

Effect of Food Kinds on Developmental Stages and Fecundity of the Astigmatid Mites, *Tyrophagus putrescentiae* (Schrank) and *Rhizoglyphus robini* Claparede (Astigmata: Acaridae)

Yassin, E. M. A.; Enas M. K. Kassem and Rania H. Mahmoud

Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza, Egypt



ABSTRACT

This investigation was conducted to study the different biological aspects of astigmatid mites, *Tyrophagus putrescentiae* (Schrank) and *Rhizoglyphus robini* Claparede (Astigmata: Acaridae) when fed on different food kinds i.e. pure white wheat flour, normal wheat flour, wheat germ, rice flour, maize flour and semolina at 25 ± 2 °C and 75 ± 5 % R.H.. The results indicated that there were obvious differences between (incubation period, life cycle, longevity and life span) of both *T. putrescentiae* and *R. robini* and the different introduced food. The longest life span periods of *T. putrescentiae* male and female were noticed when the individuals fed on wheat flour, as recorded 41.61 and 50.9 days, respectively. However, the longest life span periods of *R. robini* were observed on maize flour and recorded 49.2 and 41.2 days for male and female individuals, respectively. The food type's suitability clearly affected the number of deposited eggs by the adult female of both *T. putrescentiae* and *R. robini* and revealed highly significance between the feeding on wheat flour for the first mite and maize flour for the second one (the most suitable feeding sources for mites) than any other feeding types. The highest number of *T. putrescentiae* eggs was 40.2 eggs on wheat flour and the lowest number was recorded on wheat germ (27.8 eggs). However, the highest deposited number of *R. robini* eggs was noticed when adult female fed on maize flour (140.2 eggs), but the lowest number of laid eggs was found when the individuals reared on wheat germ (70.4 eggs).

INTRODUCTION

A stored product constitutes a biological system with limited energy and is influenced by several abiotic and biotic factors. The nutritional value of wheat is extremely important as it takes an important place among the few crop species being extensively grown as staple food sources. The importance of wheat is mainly due to the fact that its seed can be ground into flour, semolina, etc., which form the basic ingredients of bread and other bakery products, as well as pastas, and thus it presents the main source of nutrients to the most of the world population (Sramkova *et al.*, 2009). The wheat germ lies at one end of the grain. It is rich in proteins (25%) and lipids (8-13%).

The mineral level is also rather high (4,5%). Wheat germ is available as a separate entity because it is an important source of vitamin E. Wheat germ has only one half the glutamine and proline of flour, but the levels of alanine, arginine, asparagine, glycine, lysine and threonine are double (Cornell, 2003). Stored product mites form an important group among biotic factors infesting these materials. The relative humidity of the micro-environment as well as the temperature and food sources are the main ecological factors affecting the growth and development of different mites. Stored mites flourish in warm and damp environments where they feed on protein rich substance such as grain, fungi and other micro-organisms. Mites infested food products undergo a series of changes in their chemical composition and flour prepared from contaminated grains is more acidic, fusty smell and bitter taste. Mites of sub-order Acaridida (Astigmata) are known to infest a wide variety of stored materials throughout the world. These mites are a major cause of qualitative and quantitative losses to these stored materials, Hughes (1976). Nutrition is one of the important factors which has a modifying effect on growth and life span of mites, the growth of mite population is directly related with the biological as well as physical factors operating the ecosystem. The stored product mites of the genera *Tyrophagus* *oudemans* and *Rhizoglyphus* (Claparede) (Acaridae) have been identified as pests of many crops and ornamentals in storage, in the greenhouse, and in the field.

T. putrescentiae and *Rhizoglyphus robini* Claparede are the most frequently found in stored food with relatively high fat and protein content, such as wheat and soy, flour, cheese, rye bread, herring meal, bacon, dried milk and various seeds (Duek *et al.* 2001; Zhang, 2003). The scope of this work was mainly dealing with the biological aspects of the astigmatid mites, *T. putrescentiae* and *R. robini* when fed on different kinds of food stored products at 25 ± 2 °C and 75 ± 5 % R.H..

