

## Effect Of Some Fungi Species On The Biology Of *Tyrophagus putrescentiae* (Schr.)

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### Abstract

#### Introduction:

The effect of different fungi species, (*Aspergillus Carcinicus*, *Verticillium sp.*, *Helminthosporium turicum*, *Diplodia sp.* and *Alternaria tenuis*) on the biology of *Tyrophagus putrescentiae* was measured under the laboratory conditions  $27\pm 2^{\circ}\text{C}$  with  $65\pm 5\%$  RH.

#### Results and conclusion:

All different stages affected by the used fungi. The shortest period of immature stages occurred under feeding on fungi *Aspergillus carcinicus* by females and males. Feeding on *Alternaria tenuis* by females and males prolonged the period of immature stages. It also prolonged the female and male life span (36.3 days and 31.7 days respectively) in comparison with the other used fungi. The number of deposited eggs by the adult female also affected by feeding on different fungi species. Concerning the adult longevity, it was significantly differed when mites fed on the different tested fungi. Generally female longevity was longer than male when feeding on any of the used fungi. The maximum longevity of *Tyrophagus putrescentiae* was observed when rearing on *Alternaria tenuis*.

**Key words:** *Tyrophagus putrescentiae*, Fungi, Development, fecundity.

### Introduction

Several species of mites infest stored foods and other organic debris such as grain, flour, cereals, dried fruits and vegetables pet foods, cheese, dried milk, ham and sugar, etc. Prolonged contact with mite infested foods may produce a mild dermatitis known as “baker’s” or “grocer’s itch.” (Road, 1991).

The acaroid’s mites tend to attack stored food products such as cheese, milk, biscuit, etc. Quintero and Acevedo (2001) and El dabi (2003).

The biological activities of the stored product mites adversely affect the different foodstuffs, due the consumption of the feedstuffs, and biological or mechanical transmission of various microorganismes especially fungi, some of these fungi contaminating foodstuffs may produce various toxic metabolites which are usually known as Aflatoxins were recorded by some authors, Sommer *et al* 1976; Balzer

and Muzic, 1977; Bennet and Anderson, 1978 and Abd El-Hamid 1988. The present work aimed to study the effect of some fungi species on the development, and fecundity of *T. putrescentiae*.

### Material And Methods

To investigate the effect of fungi (five species) on the young stages development and fecundity of adult of *T. putrescentiae*, a samples of male and female mites were obtained from Plant Protection Research Institute, Dokki, Giza, Egypt.

The stock cultures of fungi were obtained from the National Research Centre.

Adult females were sexed and left to deposit their eggs and the females were then removed.

Hatching larvae were left to continue its development until adulthood. Five

different species of fungi namely: *Aspergillus carcinicus*; *Verticillium Sp.*; *Helminthosporium turicum*; *Alternaria tenuis* and *Diplodia Sp.* were tested.

A small piece from each fungus species were transferred to the plastic cells (rearing units) of 3x4cm diameter and 1 cm in depth with perforated covers and filled up with a plaster layer of paris and charcoal (9:1) to feed the mites (Ibrahim, 1982).

Three replicates were used to each fungus.

Observations were made every 12 hours intervals per day until all mites were reached adulthood. Adult were then observed to determine fecundity, oviposition period, number of deposited eggs, longevity, life span and the life cycle.

The biological activity of the mite was measured under the laboratory conditions of  $27\pm 2^{\circ}\text{C}$  with  $65\pm 5\%$  RH.

Statistical analysis according to Snedecor (1980), using a computer program of Noack and Reichmuth (1978).

## Results

Data in table (1) revealed that all different stages of the stored product mite *Tyrophagus putrescentiae* affected differently by each of the used fungi. The duration of the immature stages differ according to the species of fungi. It was decreased when fed on *Aspergillus carcinicus*, then increase gradually on feeding on *Verticillium sp.*, *Helminthosporium turicum*,

*Alternaria tenuis* and *Diplodia sp.* (11.73, 12.45, 13.4, 14.4 and 15.2) respectively in case of female and (9.95, 10.5, 12.5, 13.66 and 13.9) for male respectively.

