

## **SUSCEPTIBILITY OF SOME STORED GRAINS AND WHEAT FLOUR TO INFESTATION BY THE MAIN INSECT PESTS AT ALEXANDRIA GOVERNORATE**

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### **ABSTRACT**

This study was carried out during the period from December 2008 to December 2009 at Alexandria Governorate. The product samples were obtained from General Soils and Agriculture Credit Bank. Eight species, belonging to two orders; *Cleoptera* and *Lepidoptera* and only five families were recorded on wheat, wheat flour, yellow corn and barley. The survey revealed about seven species of *Cleoptera* and one species of *Lepidoptera*.

This situation of these insects as pests in Egypt or other parts of the world, the effect of sample site inside or outside of G.S. and A.C.B and monthly distribution of insect infestation are considered and discussed for each insect in each product.

The recorded data showed that the lowest infestation rate occurred at barley and yellow corn. But, the highest infestation rates were at wheat followed by wheat flour.

### **INTRODUCTION**

Cereal grains are an important food source for the majority of the world population. Also, the leguminous crops are of great importance in our life as they are of vital source of protein for communities unable to obtain adequate supplies of meat and fish. El-Lakwah (1984)

Infestation by pests reduced the yield of crops, lowers the quality and increases the cost of production. Piltz (1984)

The principal causes of losses in quantity and quality of stored commodities are rodents, insects, mites, fungi and birds. Many studies were made on the injury caused by the insects countries all over the world. Awadalla (2006).

Cereal grains should be handled and stored under conditions that minimize the opportunities for stored products pests to cause economic damage. This could be achieved by good design and maintenance of stores; regularly inspection and quality control of stored food stuffs. Good storage practice and performance of appropriate pest control measures El-Kashlan (1984).

It was found that these pests caused great loss to the stored grains in many countries (Richards *et al.*, 1946; Coombs and Freeman, 1995; Kinitani 1956; Turtl and Freeman, 1960 and Halawa, 2003).

Kamel (1977) and El-Lakwah *et al.*, (1993) studied during October 1989 tui September 1991 in stores of the Qalyubia region, Egypt and estimated losses caused by stored products pests were approx. 3.7 % of the

annual production of cereal grains and 2.7% of the main pulses (broad beans and lentils).

The major interest is to study of insect species associated with stored products imported during the period of (2008 & 2009) from united states of America, Canada, Australia and Europe to Egypt through Alexandria port.

The present investigation aims to survey the insect associated with various commodities of stored products in some situation of Alexandria governorate sites.

## **MATERIALS AND METHODS**

**Insect survey** were carried out by investigation the cargos of stored products arrived to Egypt from all parts of the world through Alexandria port. Samples were collected from general Silos Company and Agriculture Credit Bank at different levels (inside and outside port) during the period from December 2008 to December 2009.

The examined stored products were wheat, wheat flour, yellow corn and barley.

The sample weight was a one- kilogram from each places samples were taken at random from one lot which consist of 420 grain bags. Each bags weight around 100kg (42 tons). The samples were put in polyethylene bags and insects were examined and identified in laboratory.

### **Extraction procedure used :**

The modified Berlese funnel commonly used for extraction of insects from the samples under study. It was a glass funnel of 32Cm deep and 18 and 2.5cm in diameter at upper and lower end, respectively was used. A sieve with the same diameter of the upper opening of the funnel was prepared to fit at about 3cm. below the rim.

A piece of musline was spread on the sieve to prevent grain particles and flour from falling through. The sample was spread over the musline in layer not exceeding more than 1cm in depth.

This survey was undertaken to assess the size and composition of insect fauna on cargo ships and the possible importance of this fauna on a source of infestation of stored goods. Eight insect species belonging to two orders: (*coleoptera* and *lepidoptera*) and six families were found associated with the fermentation imported stored products in the period of study.

\* Standard error was calculated handily calculator.

## **RESULTS AND DISCUSSION**

Survey of insect species associated with imported stored products were recorded in Table (1). Stored wheat, wheat flour, yellow corn and barley imported from all parts of the world through Alexandria port, were examined for insects infestation. Samples were collected from General Silos Company and Agriculture Credit Bank (inside and outside). The formentioned stored products were found to be infested by insects.