MATERIALS AND METHODS

The astigmatid mites *Tyrophagus putrescentiae* and *Rhizoglyphus robini* (Acaridae: Astigmata) were reared on six different freshly materials i.e. pure wheat flour (white wheat flour), normal wheat flour (wheat flour), wheat germ, maize flour, rice flour and semolina) under constant laboratory conditions (25 ± 2 °C and 70 ± 5 % R.H.). The first mite was extracted from stored wheat bran and the second one was collected associated with onion bulbs (at Ashmoun region, El-Menuofia Governorate) by aiding of Modified Tullgren funnels. For preparing pure culture of tested mites, plastic cups of (1.5 cm high x 2.5 cm diameter) were filled up to 0.5 cm with substrate of (plaster of Paris and activated charcoal in the rate of 8: 2, respectively). One adult female and male of each *T. putrescentiae* and *R. robini* were supplied with dry yeast as food and drops of water (to maintain suitable relative humidity) and incubated at 25°C. For individual rearing, ten newly deposited eggs of each mite were transferred from the mother culture to newly rearing plastic cells contains the six previously mentioned tested food sources. Each newly hatched larva was supplied with food and kept till reaching maturity. Mites were examined twice a day. As soon as females emerged (on each rearing host), males were introduced for mating. Deposited eggs were collected during 12 h post-oviposition. Eggs were individually placed into newly cells with the aid of camel hair brush and incubated at the same conditions mentioned above. Fifteen eggs were used per each rearing material and observed every 12 h until hatching and mite become mature or died. At each rearing host, the incubation period, life cycle, longevity and life span of males and females and fecundity (total number of eggs laid per female) were calculated. All

presented data were subjected to one way of variance (ANOVA) and means were separated by Duncan's multiple range test, (Duncan, 1955).

RESULTS AND DISCUSSION

This study was conducted to throw some lights on the effect of some food stuffs; normal wheat flour (wheat flour), pure wheat flour (white wheat flour), maize flour, wheat germ, semolina and rice flour) on the main biological aspects of the acarid mites, *T. putrescentiae* and *R. robini* at 25±2 °C and 75±5 % R.H.

Feeding behavior, mating, hatching and molting.

The acarid mites, *T. putrescentiae* and *R. robini* possesses a few teeth on the fixed digit chelicerae seems to be more adapted for cutting and biting a characteristic feature of fungivorous and granivorous or omnivorous mites (Woolley, 1988; Fan and Zhang, 2003). Mating is necessary for both mite *T. putrescentiae* and *R. robini*, and the females not deposited eggs without this process. The mating occurring immediately after emergence of adult female. After emergence of the adult male and female stages, mating process occurred immediately in which the male cling over the female dorsum with their opisthosoma opposite to each other, and firmly seizing the female with hind legs. Mating process lasted about 15-20 minutes. Eggs of *T. putrescentiae* and *R. robini* are ovoid, globular or elliptical. The eggs are whitish in color. Before incubation, the embryo grows gradually in size and hatched to whitish small larvae. During hatching the shell rupture through a longitudinal slit from which larvae crawls outside with its legs leaving the egg shell. The hatching process lasted about (20-30 minutes). The hatched larvae of both tested mites stayed inactive for a short time and then began its activity. Immature stages (larvae and nymphs) searched for a suitable place, then they stop movement and feeding, extending their forelegs forwards and the hind legs backwards. At the end of this period, moulting occurs.

A- *Tyrophagus putrescentiae*

1. Incubation period:

From the tabulated data in Table (1), indicated that the obvious difference between the incubation period of *T.*

putrescentiae and different introduced food types. This period took the longest period when the individuals fed on wheat germ, (4.1 days) and decreased to record the shortest period (3.03 days) when the mite fed on wheat flour. The statistical analysis of obtained data indicated that L.S.D. for incubation periods at 0.05 = 0.379.

2. Life cycle:

The influence of different food types on life cycle of *T. putrescentiae* male and female can be summarized in Table (1), which revealed that the mean periods were 10.21, 10.04, 10.8, 11.42, 11.8 and 13.4 days when the male individuals fed on wheat flour, rice flour, pure wheat flour, semolina, maize flour and wheat germ, respectively. However, these periods changed to recorded 11.48, 11.84, 12.2, 12.82, 13.1 and 13.9 days when the female individuals of the mite fed on the same order of introduced food types, respectively. Statistical analysis of obtained data showed that L.S.D. at 0.05 = 0.314 and 0.239 for males and females, respectively.