Generally the male emerged earlier than the female when fed on the different fungi species. Statistical analysis of the data showed that shortest period of life cycle when *Tyrophagus putrescentiae* fed on *Aspergillus carcinicus*, while the longest one was when fed on *Diplodia sp.*

Table 2 showed that the lowest number of eggs deposited was when female fed on *Alternaria tenuis* (1.1 egg), while the high number of eggs deposited was when female fed on *Aspergillus carcinicus*. *Alternaria tenuis* presented the longest longevity period which exceeds that on *Helminthosporium turicum* and the shortest longevity period of female was obtained with *A. carcinicus*, while the shortest male period was when fed on *Verticillium sp.* (Table 3).

The fecundity of the adult female of *T. putrescentiae* continued ovipositing for a period differ with variation of different fungi species. *A. carcinicus* presented the longest oviposition period and the shortest period was obtained with *Alternaria tenuis*, (Table 2). This period averaged 8.1 and 4.5 days on *A. carcinicus* and *Alternaria tenuis* respectively.

Regarding the mite fecundity, it was found that although feeding on *A. carcinicus* resulted in the highest total average of deposited eggs, while the lower number of deposited eggs was obtained with *Alternaria tenuis*, (Fig. 2).

**Table (1): Developmental period of each stages of *Tyrophagus putrescentiae* (Schr.) in days (Mean±SE)feeding on different fungi species at 27 °C± 2°C and 65± 5 R.H.**

Fungi	incubation period (in days)	immature stages(in days)						total immature stages(in days)	life cycle (in days)	
		larva		Protonymph		tritonymph				
		A	Q	A	Q	A	Q			
<i>Aspergillus carcinicus</i>	♀	4.1 ±0.2	2.53±0.3	1.3±0.4	2.9±0.36	1.1±0.05	2.8±0.21	1.1±0.1	11.73±0.24	15.83±0.23
	♂	3.51±0.25	2.4±0.5	1.0±0.0	1.95±0.7	1.2±0.1	2.3±0.6	1.1±0.1	9.95±0.22	13.45±0.20
<i>Verticillium sp.</i>	♀	5.4 ±0.1	2.65±0.2	1.3±0.2	3.2±0.5	1.0±0.0	3.3±0.7	1.0±0.0	12.45±0.53	17.85±0.42
	♂	5.2 ±0.14	2.7±0.6	1.1±0.05	2.2±0.3	1.0±0.0	2.5±0.4	1.0±0.0	10.5±0.51	15.7±0.51
<i>Helminthosporium turicum</i>	♀	6.1 ±0.3	2.9±0.7	1.3±0.6	3.6±0.2	1.0±0.0	3.6±0.9	1.0±0.0	13.4±0.6	19.5±0.45
	♂	5.9±0.7	2.8±0.5	1.2±0.1	3.0±0.8	1.0±0.0	3.5±0.9	1.0±0.0	12.5±0.57	18.6±0.6
<i>Alternaria tenuis</i>	♀	6.5±0.2	3.2±0.3	1.3±0.1	3.9±0.7	1.2±0.1	3.8±0.9	1.0±0.0	14.4±0.42	20.9±0.38
	♂	6.0 ±0.8	2.96±0.9	1.2±0.09	3.7±0.4	1.2±0.1	3.6±0.5	1.0±0.0	13.66±0.40	19.66±0.36
<i>Diplodia sp.</i>	♀	7.1±0.6	3.6±0.5	1.0±0.0	4.6±0.3	1.0±0.0	4.0±0.9	1.0±0.0	15.2±0.50	22.3±0.41
	♂	6.2±0.8	3±0.6	1.0±0.0	3.8±0.2	1.0±0.0	4.1±0.3	1.0±0.0	13.9±0.47	20.1±0.39

A=Active period.

Q=Quiescence period.