**Table (1): Survey of coleopterous Insect species during the period from January 2008 to December 2009at Alexandria governorate.**

No.	Family	Scientific Name	Common Name	Crops
1	Bruchidae	<i>Callosobruchus maculatus</i> (L.) C.m	Cow- beetle	Yellow corn
2	Trogossitidae or Ostomatidae	<i>Tenebroides mauritanicus</i> (L.) T.m.	Cadelle	Yellow corn- wheat
3	Tenebrionidae	<i>Tribolium castaneum</i> (Herbst) T.C.	Rust- red flour beetle	Wheat flour- wheat
4	Tenebrionidae	<i>Tenebrio molitor</i> (L.) T.mo	The yellow meal worm	Wheat flour- wheat
5	Curculionidae	<i>Sitophilus oryzae</i> (L.) S.O.	Lasser rice weevil	Wheat- barley
6	Bostrychidae	<i>Rhizopertha dominica</i> (Fabr) R.D.	Lasser grain beetle	Wheat- barley
7	Gelechiidae	<i>Sitotroga cerealella</i> (oliv) S.C.	Angoumois grain moth	Wheat flour- yellow corn
8	Tenebroinidae	<i>Pallorus ratzeburgi</i> (wissm.) Pall.	Small- eyed flour	Wheat flour- yellow corn-Wheat flour

Eight species, belonging to two orders (*Coleoptera* & *Lepidoptera*) and six families were found.

The average number of insects imported from each place were recorded monthly throughout the year of investigation and it was expressed as the mean number of insects per one- kilogram of stored product.

Results summarized in Tables 2,3,4,5,6,7,8 and 9 detailed monthly percent of infestation of insect species collected from inside and outside of General Silos and Agriculture Credit Bank.

The following data includes the *Coleopterous* and *Lepidopterous* species which have been recorded :

***Callosobruchus maculatus* (L.)**

This species was not found in barely wheat, wheat flour and barley which collected from outside and inside of General Silos and Agriculture Credit Bank and only in the inside from General Silos of wheat in November and December with differences S.D.  $40\pm 138$  and  $82\pm 200$ , respectively, (Table, 2). However, the infestation was restricted to inside and outside of yellow corn from General Silos and Credit Bank, but the highest number occurred at July in inside General Silos and Credit Bank with differences S.D.  $214\pm 469$  and  $61\pm 67$ , respectively and at August to September in outside of Credit Bank and Silos with differences S.D,  $55\pm 16$  and  $59\pm 56$ , respectively, (Table 2).

***Tenebroides mauritanicus* (L.)**

It was not found in yellow corn from inside or outside of Agriculture Credit Bank and outside of General Silos only but it was fluctuated in the other crops (Table, 3).





The infestation has two peaks (September and June) in wheat inside General Silos and in barley inside A.C.B. respectively. The infestation occurred mainly at the A.C.B, while the G.S. was rarely infested.

***Tribilium castaneum* (Herbst)**

This pest can attack undamaged wheat kernels. It was found in wheat, wheat flour, yellow corn from outside & inside of G.S. and A.C.B., but it was rarely found in barely. Results in Table (4) illustrated that the infestation of wheat and wheat flour by *T. castaneum* increased greatly in the two places. The mean number of insects in each samples per month reached to 316 and 413 at June & July in wheat of G.S.C and A.C.B (inside), respectively.

These values were the highest values of infestation in all wheat insects (outside) G.S.C. and A.C.B., and it was moderate number of insects in wheat flour from inside & outside of G.S.C. and A.C.B. These results are confirmed by Singh *et al.*, (1978) who detailed that these insects are the major storage pests in the common wealth Caribbean.

As shown in Table (4), the highest infestation percent was in June, 884 & 1080 insects in G.S.C. & A.C.B. respectively.

***Tenebrio molitor* (L.)**

It is known as the European meal worm because of the many reports of its occurrence in Europe.