3. Longevity:

Concerning the adult longevity, Table (1), statistical analysis using L.S.D. at 0.05 level value pointed that the longevity of the resulted males and females was significantly differed when the mite *T. putrescentiae* fed on the different food types (L.S.D. = 0.619 and 0.697 for males and females, respectively). The longevity period averaged 31.4, 30.1, 29.5, 28.6, 25.0 and 22.4 days for males, changed to 39.42, 38.6, 36.5, 33.9, 26.9 and 24.7 days when female individuals fed on wheat flour, rice flour, pure wheat flour, semolina, maize flour and wheat germ, respectively.

4. Life span:

Accordingly, the life span of *T. putrescentiae* males and females also affected by feeding on different foods as shown in Table (1). The shortest period of life span resulted when the male individuals fed on wheat germ and averaged 35.8 days, but the longest resulted life span was recorded when the female individuals fed on wheat flour (50.9 days). (L.S.D. at 0.05 = 0.795 and 0.814 for males and females, respectively).

Table 1. Duration of different stages of *Tyrophagus putrescentiae* fed on different diets at 25 °C and 70 % R.H.

Biological stages		Types of food					L.S.D. at 0.05	
		Wheat flour	Rice flour	Pure wheat flour	Semolina	Maize flour		Wheat germ
Incubation period		3.03±0.09	3.04±0.12	3.2±0.11	3.42±0.12	3.5±0.14	4.1±0.16	0.379
Life cycle	♂	10.21±0.57	10.04±0.48	10.8±0.61	11.42±0.49	11.8±0.6	13.4±0.42	0.314
	♀	11.48±0.64	11.84±0.58	12.2±0.69	12.82±0.76	13.1±0.59	13.9±0.95	0.239
Longevity	♂	31.4±1.3	30.1±1.7	29.5±1.6	28.6±1.4	25.0±1.0	22.4±1.4	0.619
	♀	39.42±1.1	38.6±1.19	36.5±0.84	33.9±0.64	26.9±0.76	24.7±0.55	0.697
Life span	♂	41.61±1.12	40.5±1.57	40.3±1.9	40.02±1.14	36.8±1.5	35.8±1.32	0.795
	♀	50.9±1.47	50.7±1.34	48.7±1.6	46.72±1.44	40.0±1.67	38.6±0.86	0.814

± S.D.= Standard deviation. L.S.D. = Least significant difference

5. Pre-oviposition, oviposition and postoviposition periods:

From the tabulated data in Table (2), cleared that the pre-oviposition period of *T. putrescentiae* was slightly affected by the type of used food.

Accordingly, this period was 2.1, 2.2, 2.22, 2.26, 2.1 and 1.78 days when the mite females fed on wheat flour, rice flour, pure wheat flour, semolina, maize flour

and wheat germ, respectively. L.S.D. at 0.05 = 0.247. On the other hand, the average duration of *T. putrescentiae* oviposition period lasted 34.92, 33.86, 32.17, 29.24, 22.4 and 21.0 days when the mite reared on the same diets, respectively (L.S.D. at 0.05= 0.281). However, Data presented in Table (2) showed slightly differences in post-oviposition period, L.S.D. at 0.05 = 0.153.

Table 2. Effect of different diets on the longevity and fecundity of *T. putrescentiae* female at 25±2°C and 75±5% R.H.

Stages	Types of food						L.S.D. at 0.05
	Wheat flour	Rice flour	Pure wheat flour	Semolina	Maize flour	Wheat germ	
Preoviposition period	2.1±0.08	2.2±0.16	2.22±0.17	2.26±0.14	2.1±0.5	1.78±0.22	0.247
Oviposition period	34.92±0.62	33.86±0.8	32.17±0.48	29.24±0.33	22.4±0.42	21.0±0.5	0.281
Postoviposition period	2.4±0.24	2.54±0.3	2.11±0.09	2.4±0.37	2.4±0.6	2.11±0.51	0.153
Fecundity	40.2±1.4	39.0±1.8	36.8±1.6	34.0±1.5	31.4±0.64	27.8±0.7	1.104

