# 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 Dakhlia 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 oyrzae* L. and *Liposcelis bostrychopilus* 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, *Lipscelis bostrychopilous* 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 subjecting 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 allover 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 heir 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 oyrzae* Linnaeus and *Liposcelis bostrychopilus* Bado. While, *Aliphtobus laevigatus* and *Lasioderma serricorne* and *Oryzaephilus surinamensis* Linnaeus were found in moderate numbers. Moreover, the *Carpophilusm 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 *Cheletomorphoa, Hemicheyletus, Androlaelaps* and *Proctolaelapis* 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 loosing 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).

Similary, 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. confusm 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 Dakhlia 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 bostrychopilus* 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 Dakhlia Governorate during two considered years by *Sitophilus oyrzae* 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 | *Tribolium castaneum* (Herbst) | Rust Red flour beetle | High |
| | | *Aliphtobus laevigatus* (Fabricius) | Black fungus beetle | Moderate |
| | Curculionidae | *Sitophilus oyrzae* (Linnaeus) | Rice weevil | High |
| | Silvanidae | *Oryzaephilus surinamensis* (Linnaeus) | Saw-grain beetle | moderate |
| | Anobiidae | *Lasioderma serricorne* (Fabricius) | Cigarette beetle | moderate |
| | Nitidulidae | *Carpophilus mutitatus* Erichson | Sap Beetles | rare |
| Psocoptera | Liposcelididae | *Liposcelis bostrychopilus* 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 | *Tyrophagus putrescentiae* (Schrank) | High |
| | | *Tyrophagus longior* (Gervais) | moderate |
| | | *Tyrophagus* sp | |
| | | *Acarus siro* l. | high |
| | | *Aleuroglyphus ovatus* (Troupeau) | rare |
| | | *Caloglyphus berlesi* (Micheal) | few |
| | Glycyphagidae | *Glycyphagus ornatus* (Kramer) | high |
| | | *Glycyphagus domesticus* (De Geer) | few |
| | | *Glycyphagus* sp | rare |
| | Ctenoglyphidae | *Ctenoglyphus plumiger* (Koch) | rare |
| | Pyroglyphidae | *Dermatophagiodes farinae* Hughes | few |

Table 2. Continued

| suborder | Family | Scientific name | Density |
|---|---|---|---|
| Prostigmata | Cheyletidae | *Cheyletus eruditus* (Schrank) | high |
| | | *Cheyletus malaccensis* (Oudemans) | high |
| | | *Cheyletus* sp | few |
| | | *Cheletomorphoa lepidopterorum* (Shaw) | moderate |
| | | *Hemicheyletus* sp | moderate |
| | Bdellidae | *Spinidella bifuracata* Atyeo | few |
| | Pyemotidae | *Pyemotes herfsi* (Oudemans) | few |
| | Cunaxidae | *Cunaxa* sp | rare |
| Mesostigmata | Ascidae | *Blattisocius tarsalis* (Berlese) | high |
| | | *Blattisocius keegani* Fox | high |
| | Lealapidae | *Androlaelaps casalis* (Berlese) | moderate |
| | | *Hypoasois sardoa* (Berlese) | few |
| | Ascidae | *Lasioseius* sp | few |
| | | *Proctolaelapis pygmaeus* (Muller) | moderate |
| Cryptostigmata | Oribatuloidae | *Scheloribates* sp | Rare |