**Table (2): Mean of oviposition period and fecundity of *Tyrophagus putrescentiae* (Schr.) in days (Mean±SE) feeding on different fungi species at 27 °C± 2°C and 65± 5 R.H.**

Fungi	Oviposition period ( in days)	Number of deposited eggs	
		Total average	Daily mean
<i>Aspergillus carcinicus</i>	8.1±0.8	96±12.1	11.85±8.36
<i>Verticillium Sp.</i>	7.2±0.72	59.2±5.2	8.36±6.3
<i>Helminthosporium turicum</i>	6.8±0.9	30±4.4	4.55±3.6
<i>Alternaria tenuis</i>	4.5±0.61	4.9±0.8	1.1±0.5
<i>Diplodia Sp.</i>	5.0±0.82	15.8±11.3	3.16±2.7

**Table (3): Mean of generation, longevity period and life span of *Tyrophagus putrescentiae* (Schr.)in days(Mean±SE)feeding on different fungi species at 27 °C± 2°C and 65± 5 R.H.**

Fungi	Generation period(in days)	Longevity(in days)		Life Span ( in days)	
	♀	♀	♂	♀	♂
<i>Aspergillus carcinicus</i>	17.83±0.39	11.6±0.54	10.0±0.5	27.43±0.5	23.45±0.47
<i>Verticillium Sp.</i>	19.95±0.51	11.8±0.9	8.8±0.72	29.65±0.95	24.5±0.3
<i>Helminthosporium turicum</i>	22.19±0.5	14.0±0.78	10.88±0.45	33.5±0.55	29.48±0.53
<i>Alternaria tenuis</i>	27.4±0.89	15.4±0.51	12.1±0.36	36.3±0.68	31.7±0.5
<i>Diplodia Sp</i>	27.1±0.59	13.6±0.57	10.5±0.7	35.9±0.59	30.63±0.62

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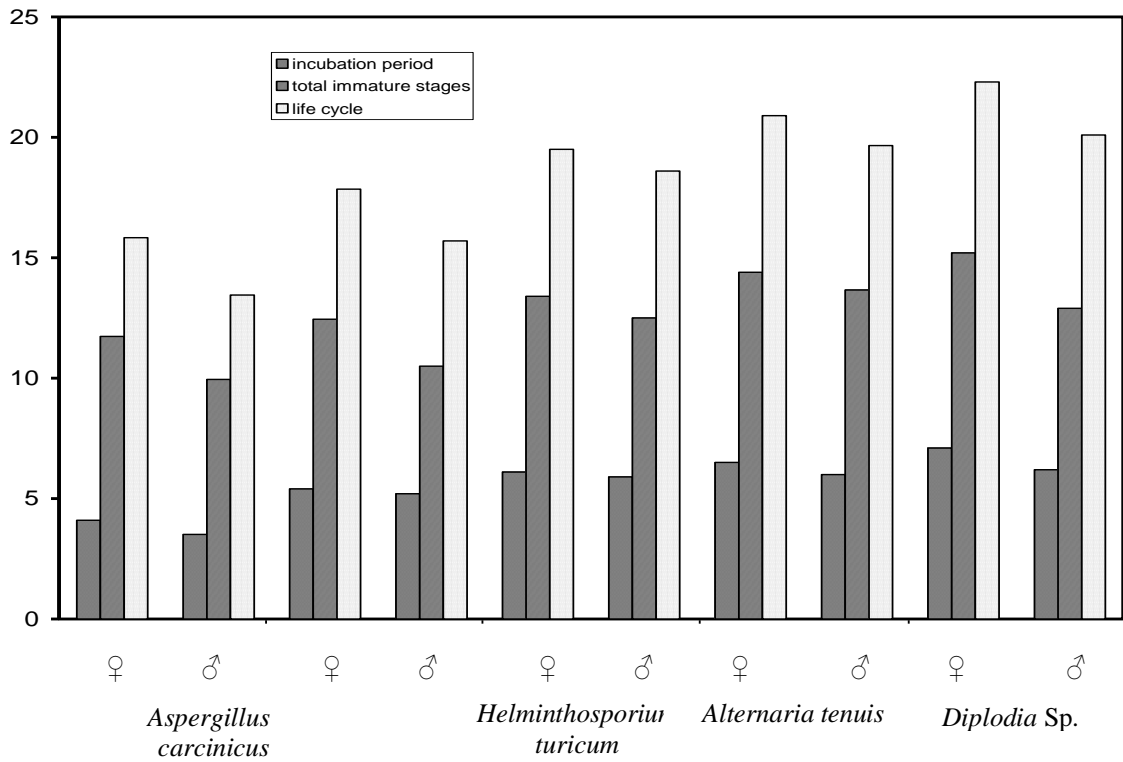