± S.D.= Standard deviation. L.S.D. = Least significant difference

6. Fecundity:

The food type's suitability clearly affected the number of deposited eggs by the adult female of *T. putrescentiae* and revealed highly significance between the feeding on wheat flour and rice flour (the most suitable feeding sources for mite) than any other feeding types (L.S.D. at 0.05 level = 1.014). The highest number of eggs was 40.2 eggs on wheat flour, but the lowest number was recorded on wheat germ (27.8 eggs). The current study (Table 3) indicated that the different biological aspects of *T. putrescentiae* were highly affected in both sexes (male and female) when the different foods were used. The statistical analysis of data showed that L.S. D. at 0.05 = 0.052 and 0.10 in case of incubation period for the effect of sex and diet on this period, respectively.

Table 3. Effect of different factors (sex and diet) on the biological aspects of *T. putrescentiae* at 25±2°C and 75±5% R.H.

Biological aspect	Source	F	P	L.S.D. at 0.05 level	
				Sex	Diet
				Incubation period	Sex
	Diet	115.56	0.000***	0.052	0.10
	Int. sex x diet	4.68	0.0124 *		
Life cycle	Sex	165.39	0.000***		
	Diet	8671.33	0.000***	0.216	0.318
	Int. sex x diet	3.24	0.0349*		
Longevity	Sex	1233.11	0.000***		
	Diet	555.0	0.000***	0.498	0.577
	Int. sex x diet	6.44	0.0019**		
Life span	Sex	1444.25	0.000***		
	Diet	86.64	0.000***	0.541	0.722
	Int. sex x diet	9.33	0.0000***		

*= significant ** = highly significant *** = very highly significant

However, L.S. D. was 0.216 & 0.318; 0.498 & 0.577 and 0.541 & 0.722 in case of life cycle, longevity and life span, respectively. Although *T. putrescentiae* has previously been described as saprophagous species (Hughes, 1976), their attraction to, and successful completion of life cycles feeding exclusively on maize flour, rice flour, semolina, wheat flour, pure wheat flour

and wheat germ, suggests frequent utilization of this food resources under natural conditions.

The results obtained by Chmielewski (1999) showed that bruised buckwheat is accepted as food by the mould mite, *T. putrescentiae* which allows completing its development and multiplication. The main life cycle 16.9 days and the high fecundity and fertility of this mite species indicated that bruised buckwheat seems to be most favorable medium for rearing this acarid mite. Also, Sarwar *et al.*, (2010) mentioned that the assessment of macronutrients in soybean, maize, and wheat flours showed that wheat had more carbohydrate and ash but reduced protein and fat contents and merits as leading compound in supporting higher *T. putrescentiae* populations. The authors added that egg, larval, protonymphal, and deutonymphal stages of *T. putrescentiae* that fed on wheat had faster development compared to those fed on maize and soybean. The female longevity averaged 34.1, 27.0, and 40.8 days and male longevity was 23.5, 18.7, and 28.7 days when raised on maize, soybean, and wheat, respectively. Similar results were obtained by Abd El-Khalik (2013) who noticed that the life span of *T. putrescentiae*, affected by the types of food, as the female life span averaged 50.1, 47.2, 40.3 and 39.1 days when the mites fed on wheat flour, milk powder, granular feed and fish powder, respectively at 25 °C and 75 % R.H. She also noticed that the feeding on different source of food affected significantly on the fecundity of *T. putrescentiae*. The highest deposited number of eggs was noticed when the female fed on wheat flour (39.2 eggs), but the lowest number recorded when the mite fed on fish powder (28.0 eggs). The female deposited 34.2 eggs on milk powder and 30.0 eggs on granular chicken feed.

B- *Rhizoglyphus robini*

1. Incubation period:

As shown in Table (4), the obtained data cleared that there were not significant differences for influence of different food kinds on egg incubation period of the acaridid mite, *R. robini*. These periods ranged from 3.31 and 3.62 days when the mite fed on maize flour and wheat germ, respectively. (L.S.D. at 0.05 = 0.45).

Table 4. Duration of different stages of *Rhizoglyphus robini* fed on different diets at different temperatures at 25 °C and 70 % R.H.