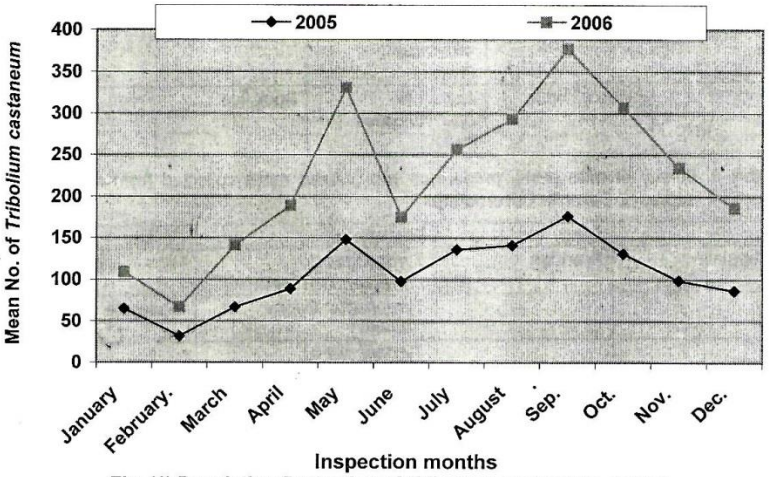


**Fig. (1) Population fluctuation of *Tribolium castaneum* during two years; 2005-2006**

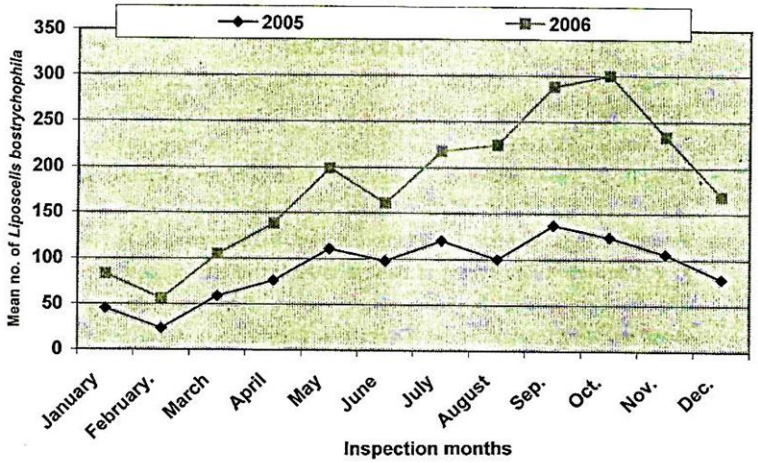


**Fig. (2) Population fluctuations of *Liposcelis bostrychophila* during two years; 2005-2006**

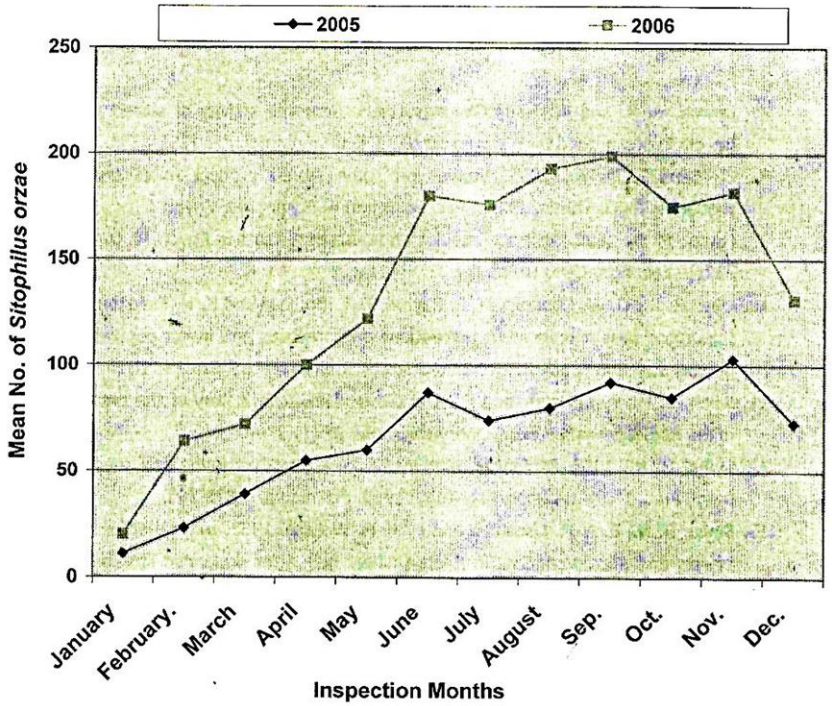


**Fig. (3) Population fluctuations of *Sitophilus oyrzae* duting two years; 2005 -2006**

## REFERENCES

1. Arbogast, T. A., P. E. Kendra, R. W. Mankin and J. E. McGovern. 2000. Monitoring insect pests in retail stores by trapping and spatial analysis. J. Econ. Entomol. 93: 1531-1542.
2. Baker,P. S. 1967. Bionomic of *Blattisocius keegani* fox (Acarina: Ascidae), a predator on eggs of pests of stored grain. Can. J. Zool. 45(1):193-9.
3. Borgemeister, C., C. Adda, M. Setamou, K. Hell, B. Djomamou, R. H. Markham and K. F. Cardwell. 1998. Timing of harvest in Maize: effects on post harvest losses due to insects and fungi in central Benin, with particular reference to *Prostephanus truncatus* (Hora) (Coleoptera: Bostrichidae). Agric. Ecosys. Environ. 69:233-242.
4. Cogburn, R. R. 1973. Stored product insect populations in boxcars delivering flour and rice to Gulf coast ports. Environ. Entomol. 2: 427-431.
5. Cogburn, R. R., and K. W. Vick. 1981. Distribution of Anggoumois grain moth, almond moth, and Indianmeal moth in rice fields and rice storage in Texas as indicated by pheromone-baited adhesive traps. Environ. Entomol. 10: 1003-1007.
6. Dix, D. E. and J. N. All. 1986. Population density and sex ratio dynamics of over wintering maize weevils (Coleoptera: CurCulionidae) infesting field corn. J. Entomol. Sci. 21: 368-375.
7. Dowdy, A. K. and W. H. McGaughey. 1994. Seasonal activity of stored product insects in and around farm stored wheat. J. Econ. Entomol. 87: 1351-1358.
8. El- Sanady, M. A., 2005. Studies on some stored product mites and their predators. Ph.D. Thesis, 193pp. Fac. Sc. (girls) Al-Azhar Univ. Egypt.
9. Fawzy, M. M. 1996. Biological studies on house dust mites in Egypt. Ph.D. Thesis, 237pp. Fac. Agri. Cairo University,