*T. molitor* appears to be the many crops from different places, except barley from inside & outside of General Silos and Agriculture Credit Bank.

In the present work it was found in wheat, wheat flour and yellow corn, but the highest number occurred in wheat from outside of G.S.C. and A.C.B. (Table 5), the infestation was restricted at September the number reached to 161 and 391 individuals, respectively.

From this result show that the occurrence in G.S.C highest than in A.C.B. with the L.S.D.  $72\pm 135$  and  $57\pm 54$ , respectively.

***Sitophilus oryzae* (L.)**

This insect is a serious pest of all cereal grains and many other seeds. The larvae can also develop in farinacous products, buck wheat, peas, acorns, chestnuts and cottonseed; the weevils also feed on flour, biscuits, waffles, bread and tobacco; often found together with grain weevils.

It was only found in wheat, yellow corn and rarely found in wheat flour Table (6).

As shown in Tables (6), the infestation increased in wheat from both General Silos and Agriculture Credit Bank, also the average number of insect per sample increased in outside than inside one. Results showed that the infestation rates are high in all months in the wheat of G.S. & A.C.B. except at the first month. It was found in relatively high from May to December at the inside & outside of G.S.C. & A.C.B. with differences S.D.  $185\pm 246$ ;  $375\pm 35$ ;  $234\pm 33$  and  $495\pm 547$ , but the maximum infestation occurred at May in both places.







***Rhizopertha dominica* (Fabr.)**

It was a primary pest of cereal grains and other seeds, also feeds on dried potatoes, topica and herbs. Larvae and adult bore into grain eating out the entire starchy interior and the seed coat in places, leaving irregularly-shaped holes.

This insect not found in wheat flour Table (7) and it could be noticed rarely of infestation in the other crops (wheat, yellow corn and barley) from both places G.S. and A.C.B. (inside & outside)

***Sitotroga cerealella* (oliv.)**

This moth is a primary pest of grain, most of its damage occurs in storage. Attacks all types of cereal grain, particularly maize and wheat. The weight losses can be as much as 50% for wheat and 24% for maize. Badly infested grain has a sickenening smell and tests that makes it unpalatable.

***S. cerealella***, was found in all imported crops (wheat, wheat flour, yellow corn & barley) in Table (8).

It was rarely found in yellow corn and barley the infestation of this insect occurred in wheat at some months, but its infestation was restricted to wheat flour at all months years, as shown in Table (8). Relatively high number from May to September, May to November and May to November, April to September in wheat flour from General Silos, Agriculture Credit Bank (inside and outside). These results in line with findings of I.H. El- Kashlan (1984).

So it could be recommended that the American wheat and wheat flour was the best concerning the infestation by stored product pests. Thus, inspection of grains and feed commodities stored in the general silos and Agriculture Credit Bank imported from all world to Alexandria Port, must be carried out regularly and carefully every two weeks and if infestation is detected, treatment of the stored commodity must be conducted immediately.

Also, recommendations for improvement of the storage system and the pest control measures in use at present time with the aim of reducing losses in food and feed commodities stored in the General Silos and Agriculture Credit Bank are also given.

***Pallorus ratzeburgi* (wism.)**

It was found approximately in all the crops under study with out barley crop (Table, 9), but it was rarely in yellow corn.

Its maximum infestation is found all over the year of investigation from December 2008 to December 2009 in wheat flour from inside & outside of G.S.C. and A.C.B.

This insect was found in the two places but mainly in high numbers at October in G.S.C and August in A.C.B., whereas number were 210 and 265, respectively, (Table, 9).