Stages		Types of food					L.S.D. at 0.05	
		Maize flour	Rice flour	Semolina	Wheat flour	Pure Wheat flour		Wheat germ
Incubation period		3.62±0.17 (3.0-3.56)	3.59±0.17 (3.1-3.7)	3.54±0.14 (3.2-3.7)	3.45±0.14 (3.38-3.72)	3.36±0.12 (3.4-3.7)	3.31±0.13 (3.3-3.9)	0.45
Life cycle	♂	8.6±0.57	8.0±0.46	7.7±0.45	7.5±5.1	7.3±4.9	7.0±0.46	0.81
	♀	11.6±0.66	11.4±0.72	10.5±0.67	10.2±0.69	10.0±0.77	8.8±0.81	0.90
Longevity	♂	40.6±1.66	36.8±1.73	36.1±1.91	35.4±1.84	34.2±1.9	31.4±1.8	2.9
	♀	29.6±2.87	27.0±2.6	25.2±1.8	24.0±2.1	22.0±1.4	20.5±1.6	2.6
Life span	♂	49.2±2.4	44.8±2.2	43.8±2.2	42.9.5±2.1	41.5±1.9	38.4±1.84	3.9
	♀	41.2±3.9	38.4±3.6	35.7±3.8	34.2±3.8	32.0±3.6	29.3±3.4	3.54

± = Standard deviation L.S.D. = least significant differences

2. Life cycle:

The tabulated data in Table (4) indicated that the female life cycle of *R. robini* lived longer than male individuals under tested conditions of different kinds of food. The obtained results revealed that obviously significant differences in the life cycle. The life cycle averaged 8.6, 8.0, 7.7, 7.5, 7.3 and 7.0 days for male individuals, changed to recorded 11.6, 11.4, 10.5, 10.2, 10.0 and 8.8 days for female individuals when fed on maize flour, rice flour, semolina, wheat flour, pure wheat flour and wheat germ, respectively, Table (4). These results clearly indicated that maize flour was the most suitable diet for life cycle of *R. robini*.

3. Longevity:

As shown in Table (4), male adulthood period of *R. robini* duarted the longest periods than female individuals, as recorded 40.6, 36.8, 36.1, 35.4, 34.2 and 31.4 days on maize flour, rice flour, semolina, wheat flour, pure wheat flour and wheat germ, respectively, changed to 29.6, 27.0, 25.2, 24.0, 22.0, and 20.5 days for female individuals fed on the same previously mentioned diets, respectively. The statistical analysis of data showed that L.S.D. at 0.05 level = 2.9 and 2.6 for males and females, , respectively.

4. Life span:

Accordingly, the female and male life span of the acaridid mite, *R. robini*, was different significantly differed according to the kind of used food, Table (4). The obtained results revealed that the longest life span was recorded for male individuals fed on maize flour (49.2 days) and the shortest period was found when the females reared on

wheat germ (29.3 days). L.S.D. at 0.05 = 3.9 for males and 3.54 for females, respectively.

5. Pre-oviposition, oviposition and post-oviposition periods:

The influence of different diets on female pre-oviposition period of *R. robini*, Table (5) revealed that this period lasted 4.6, 4.2, 3.9, 3.6, 3.4 and 3.2 days when the individuals fed on maize flour, rice flour, semolina, wheat flour, pure wheat flour and wheat germ, respectively. L.S.D. at 0.05 = 1.64. The same obtained data indicated that the kind of introduced food to *R. robini* was significantly affected on the oviposition period of this astigmatid mite. The longest period noticed when the mites fed maize flour and averaged 18.5 days, which decreased to recorded the shortest period on wheat germ (13.5 days) with L.S.D. at 0.05 level = 2.68. The results in Table (5) showed that there were significant differences between the postoviposition period of *R. robini* fed on different diets which averaged 6.5, 5.7, 5.2, 4.8, 4.1 and 3.8 days when females fed on maize flour, rice flour, semolina, wheat flour, pure wheat flour and wheat germ, respectively. L.S.D. at 0.05 = 1.39

6. Female fecundity:

The current study indicated that the different diets affected significantly on the number of deposited eggs by female of *R. robini*. The highest number of eggs recorded in Table (5) was laid when adult female mite fed on maize flour (140.2 eggs), but the lowest number of resulted eggs was demonstrated when the mite individuals reared on wheat germ (70.4 eggs).The statistical analysis of obtained data observed that L.S.D. at 0.05 level was 13.65.