Fig. (1): Developmental period of each stages of *Tyrophagus putrescentiae* (Schr.) in days (Mean±SE) feeding on different fungi species at 27 °C± 2°C and 65± 5 R.H.

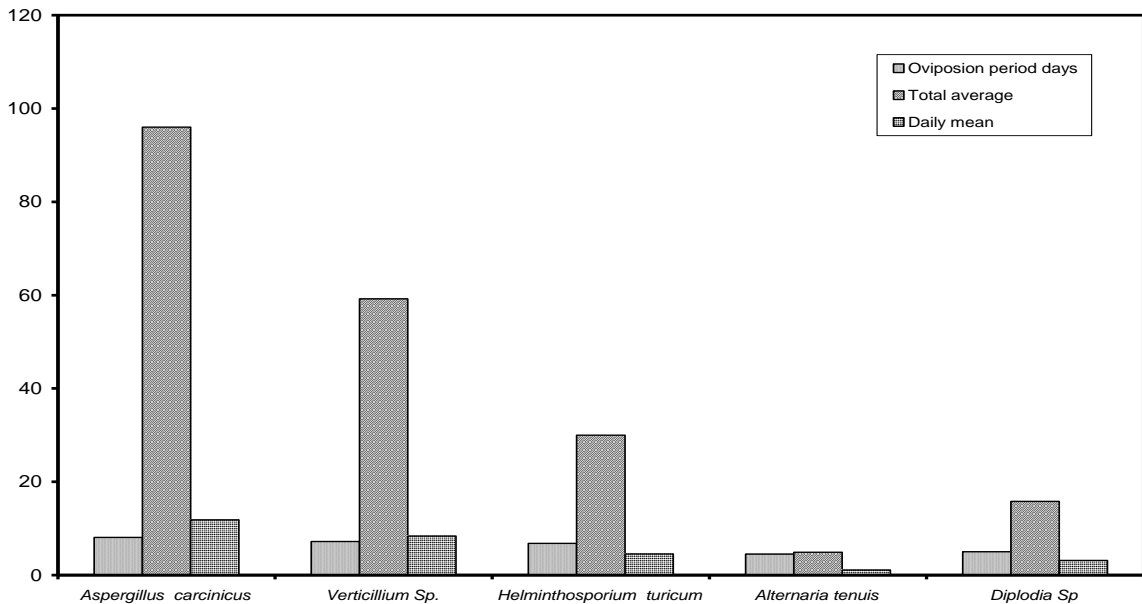
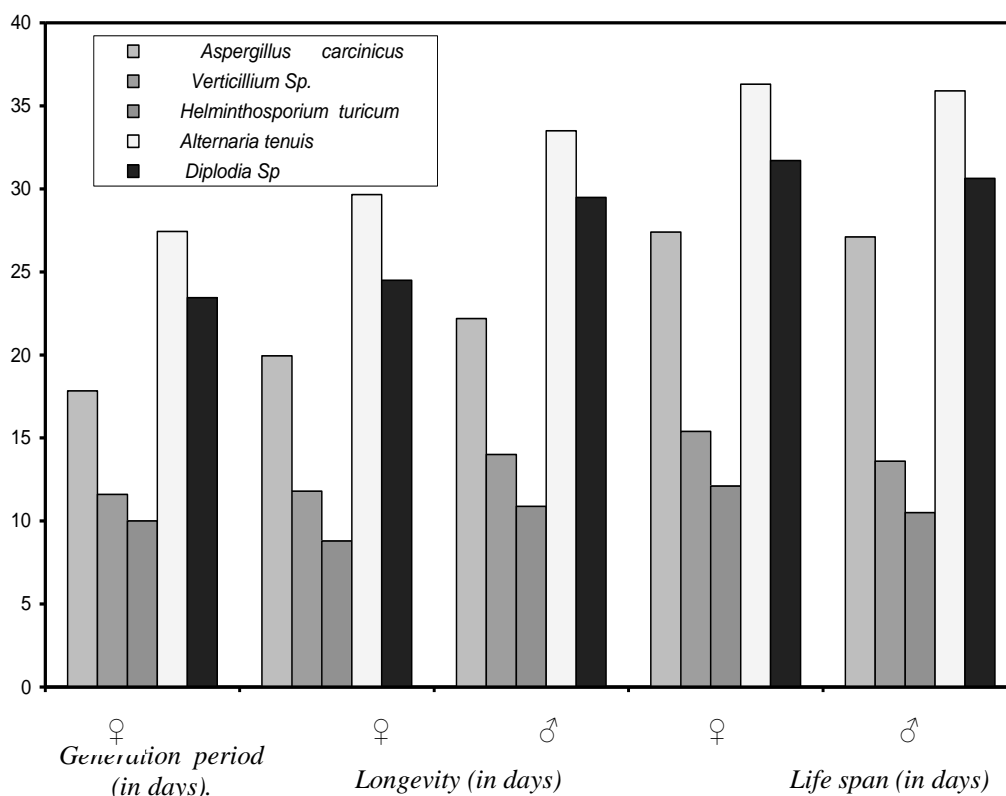