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**حساسية بعض الحبوب المخزونة وكذلك دقيق القمح للإصابة بالحشرات الهامة  
الرئيسية في محافظة الإسكندرية  
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أجريت هذه الدراسة في الفترة من ديسمبر عام ٢٠٠٨ إلى شهر ديسمبر عام 2009 وتهدف إلى عمل حصر لأهم مجموعات حشرات المواد المخزونة ، وقد تمت عملية الحصر علي أربعة محاصيل هي القمح ، ودقيق القمح ، الذرة الصفراء وكذلك الشعير المستورد من مناطق مختلفة إلى جمهورية مصر العربية وذلك عن طريق ميناء الإسكندرية والآتية عن طريق البواخر المختلفة. وقد تم اخذ العينات من خارج وداخل الصوامع العامة وكذلك بنك الائتمان الزراعي. كما تم تحديد نسب الإصابة بالآفات المختلفة علي العوائل المختارة خلال أشهر السنة من خلال هذا الحصر تم تسجيل ثمانية أنواع حشرية تنتمي إلي رتبتيين أساسيتين (غمدية الأجنحة وحرشفية الأجنحة) واللتان تكونان خمس عائلات مختلفة وفيما يلي توزيع هذه الأنواع الحشرية. كما أشارت النتائج أن موقع الحشرات كآفات في مصر أو في أنحاء العالم يتوقف تأثيرها علي المكان الذي أخذت منه سواء الصوامع العامة أو بنوك الائتمان والتنمية الزراعية سواء خارج أو داخل هذه المواقع . كذلك بينت النتائج أن نسبة الإصابة كان أقل من معدلها في الشعير والذرة الصفراء ولكن كانت نسبة وجود الحشرات في أعلى مستوياتها في القمح يلبيها دقيق القمح.

**قام بتحكيم البحث**

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Table (2): Monthly mean number of *C. maculates* in different stored products imported from different parts of the world through Alexandria port taken from General Silos company and Agriculture Credit Bank (inside and outside) the port during the period from December 2008 to December 2009.

Sampling Date	Stored wheat				Wheat flour				Yellow corn				Barley			
	G.S.C.		A.C.B.		G.S.C.		A.C.B.		G.S.C.		A.C.B.		G.S.C.		A.C.B.	
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside
December 2008	-	-	-	-	-	-	-	-	13	17	20	-	-	-	-	-
January 2009	-	-	-	-	-	-	-	-	18	-	-	-	-	-	-	-
February 2009	-	-	-	-	-	-	-	-	31	-	-	54	-	-	-	-
March 2009	-	-	-	-	-	-	-	-	62	120	48	-	-	-	-	-
April 2009	-	-	-	-	-	-	-	-	102	160	37	100	-	-	-	-
May 2009	-	-	-	-	-	-	-	-	64	117	114	140	-	-	-	-
June 2009	-	-	-	-	-	-	-	-	105	51	154	110	-	-	-	-
July 2009	-	-	-	-	-	-	-	-	148	53	168	13	-	-	-	-
August 2009	-	-	-	-	-	-	-	-	160	95	185	180	-	-	-	-
September 2009	-	-	-	-	-	-	-	-	145	136	-	103	-	-	-	-
October 2009	-	-	-	-	-	-	-	-	-	-	-	24	-	-	-	-
November 2009	521	380	-	-	-	-	-	-	-	-	62	-	-	-	-	-
December 2009	-	80	400	-	-	-	-	-	90	23	-	-	-	-	-	-
Mean ± SD.	40±138	82±200	31±106	-	-	-	-	-	214±649	59±56	61±67	55±61	-	-	-	-

**Table (3): Monthly mean number of *T. mauritanicus* in different stored products imported from different parts of the world through Alexandria port taken from General Silos company and Agriculture Credit Bank (inside and outside) the port during the period from December 2008 to December 2009.**