Table 5. Effect of different diets on the longevity and fecundity of *Rhizoglyphus robini* female at 25 ±2°C and 75±5% R.H.

Stages	Types of food						L.S.D. at 0.05 level
	Maize flour	Rice flour	Semolina	Wheat flour	Pure wheat flour	Wheat germ	
Preoviposition period	4.6±0.45	4.2±0.34	3.9±0.27	3.6±0.21	3.4±0.33	3.2±0.36	1.64
Oviposition period	18.5±0.78	17.1±0.55	16.1±0.43	15.6±0.4	14.5±0.38	13.5±0.34	2.68
Postoviposition period	6.5±0.43	5.7±0.41	5.2±0.46	4.8±0.4	4.1±0.38	3.8±0.41	1.39
Fecundity	140.2±6.5	122.5±5.41	110.6±5.8	85.6±4.2	75.6±4.2	70.4±3.6	13.65

± = Standard deviation L.S.D. = least significant differences

Generally, the best host for feeding the astigmatid mite, *R. robini* was maize flour, but the lowest favorable one was wheat germ. The obtained results in Table (6) explained the relation between the mite sex (male and female), tested diets and the different biological aspects of *R. echinopus*. The results denoting that the relations were highly significant. The current study indicated that all of the selected food products have already been found suitable for extent for the tested mite species survival and development. Out of the tested diets for rearing the mites the most attractive food was maize flour, but the lowest one is wheat germ. Although wheat germ was less suitable than other food types, the mites positively reared and reproduced on this diet. Similar results were obtained by Qu *et al.*, (2018) who noticed that the developmental time for the immature stages of *R. robini* was significantly affected by fungal species, ranging from 9.45±1.83 days reared on the *Lentinula edodes* (Berk.) at 31°C to 26.39 ± 2.10 days reared on *Agaricus bisporus* Lange at 15°C. On the other hand, Raut and Sarkar (1991) found this mite required 25.8, 18.3, 15.6 and 18.0 days reared on semi-

decomposed potato slices to complete its life-cycle when maintained at 15, 20, 25, 30°C.

Table 6. Effect of different factors (sex and diet) on the biological aspects of *Rhizoglyphus robini* at 25 ±2°C and 75±5% R.H.

Biological aspect	Source	F	P	L.S.D. at 0.05 level	
				Sex	Sex
Incubation period	Sex	51.00	0.000***	0.042	0.19
	Diet	92.6	0.000***		
	Int. sex x diet	4.33	0.0321 *		
Life cycle	Sex	136.54	0.000***	0.301	0.287
	Diet	7452.36	0.000***		
	Int. sex x diet	5.24	0.0514*		
Longevity	Sex	1245.33	0.000***	0.455	0.621
	Diet	651.0	0.000***		
	Int. sex x diet	7.22	0.0026**		
Life span	Sex	1243.22	0.000***	0.419	0.805
	Diet	85.64	0.000***		
	Int. sex x diet	4.673	0.0000***		