10. Platt, R. R., G. W. Cuperus, M. E. Payton, E. L. Bonjour and K. N. Pinkston. 1998. Integrated pest management perceptions and practices and insect populations in grocery stores in south-central United States. J. Stored Prod. Res.34: 1Ð10.
11. Saleh, S. M., A. El-Helaly and F. H. El Gazar. 1986. Life history of the predatory mites *Cheyletus malaccensis* Oud. Acarologia, 27 (1) 37-40.
12. Sinha, R. N., 1964. Ecological relations of stored product mites and seed bore fungi, Proc. 1 st Int. Congr. Acarology, 1963. acarologia, 6:372-398.
13. Sinha, R. N., E. A. R. Liscombe and H. A. H. Wallace. 1962. Infestation of mites, insects and microorganisms in a large wheat bulk after prolonged storage. The Canadian Entomologist. 94: 542-555.
14. Wafa, A. K., M. A. Zaher, A. M. El- Kifl and M. A. Hagazy. 1966. Survey on stored grain and seed mites (Acarine). Bull. Ent. Soc., Egypt 50:225-232.

# حصر و دراسة دينامكية التعداد للحشرات و الأكاروسات التي تصيب مخزون الذرة في محافظة الدقهلية

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

**اولاً: الحصر:**

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

حيث سجلت حشرة خنفساء الدقيق الصدئية، *Tripolium castneum*; وسوسة الأرز *sitophilus oryzae* وحشرة *Liposcelis bostrychopilus* باعداد وفيرة بينما وجدت حشرة خنفساء الحبوب، *Oryzaephilus surinamensis*, *Lasioderma serricorne* و *Aliphtobus laevigatus* بإعداد متوسطة.

بالنسبة الأكاروسات سجلت الأنواع التالية *Glycyphagus ornatus* و *Tyrophagus putrescentiae* , *Acarus siro* بإعداد كبيرة وعلى الصعيد الأخر وجدت الأكاروسات المفترسة *Cheyletus eruditus* و *Cheyletus malaccensis Blattisocius tarsalis* و *B. keegani* بإعداد وفيرة ايضا، حيث يمكن ان تلعب دورا في المقاومة المتكاملة.

كانت باقي الأكاروسات قليلة العدد أو نادرة.

**ثانيا: دراسة دينامكية 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 التوالى، بينما سجلت اعداد الحشرة *Lipscelis bostrychopilous* ثلاثة قمم في عام الدراسة الأول و الثاني وربما يكون ذلك راجعا لتأثير العديد من العوامل و بخاصة العوامل الجوية المحيطة بأماكن التخزين.