Sampling Date	Stored wheat				Wheat flour				Yellow corn				Barley			
	G.S.C.		A.C.B.		G.S.C.		A.C.B.		G.S.C.		A.C.B.		G.S.C.		A.C.B.	
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside
December 2008	-	-	-	-	9	10	3	-	-	-	-	-	-	-	5	-
January 2009	-	-	-	-	8	9	5	-	-	-	-	-	-	-	-	-
February 2009	-	-	9	-	9	8	3	-	-	-	-	-	3	-	-	-
March 2009	-	-	4	-	-	-	-	-	-	-	-	-	15	-	-	-
April 2009	-	2	3	-	-	7	5	-	-	-	-	-	7	-	39	20
May 2009	-	14	13	14	7	16	10	-	-	-	-	-	-	-	-	31
June 2009	-	-	23	29	26	39	-	-	1.9	-	-	-	17	-	54	-
July 2009	-	-	-	6	-	-	-	-	-	-	-	-	27	-	7	20
August 2009	-	-	-	14	-	-	-	-	32	-	-	-	41	-	8	37
September 2009	-	21	38	28	-	-	-	-	-	-	-	-	-	-	11	-
October 2009	-	-	13	13	-	-	-	-	-	-	-	-	4	-	16	6
November 2009	521	24	15	17	-	-	-	-	-	-	-	-	-	-	28	17
December 2009	703	-	18	11	-	-	-	-	-	-	-	-	2	-	-	9
Mean ± SD.	94±223	5±8	10±10	10±10	4±7	6±10	2±3	-	4±9	-	-	-	9±12	-	13±16	11±12

G.S.C. = General silos company

A.C.B.= Agriculture Credit Bank

SD.= Standard error.

Table (4): Monthly mean number of *T. castaneum* in different stored products imported from different parts of the world through Alexandria port taken from General Silos company and Agriculture Credit Bank (inside and outside) the port during the period from December 2008 to December 2009.

Sampling Date	Stored wheat				Wheat flour				Yellow corn				Barley			
	G.S.C.		A.C.B.		G.S.C.		A.C.B.		G.S.C.		A.C.B.		G.S.C.		A.C.B.	
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside
December 2008	8	20	13	25	3	18	48	54	37	-	37	-	-	-	-	-
January 2009	2	18	26	18	6	15	37	48	-	-	-	-	-	-	-	-
February 2009	2	3	6	9	40	27	46	66	-	-	-	-	-	-	-	-
March 2009	15	21	37	39	58	47	50	91	46	-	-	-	-	-	-	-
April 2009	39	37	45	35	139	86	80	118	46	-	-	17	3	-	-	-
May 2009	156	237	252	944	149	136	144	146	98	62	-	24	7	-	-	-
June 2009	316	884	229	1080	169	173	177	169	68	85	-	36	-	-	-	-
July 2009	302	615	413	600	173	273	192	199	73	96	17	-	15	-	-	-
August 2009	155	510	485	882	187	381	213	375	48	72	-	52	-	-	-	-
September 2009	287	541	304	791	200	294	201	288	-	77	43	-	-	-	-	-
October 2009	123	182	89	183	417	307	172	254	-	31	-	13	-	-	-	-
November 2009	82	458	200	388	254	285	144	110	-	62	82	-	-	-	-	-
December 2009	163	730	621	203	49	96	60	28	-	28	-	-	-	-	-	-
Mean ± SD.	127±111	327±297	209±192	396±386	182±110	164±123	120±65	149±100	32±33	40±35	13±23	11±16	2±4	-	-	-

**Table (5): Monthly mean number of *T. mauritanicus* in different stored products imported from different parts of the world through Alexandria port taken from General Silos company and Agriculture Credit Bank (inside and outside) the port during the period from December 2008 to December 2009.**

Sampling Date	Stored wheat				Wheat flour				Yellow corn				Barley			
	G.S.C.		A.C.B.		G.S.C.		A.C.B.		G.S.C.		A.C.B.		G.S.C.		A.C.B.	
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside
December 2008	-	-	3	-	7	2	54	14	-	-	-	-	-	-	-	-
January 2009	8	-	-	-	21	16	34	13	-	-	-	-	-	-	-	-
February 2009	-	-	-	-	34	16	13	16	-	-	-	-	-	-	-	-
March 2009	3	4	6	-	-	38	23	13	-	-	-	-	-	-	-	-
April 2009	9	9	8	8	29	48	47	27	-	-	-	-	-	-	-	-
May 2009	-	14	-	34	42	52	70	71	19	17	-	21	-	-	-	-
June 2009	39	69	17	33	51	68	-	63	24	-	-	-	-	-	-	-
July 2009	60	82	23	50	78	79	-	110	32	40	-	37	-	-	-	-
August 2009	38	76	43	391	100	82	-	134	16	-	-	18	-	-	-	-
September 2009	65	76	85	382	130	104	-	124	14	-	-	-	14	-	-	-
October 2009	16	161	16	-	124	109	-	112	3	-	-	-	-	-	-	-
November 2009	-	120	34	-	49	40	-	68	3	3	-	-	-	-	-	-
December 2009	18	131	69	42	13	20	-	13	-	-	-	-	-	-	-	-
Mean ± SD.	20±22	57±54	23±26	72±135	52±41	52±33	18±23	60±45	8±10	5±11	-	6±11	1±3	-	-	-