*= significant ** = highly significant *** = very highly significant

REFERENCES

- Abd El-Khalik, A. R. 2013. Studies on the effect of certain mites on some food products. M. Sc. Thesis, Fac. Sci. El-Menofia Univ., 104 pp.
- Chmielewski, W. 1999. Acceptance of buckwheat grain as a food by *Tyrophagus putrescentiae* (Schrank) (Acari: Acaridae). *Fagopyrum*, 16:95-97.
- Cornell, H. 2003. Bread Making: Improving Quality. Woodhead Publishing, Cambridge
- Duek, L.; Kaufman, G.; Palevsky, E. and Bericevsky, I. 2001. Mites in fungal cultures. *Mycoses*, 44 (9-10):390-394.
- Duncan, D. B. 1955. Multiple range and multiple F. test. *Biometrics*, 11: 1-42.
- Fan, Q. and Zhang, Z. 2003. *Rhizoglyphus echinopus* and *Rhizoglyphus robini* (Acari: Acaridae) from Australia and New Zealand: identification, host plants and geographical distribution. *Systematic & Applied Acarology, Special Publications*, 16, 1-16.
- Hughes, A. M. 1976. The mites of stored food products and houses. *Tech. Bull., Min. Agric. and Fisheries in London*, 63: 105 – 110.
- Qu, S.; Luo, X. and Ma, L. 2018. Effect of fungal species on development and reproductive traits of the fungal-feeding mite *Rhizoglyphus robini* (Astigmata: Acaridae). *J. Econ. Entomol.*, 111 (1,9):154-158.
- Raut, S.K., and Sarkar, R.. 1991. The influence of temperature on the life cycle of *Rhizoglyphus robini* Claparede (Acari: Acaridae). *Int. J. Acarol.* 17: 145–148.
- Sarwar, M; Xuenong, X. and Kongming, W. 2010. Effects of different flour on the biology of the prey *Tyrophagus putrescentiae* (Schrank) (Acarina: Acaridae) and the predator *Neoseiulus pseudolongispinosus* (Xin, Liang and Ke) (Acari: Phytoseiidae). *International Journal of Acarology*, 36 (5): 363–369.
- Sramková, Z.; Gregova, E. and Sturdik, E. 2009. Chemical composition and nutritional quality of wheat grain. *Acta Chimica Slovaca*, 2, (1): 115 – 138.
- Woolley, T.A. 1988. Acarology- Mites and human welfare. Jhon Wiley and Sons, New York, pp. 86-93.
- Zhang, Z. 2003. Mites of greenhouses, identification, biology and control. CABi Publishing, 244 pp.

تأثير نوع الغذاء على أطوار النمو وخصوبة الاكاروسات عديمة الثغر *Tyrophagus putrescentiae* (Schrank) و *Rhizoglyphus robini* Claparede (عديمة الثغر : اكاريدى) عصام محمد عبد السلام ياسين ، ايناس مصطفى قطب قاسم و رانيا حسن محمود معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقي - جيزة - مصر

أجريت هذه الدراسة لمعرفة المظاهر البيولوجية المختلفة (فترة حضانة البيض ودورة الحياة وفترة حياة الأفراد البالغة والفترة الكلية لحياة الأكاروس) لأفراد الأكاروسات *Tyrophagus putrescentiae* و *Rhizoglyphus robini* المنتميان لعائلة Acaridae عند تغذية الأفراد على أنواع مختلفة من الغذاء (دقيق القمح الفاخر ودقيق الأرز ودقيق القمح العادي والسيمونيل ودقيق الذرة وجنين القمح وذلك عند درجة حرارة $25 \pm 2^\circ\text{C}$ ورطوبة نسبية $70 \pm 5\%$. وأوضحت النتائج المتحصل عليها ان نوع الغذاء المستخدم اثر بصورة معنوية على هذه الفترات. وقد وجد أن أطول فترة حياة الأكاروس الكلية Life span للأكاروس *T. putrescentiae* كانت عند تغذية الأفراد الذكور والإناث على دقيق القمح العادي حيث سجلت 41.61 و 50.9 يوما على الترتيب بينما سجلت اقل فترة عند التغذية على جنين القمح وسجلت 38.6 و 35.8 يوما على الترتيب . بينما سجلت أعلى فترة لحياة الأكاروس *R. robini* عند التغذية على دقيق الذرة لكلا من الذكور والإناث وسجلت زمنا مقداره 49.2 و 41.2 يوما على الترتيب . ولقد أشارت النتائج المتحصل عليها ايضا أن عدد البيض الذي تم وضعه بواسطة إناث الأكاروسات المستخدمة قد تأثر بنوع الغذاء المستخدم حيث وضعت إناث الأكاروس *T. putrescentiae* أكبر عدد من البيض (40.2 بيضة) عند تغذية الأفراد الإناث على دقيق القمح العادي بينما كان اقل عدد من البيض تم وضعه بواسطة الإناث عند التغذية على جنين القمح (27.8 بيضة). من ناحية أخرى لوحظ أن أكبر عدد من البيض الموضوع بواسطة إناث الأكاروس *R.robini* كان 140.2 بيضة عند تغذية الإناث على دقيق الذرة بينما وضعت عددا مقداره (70.4 بيضة) وهو اقل عدد من البيض لها عند تغذية نفس الأفراد على جنين القمح .