Fig. (2): Mean of oviposition period and fecundity of *Tyrophagus putrescentiae* (Schr.) in days (Mean±SE) feeding on different fungi species at 27 °C± 2°C and 65± 5 R.H.



**Fig. (3): Mean of generation, longevity period and life span of *Tyrophagus putrescentiae* (Schr.) in days (Mean±SE) feeding on different fungi species at 27 °C± 2°C and 65± 5 R.H.**

## Discussion

The present study was aimed to throw light on the biological aspects of the stored product mite *Tyrophagus putrescentiae* when it fed on different fungi species associated with this mite on the stored product samples.

From the results, it can be concluded that the greatest biological activities of *T. putrescentiae* in term of development and fecundity was when fed on *A. Carcinicus*, the mite young stages developed quicker, adults lived shorter and laid greater number of eggs.

*Alternaria tenuis* and *Diplodia sp.* seemed to be the least suitable fungi as it induced longer period of immature stages and the shortest oviposition period and few eggs were laid. These fungi often play an important role in the regulation of the natural mite populations. So some of these fungi can be studied to be considered as

acaricides. Similar results were obtained by Parkinson et al. (1991), Van der Gest et al. (2000) and Quintero and Acevedo (2001).

## References

1. **Abdel- Hamid, A.M., (1988):** Physionutritional effects of pubratexin-B on rabbits. Anim. Nutr., Berlin, 38(9):820-832.
2. **Balzer, I. and Muzic, A. (1977):** natural contamination of corn (*Zea mize*) with mycotoxins in yugoslarvia . Ann. Nutr. Anim., 3: 425-430.
3. **Bennet, G. A. and Anderson, R. A; (1978):** Distribution of aflatoxin and or zearalenone wet-millet corn products. A review J. Agric. food chem., 26:1055-10560.
4. **El-dabi, A. M. R. (2003):** Studies on some species of Astigmatid mites Ph.D. Thesis, Fac. Agric. Cairo. Univ.

