REPRODUCTION OF THE MITE *TYROPHAGUS PUTRESCENTIAE* (SCHRANK) (ACARIDAE) AND THEIR INFLUENCE ON SOME SEED GERMINATION

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ABSTRACT

Stored product mite, *T. putrescentiae* was reared on coriander seeds (*Conandrum sativum* L.), molokhia seeds (*Corchorus olitorius* L.) and roquette seeds (*Eruca sativa* L.) and able to reproduce a large number of eggs and moving stages. Seeds germination were affected as a results of infestation under laboratory conditions (26.4 ºC and RH 64.5 %). Each total number of eggs and moving stages were increased gradually to reach its maximum then, declined thereafter.

Keywords:*Tyrophagous putrescentiae* (Koch), Reproduction, Seed germination.

INTRODUCTION

Mites are important pests in stored food. The contamination of stored food by arthropods may seriously endanger human health because of allergic (**Van and Johansson, 1992; Stejskal, 2000 and 2001)**. Significant weight loss of grains and oilseeds caused by mite feeding **(Žd'árková and Reška, 1976)**. Storage mites not only responsible for direct damage in form of weight reduction but also imply the indirect damage in form of germination loss of the grains, deterioration of the nutrients and quality of the stored grains **(Bashir, *et al.* 2011 and Mahmood, *et al.* 2012)**. Fourty percent of infested intact kernels failed to germinate after 45 days of infestation by *Liposcelis paeta* mite, and psocid infestations do not only cause considerable loss in weight of wheat, but also result in significant germination failure **(Gautam, *et al.* 2013).** Mites, psocids, and moths are the main pests of each stored grass and vegetable seeds. mites can decrease seed germinability by 52% and psocids caused 9.7% seed weight loss in broken wheat kernels after 3 months of infestation under laboratory conditions. **(Stejskal, *et al.* 2014).** *Lepidoglyphus destructor* (Schrank) infestation of the wheat grains led to significantly lower fat acidity values ($P<0.01$) and significantly slower loss of seed germination than in the uninfested wheat **(White *et al.*1979). Zdarkova, 1996,** exposed each of the mite *Acarus siro* and *Tyrophagus putrescentiae* to different stored seeds for 3-6 months under ambient conditions (20 ºC and 75 % RH). Both mite species had same effect on seed germination. (**Mahmoud 2013**) studied the population development of the dust mite, *Caloglyphus redikorzevi* Zach. on canola (*Brassicae napus*) and black (*Nigella sativa*) seeds during seven weeks storage, and showed that germination activity of both seeds was affected by mite infestation. The present work amid to study the reproduction

of mite *Tyrophagus putrescentiae* on different vegetable seeds and their influence on germination activity .

MATERIALS AND METHODS

A- Mite culture: Individuals of *Tyrophagus putrescentiae* were separated from infested bean samples by Tullgren funnel and placed in glass jars (14.0 cm diameter & 19 cm height) containing pieces of wet bread with water and kept in the laboratory at average temperature 26.4 ºC and RH 64.5 % to use as a source of mite for biological studies .

B- Biological studies: One hundred rearing units (4cm. diameter & 3 cm. height) were used and divided into 20 groups to study the development of mite and their influence on seeds. Each group contained five units and each unit contained five pairs of mite with 100 of plant seeds. Mites were observed until the end of population. Only one group (5 reps.) was examined every week to record the number of eggs and moving stages. The previous method was used for each of the three plants coriander seeds *Coriandrum sativum* L., molokhia seeds (*Corchorus olitorius* L.) and roquette seeds (*Eruca sativa* L.) .

C- Effect of the mite on seed germination: After every week, one group of plant seeds with mites (5 units) were transferred to 5 Petri dishes (14 cm. diameter & 2 cm. height) which contained a thin layer of wetted cotton for germination and compared with 5 units contained plant seeds without mites as a control. The previous technique was used for seed germination for the three plant seeds.

RESULTS AND DISCUSSION

1-Propagation of the *Tyrophagus putrescentiae* mite fed on coriander seeds, *Coriandrum sativum* L.

As shown in Table (1), number of eggs and moving stages averaged 10.0 and 25.2 after 1st week, respectively, then increased to reach its maximum average after the 10th week to record 330.8 eggs and 432 moving stages. After that, number declined at 13th week to 96.8 eggs and 107.2 individuals. Germination of seeds combined with the mites recorded 80.5 after the 1st week then decreased gradually to reach 0.0 after 13th week. Reduction of % germination being 2.5 % after the 1st week and increased to reach its maximum 81.1 after 13th week.

2- Propagation of the *Tyrophagus putrescentiae* mite fed on molokhia seeds, *Corchorus olitorius* L.