G.S.C. = General silos company

A.C.B.= Agriculture Credit Bank

SD.= Standard error.

Table (6): Monthly mean number of *S. oryzae* in different stored products imported from different parts of the world through Alexandria port taken from General Silos company and Agriculture Credit Bank (inside and outside) the port during the period from December 2008 to December 2009.

Sampling Date	Stored wheat				Wheat flour				Yellow corn				Barley				
	G.S.C.		A.C.B.		G.S.C.		A.C.B.		G.S.C.		A.C.B.		G.S.C.		A.C.B.		
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	
December 2008	4	4	6	17	-	-	-	6	-	-	-	-	-	-	-	-	-
January 2009	13	12	20	13	-	-	-	-	-	-	-	-	-	-	-	-	-
February 2009	5	6	8	11	-	-	-	-	-	-	-	-	-	-	-	-	-
March 2009	17	41	60	37	-	3	-	-	-	14	-	3	-	-	-	-	-
April 2009	52	41	35	44	3	5	-	14	-	-	-	4	-	-	-	-	-
May 2009	841	875	968	1577	8	13	3	-	-	3	-	19	-	-	-	-	-
June 2009	580	632	912	1024	-	-	-	-	-	-	-	21	-	-	-	-	-
July 2009	304	900	593	1104	-	-	-	-	18	-	-	-	-	-	-	-	-
August 2009	180	617	258	713	-	-	-	-	24	14	37	68	-	-	-	-	-
September 2009	217	866	275	1298	-	-	-	-	14	19	43	-	-	-	-	-	-
October 2009	69	181	89	97	-	-	-	-	-	-	-	36	-	-	-	-	-
November 2009	36	512	527	289	-	-	-	-	3	-	22	48	-	-	-	-	-
December 2009	89	197	80	215	-	-	-	-	-	-	-	-	-	-	-	-	-
Mean ± SD.	185±246	375±351	294±331	495±547	0.8±2	2 ± 3	0.2±0.7	2±4	4±8	4±6	8±15	15±21	-	-	-	-	-

Table (7): Monthly mean number of *R. dominica* in different stored products imported from different parts of the world through Alexandria port taken from General Silos company and Agriculture Credit Bank (inside and outside) the port during the period from December 2008 to December 2009.

Sampling Date	Stored wheat				Wheat flour				Yellow corn				Barley			
	G.S.C.		A.C.B.		G.S.C.		A.C.B.		G.S.C.		A.C.B.		G.S.C.		A.C.B.	
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside
December 2008	-	-	-	-	-	-	-	-	11	16	13	-	-	-	-	-
January 2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
February 2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
March 2009	13	-	-	-	-	-	1	-	-	-	-	-	-	11	-	-
April 2009	8	5	3	-	-	-	-	-	-	-	-	-	17	13	-	-
May 2009	-	14	-	35	-	-	-	-	16	-	34	-	18	36	17	-
June 2009	34	-	17	26	-	-	-	-	24	37	-	-	19	40	14	-
July 2009	60	18	38	38	-	-	-	-	19	-	-	-	39	73	56	16
August 2009	45	34	42	42	-	-	-	-	64	72	51	-	56	13	33	33
September 2009	58	42	58	56	-	-	-	-	-	12	-	62	-	18	23	46
October 2009	16	-	-	12	-	-	-	-	15	-	-	-	-	30	24	-
November 2009	-	56	-	-	-	-	-	-	-	-	21	-	3	3	-	-
December 2009	11	193	-	18	-	-	-	-	-	-	-	-	-	-	-	-
Mean ± SD.	19±21	28±50	12±19	17±19	-	-	0.07±0.2	-	11±17	10±20	9±15	5±16	11±17	18±20	13±16	7±14

G.S.C. = General silos company

A.C.B.= Agriculture Credit Bank

SD.= Standard error.

