcelis bostrychophila* during two years; 2005-2006

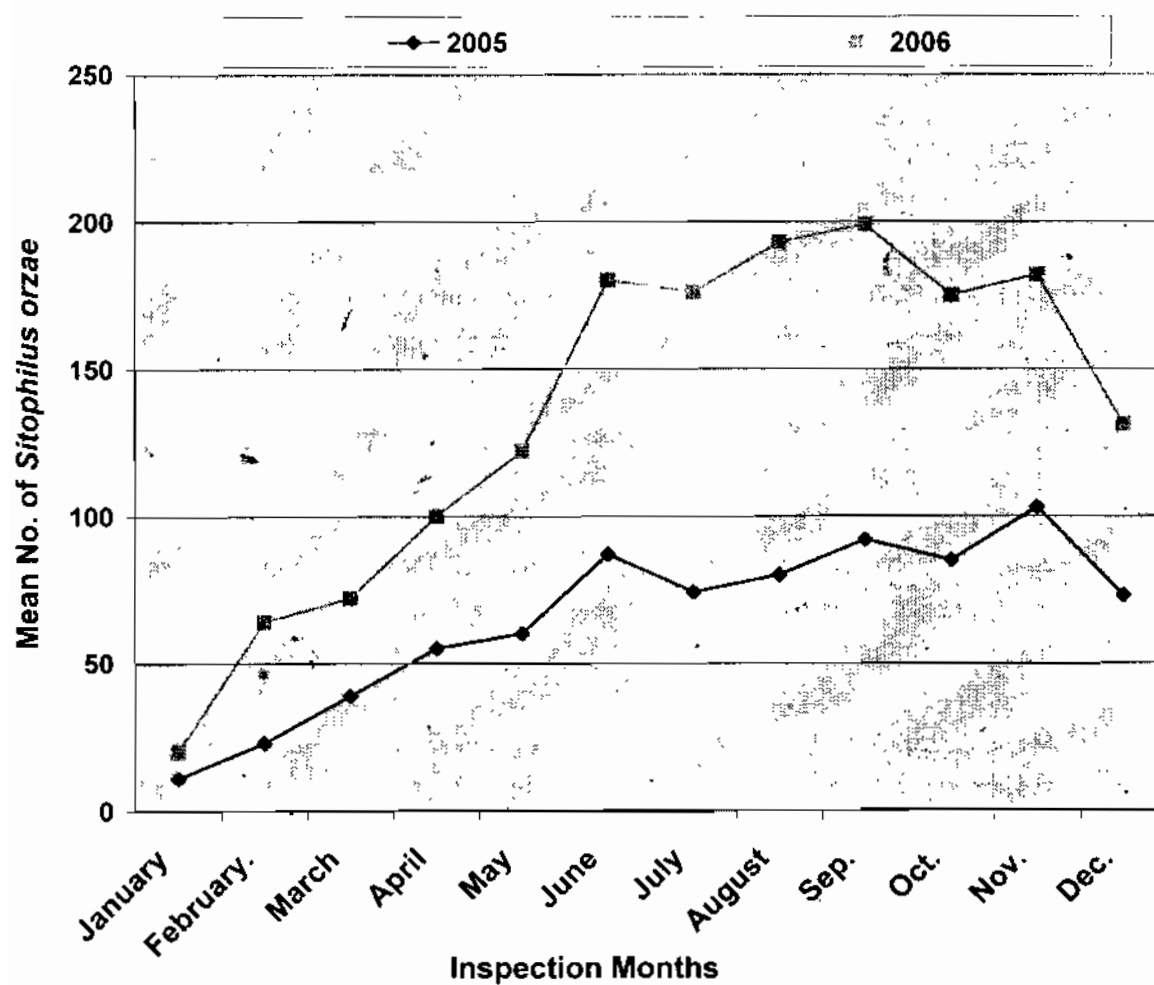


Fig. (3) Population fluctuations of *Sitophilus oryzae* during two years; 2005 -2006

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حصار و دراسة ديناميكية التعداد للحشرات و الأكاروسات التي تصيب مخزون الذرة في محافظة الدقهلية

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في دراسة للحشرات و الأكاروسات المتواجدة في صوامع الذرة في محافظة الدقهلية على مدار عامين متتاليين (٢٠٠٥-٢٠٠٦) أسفرت النتائج عن ما يلي:
أولاً: الحصر:

تم حصر ٣٣ نوع من الحشرات و الأكاروسات المرتبطة بمخزون الذرة في محافظة الدقهلية، تنتمي إلى ١٣ عائلة.

حيث سجلت حشرة خنفساء الدقيق الصدنية، *Tripolium castneum*; وسوسة الأرز *Sitophilus oryzae* وحشرة *Liposcelis bostrychophilus* بأعداد وفيرة بينما وجدت حشرة خنفساء الحبوب، *Oryzaephilus surinamensis*, *Lasioderma serricorne* و *Aliphobus laevigatus* بأعداد متوسطة.

بالنسبة الأكاروسات سجلت الأنواع التالية *Glycyphagus ornatus* و *Tyrophagus putrescentiae*, *Acarus siro* بأعداد كبيرة وعلى الصعيد الآخر وجدت الأكاروسات المفترسة *Cheyletus eruditus* و *Cheyletus malaccensis* *Blattisocius tarsalis* و *B. keegani* بأعداد وفيرة أيضاً، حيث يمكن ان تلعب دوراً في المقاومة المتكاملة. كانت باقي الأكاروسات قليلة العدد أو نادرة.

ثانياً: دراسة ديناميكية التعداد:

في دراسة لكثافة التعداد لبعض الحشرات، وجد أن تعداد حشرتي *Sitophilus oryzae* و *Tribolium castaneum* لهما ذروتين و ثلاثة قمم في كلتا موسمي الدراسة على التوالي، بينما سجلت اعداد الحشرة *Liposcelis bostrychophilus* ثلاثة قمم في عام الدراسة الأول و الثاني وربما يكون ذلك راجعاً لتأثير العديد من العوامل و بخاصة العوامل الجوية المحيطة بأماكن التخزين.