## Effect Of Some Fungi Species On.....

5. **Ibrahim, H. A.,(1982):**Studies on some mits associated with certain insect pests .Ph. D. Thesis, Fac. of Science, Al-Azhar Univ. For Girls, 142pp.
6. **Noack, S. and Reichmuth, CH. (1978):** Fin rechneriches verfahren Zur Bestimmung vonbeliebigen Dosiswerten eines wirks-toffes aus empirisch ermittelten Dosis-wirkungen-Daten. Mitt. aus Bba berlin, Heft.,185 :1-49.
7. **Parkiuson, C. L, Barron,C. A.; Armitage, D. M.(1991):** longevity and fecundity of acarus sirol an fonn field and eight storage fungi Expr. Appl. Acaro. 11: 1-8. UK.
8. **Quintero, M. T. and Acevedo, H. A. (2001):** Mites of fermented liquid foods and fungi in mexico. Modem Acarology, 61:611-614.
9. **Road, K. (1991):**Mites infesting stored foods. HYG.,2152:97.
10. **Sommer, N. F,Buchanan, J. R. and Fortagr (1976):** Aflatoxin sterigmatocystin contamination of pistachio nuts in orcharids. Appl. Environ. Microbiol.,32: 64-66.
11. **Snededor, G. W. (1980):** Statistical methods.7<sup>th</sup> Ed., Iowa state.Univ. press, Ames., Iowa, USA.
12. **Van der Gest ,L.P.,Breeuwer,J.A. and Beerling, E.A.M.(2000):**Diseases of mites. Experimental and Applied Acarology, 24 (7): 497-560.

## تأثير بعض أنواع من الفطريات على السلوك البيولوجي للأكاروس *Tyrophagus putrescentiae* (Schr.)

بسملة محمد أبو النور  
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استهدفت الدراسة تقييم تأثير بعض الفطريات على السلوك البيولوجي للأكاروس *Tyrophagus putrescentiae* (Schr.) عند درجة حرارة  $27 \pm 2$  درجة مئوية مع رطوبة نسبية  $65 \pm 5\%$  RH. وقد تم متابعة التغيرات التي تحدث أثناء نمو وتطور الأطوار غير الكاملة والأطوار الكاملة وتسجيل كل من دورة الحياة وفترة حياة الفرد البالغ وفترة الحياة الكلية والخصوبة مع عد كمية البيض التي تضعها كل أنثى وذلك عند التغذية على الفطريات الأتية كل على حدة: *Aspergillus carcinicus*; *Verticillium sp.*; *Helminthosporium turicum*; *Alternaria tenuis*; *Diplodia sp.* وقد أظهرت النتائج أن أقل فترة للأطوار الغير الكاملة كانت عند التغذية على الفطر *Aspergillus carcinicus* في الإناث حيث كانت 4.1 يوما بينما أطول فترة للأطوار الغير الكاملة كانت عند التغذية على فطر *Alternaria tenuis* في الإناث والذكور كانت 6.5 يوم و 6 يوما على التوالي. و كان أطول تاريخ حياة 36.3 يوما للإناث و 31.7 يوما للذكور عند التغذية على فطر *Alternaria tenuis*. أقل معدل وضع للبيض اليومي كان نتيجة تغذية الأنثى على فطر *Alternaria tenuis* بينما كان أعلى معدل وضع للبيض اليومي كان عند التغذية على فطر *Aspergillus carcinicus*. فترة حياة الأنثى عموما كانت أطول من الذكر عند التغذية على كل أنواع الفطريات بينما كانت فترة الأنثى الأطول عند تغذيتها على فطر *Alternaria tenuis* عنها في حالة التغذية على أي من الأنواع الأخرى وتشير النتائج إلى أن فطر *Alternaria tenuis* له تأثير مثبت على السلوك البيولوجي للأكاروس *Tyrophagus putrescentiae* مما يعطى الأمل مستقبلا لأستخدامه كأداة من أدوات مكافحة البيولوجية و استخلاص الجزء الممرض منه.