Table (2) indicated that, after the 1st week, the number of eggs and moving stages averaged 12.0 and 28.0, respectively. Then the number of eggs increased to reach maximum average after the 7th week recording 400.6 eggs and 516.8 moving stages. Population then declined to 110.4 eggs and 131.8 individuals after the 10th week. Germination of seeds combined with mites recorded 74.4 after 1st week then decreased gradually to reach 0.0 after 10th

weeks. Reduction of germination being 0.6 % after 1st week and increased to reach its maximum (73.5 %) after 10th week.

Table (1): Mean number of *Tyrophagus putrescentiae* associated with coriander seeds, *Coriandrum sativum* L.and its germination under different periods at 26.4ºC & 64.5 RH%.

Periods / Week	Number of acarid mite stages		% Germination of Seeds		
	Egg	Moving Stages	Treatment	Control	% Reduction
1st	10.0 ±0.5 8-14	25.2±0.9 22-28	80.5±1.5 75-85	83.0±1.3 75-86	2.5
2nd	18.8 ±0.4 17-21	56.6±1.5 50-72	75.5±1.2 69-80	80.2±2.2 70-83	4.7
3rd	28.6±0.7 18-38	77.9±1.8 68-87	71.9±2.1 61-81	80.6±2.3 70-89	8.7
4th	34.3±1.4 30-39	107.3±2.2 97-115	64.5±3.1 60-69	81.2±2.4 77-86	16.7
5th	61.0±2.2 54-68	128.9±2.4 117-143	60±2.5 52-68	82.2±2.1 79-85	22.2
6th	72.0±2.4 60-84	157.2±1.7 140-175	54.0±0.9 48-60	82.8±3.1 80-86	28.8
7th	86.8±3.5 78-99	181.0±5.4 170-192	50.0±0.6 40-60	82.9±3.2 80-85	32.9
8th	118.9±4.1 109-131	296.9±4.5 277-317	38.0±0.7 30-52	81.6±2.8 80-85	43.6
9th	257.1±5.2 215-350	400.4±6.3 352-401	29.5±3.1 23-35	82.0±2.1 80-84	52.5
10th	330.8±7.3 300-356	432.6±9.1 400-471	12.9±0.6 10-17	81.6±2.3 79-85	68.7
11th	230.5±4.2 206-245	315.2±5.2 299-341	2.9±1.0 1-7	80.1±2.2 75-85	77.2
12th	189.4±2.7 142-251	229.3±2.4 192-264	1.0±0.4 0-2	81.4±2.7 79-85	80.4
13th	96.8±1.5 75-120	107.2±3.1 75-130	00±0.0 0-0	81.1±2.4 77-85	81.1

Table (2): Mean number of *Tyrophagus putrescentiae* associated with molokhia seeds *Corchorus olitorius* L. and its germination under different periods at 26.4ºC & 64.5 RH%.

Periods / Week	Number of acarid mite stages		% Germination of Seeds		
	Egg	Moving Stages	Treatment	Control	% Reduction
1st	12.0±0.2 9-13	28±0.9 23-32	74.4±2.1 72-75	75.0±0.9 73-77	0.6
2nd	23.2±0.5 21-26	60.2±0.7 54-73	73.3±1.1 71-75	75.2±0.8 73-76	1.9
3rd	51.6±0.8 48-54	126.4±7.1 118-137	72.1±3.1 70-73	75.5±0.6 74-76	3.4
4th	73.5±0.8 69-77	195.8±4.2 171-209	70.5±1.3 68-71	74.5±0.7 72-76	4.0
5th	135.0±0.7 131-142	262.7±6.2 241-283	67.6±1.5 65-69	74.8±0.9 73-77	7.2
6th	281.6±5.1 269-292	321.6±2.1 301-335	56.5±1.7 54-59	74.6±0.6 72-78	18.1
7th	400.6±9.8 378-461	516.8±8.1 498-541	45.6±1.2 43-49	73.6±0.8 71-75	28.0
8th	380.5±7.8 364-391	430.7±7.2 406-441	23.5±0.9 21-26	73.2±0.9 72-74	49.7
9th	222.6±8.9 201-241	251.6±6.7 230-271	12..0±0.8 11-14	73.4±0.9 71-75	61.4
10th	110.4±5.2 98-125	131.8±5.8 125-143	0.00	73.5±1.1 71-75	73.5

3- Propagation of the *Tyrophagous putrescentiae* mite fed on roquette seeds, *Eruca sativa* L.

As shown in table 3, the number of eggs and moving stages averaged 5.5 and 15.6 after the 1st week, respectively. Then increased to reach maximum average after the 14th week recording 90.6 eggs and 301.6 moving stages . Population then declined to 41.8 eggs and 133.3 individuals after the 15th week. Germination of seeds combined with mites recorded 81.0 after 1st week then decreased gradually to reach 0.0 after 15th week. Reduction % of germination being 0.5 % after 1st week and increased to reach its maximum 81.9 % after 15th week. Finally, it could be concluded that population of the mite, *T. putrescentiae* gradually increased to reach its maximum number then decreased to reach the lowest at the end of the experiment.