**Table (8): Monthly mean number of *S. cerealella* in different stored products imported from different parts of the world through Alexandria port taken from General Silos company and Agriculture Credit Bank (inside and outside) the port during the period from December 2008 to December 2009.**

Sampling Date	Stored wheat				Wheat flour				Yellow corn				Barley			
	G.S.C.		A.C.B.		G.S.C.		A.C.B.		G.S.C.		A.C.B.		G.S.C.		A.C.B.	
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside
December 2008	-	-	-	-	19	20	38	25	-	18	-	8	-	-	-	-
January 2009	-	-	-	-	38	31	23	3	-	15	-	-	-	-	-	1
February 2009	-	-	-	-	26	20	28	15	-	-	-	-	-	-	-	-
March 2009	-	3	12	6	13	9	20	28	-	-	-	-	17	16	-	13
April 2009	7	-	-	3	22	27	21	37	-	-	-	3	12	31	-	20
May 2009	-	-	145	337	50	76	49	48	-	-	-	-	9	22	-	21
June 2009	58	148	151	50	67	82	64	82	-	-	-	8	6	-	15	19
July 2009	14	48	24	48	101	100	96	118	-	47	58	52	-	31	32	20
August 2009	28	40	34	86	102	113	118	138	-	46	84	43	13	33	34	-
September 2009	39	62	13	114	88	106	108	104	-	44	-	44	-	-	-	-
October 2009	24	-	-	-	75	83	58	25	-	18	-	52	8	3	3	-
November 2009	-	-	-	-	35	85	69	10	-	21	-	3	3	3	6	-
December 2009	19	9	-	-	12	18	20	-	-	13	-	-	-	-	9	4
Mean ± SD.	15±17	23±41	29±51	49±90	50±31	59±37	55±33	48±44	-	16±17	11±26	16±21	5±6	7±13	8±11	8±8

Table (9): Monthly mean number of *P. retzeburgi* in different stored products imported from different parts of the world through Alexandria port taken from General Silos company and Agriculture Credit Bank (inside and outside) the port during the period from December 2008 to December 2009.

Sampling Date	Stored wheat				Wheat flour				Yellow corn				Barley			
	G.S.C.		A.C.B.		G.S.C.		A.C.B.		G.S.C.		A.C.B.		G.S.C.		A.C.B.	
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside
December 2008	-	3	-	-	41	42	50	21	21	-	20	15	-	-	-	-
January 2009	-	-	-	-	38	28	43	31	24	-	-	-	-	-	-	-
February 2009	-	4	-	11	42	58	33	43	41	-	-	-	-	-	-	-
March 2009	3	7	-	13	39	24	34	55	-	37	-	95	-	-	-	-
April 2009	14	13	14	21	60	80	41	109	-	12	-	18	-	-	-	-
May 2009	-	67	97	97	129	132	129	123	-	13	38	-	-	-	-	-
June 2009	101	17	87	76	128	119	154	149	-	52	66	37	-	-	-	-
July 2009	90	9	68	82	165	161	182	199	46	75	73	-	-	-	-	-
August 2009	73	34	71	102	189	180	202	265	19	79	111	37	-	-	-	-
September 2009	91	42	73	109	194	195	196	208	9	103	13	109	-	-	-	-
October 2009	43	14	15	40	210	190	159	150	-	18	19	13	-	-	-	-
November 2009	13	40	-	42	145	138	118	13	-	-	-	-	-	-	-	-
December 2009	82	17	37	70	61	13	53	7	-	19	-	-	-	-	-	-
Mean ± SD.	39±40	20±19	35±36	51±38	112±62	104±64	107±64	105±81	12±15	31±33	26±34	25±35	-	-	-	-

G.S.C. = General silos company

A.C.B.= Agriculture Credit Bank

SD.= Standard error.