Table (3): Mean number of *T. putrescentiae* associated with roquette seeds (*E. sativa* L.) and its germination under different periods at 26.4 ºC & 64.5 RH %.

Periods / Week	Number of acarid mite stages		% Germination of Seeds		
	Egg	Moving Stages	Treatment	Control	% Reduction
1st	5.5±0.5 4-7	15.6±0.8 13-17	81.0±1.5 78-84	81.5±0.5 78-87	0.5
2nd	7.6±0.8 5-9	31.8±1.2 28-34	80.4±1.7 78-86	81.6±0.4 79-86	1.2
3rd	10.8±0.4 8-12	51.6±1.3 47-53	76.6±1.6 74-81	81.6±0.5 75-89	5.0
4th	15.6±0.7 12-18	62.8±1.2 60-67	74.2±15 71-80	81.0±0.5 74-90	6.8
5th	18.5±.09 16-21	70.4±4.5 66-74	71.9±1.3 65-76	81.9±0.6 74-94	10.0
6th	23.5±1.2 20-25	83.5±3.1 80-86	67.2±1.1 61-72	81.7±0.4 78-85-	14.5
7th	31.7±1.6 29-33	97.6±3.2 92-102	61.2±2.1 57-68	82.2±0.6 79-84	21.0
8th	37.6±1.5 34-41	112.4±4.6 105-117	58.4±1.9 52-64	82.0±0.7 77-86	23.6
9th	45.4±2.0 40-48	127.4±3.5 121-132	52.6±1.7 48-57	82.6±0.3 79-85	30.0
10th	54.2±3.4 51-57	139.6±7.3 135-144	41.5±1.8 38-45	81.9±.3 78-84	40.4
11th	63.4±2.5 58-67	168.4±8.1 162-175	32.4±0.9 27-36	81.4±0.5 79-85	49.0
12th	81.6±3.1 74-84	196.4±6.2 191-205	25.6±0.8 21-29	81.0±0.4 77-84	55.4
13th	92.6±5.8 89-96	241.0±4.2 235-250	17.4±0.3 14-20	82.0±0.6 79-84	64.6
14th	90.6±7.1 84-97	301.6±9.1 296-305	5.2±0.3 3-7	82.6±0.8 79-86	77.4
15th	41.8±1.4 35-45	133.3±4.3 125-139	0.0±00 0-0	81.9±0.7 78-85	81.9

This could be attributed to crowding effect which decreased reproduction activity. This phenomenon obviously appeared after outbreak. These results also supported by **(Zaher *et al*. 1978)** who found that the two spotted spider mite *Tetranychus urticae* increased with increasing density to the maximum then decreased thereafter. Also in this respect, **(Zdarkova 1996)** mentioned that *Acarus siro* and *Tyrophagus putrescentiae* to different stored seeds for 3-6 months under ambient conditions (20 ºC and 75 % RH). Both mite species had a similar effect on seed germination. The germination of cereals decreased by 11.2-33.3 % and 20.6-87 % after 3 and 6 months,

respectively. Vegetable seeds germination decreased by 0-38.7 and 3.4-100%, respectively. Mite damage to hard red wheat variety was evident. This damage was manifested as loss in grain weight and germination rate, also the constituents of grains were affected. Germination rate was affected by10.42% after 28% days of infestation at initial infestation of 20 pairs of adults per two grams of grains. (**Mahmoud 2013)**, studied the population development of *Caloglyphus redikorzevi* Zach. on canola (*Brassicae napus*) and black (*Nigella sativa*) seeds during seven weeks storage, and showed that germination activity of both seeds was affected mite infestation.

ACKNOWLEDGMENT

Deep thanks are due to Dr. Essam Abdel Salam Professor of Acarology, Plant Protection, Research Institute, Agricultural Research Center for mite species identification.

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تكاثر الأكاروس تيروفاجس بتروسينشيا (أكاريدى) وتأثيره على انبات بعض البذور

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تمت تربية أكاروس المواد المحزونة تيروفاجس بتروسينشيا على ثلاثة أنواع من بذور النباتات وهم الجرجير والملوخية والكسبرة وقد وجد من النتائج أن هذا النوع له القدرة على التكاثر وانتاج عدد كبير من الأفراد، كما وجد أيضا أن نسبة انبات هذه البذور قد تأثرت سلبا نتيجة التغذيه عليها وذلك تحت ظروف المعمل من متوسط درجة حرارة ٢٦,٤ م ومتوسط رطوبة نسبية ٦٤,٥ % وسجل ايضا زيادة تعداد الأكاروس حتى وصلت الى أعلى معدل لها ثم انخفضت بعد ذلك ويرجع ذلك الى التزاحم الناتج من زيادة التعداد مع نقص فى كمية المادة الغذائية.