

**EFFECT OF FOOD AND TEMPERATURE ON DEVELOPMENTAL STAGES AND FECUNDITY OF THE GRAIN MITE *DERMATOPHAGOIDES FARINAE* HUGHES (ACARI : ACARIDIDA : PYROGLYPHIDAE).**

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(Manuscript received November 2003)

**Abstract**

Biological studies were carried out on the grain mite, *Dermatophagoides farinae* Hughes when feeding on three different types of food (dry yeast, crushed wheat and crushed rice) under laboratory conditions of 25 & 30°C and 60 % RH. Developmental stages and female fecundity of mites were affected by different food types and temperature where female total immature stages lasted (15.2 & 14.1), (16.4 & 14.5) and (17.6 & 15.8) days at 25 and 30°C when mite fed on dry yeast, crushed wheat and crushed rice, respectively. Adult female and male longevity lasted (28.6 & 25.8), (32.1 & 27.7) and (35.4 & 29.0) days at 25°C when mite fed on the above mentioned diets, respectively. Female fecundity was also affected by both food and temperature where the average number of deposited eggs and the daily rate were (65.2, 55.9) (53.2 & 44.4) and (45.5 & 35.2) when mite fed on dry yeast, crushed wheat and crushed rice at 25 and 30°C, respectively.

**INTRODUCTION**

Astigmatid mites associated with stored products are considered of great economic importance, where they cause great damage not only by consuming a large amounts of stored food but also contaminating materials with their excretions and dead bodies (Taha, 1985). Under favorable conditions, the mite population markedly increase in stored products, making materials unsuitable for human and domestic animals consumption (Hughes, 1976). Although, mites are very small in size, they form an important group some acaridida cause considerable damage in stored products with high moisture content (Cunnington, 1976). The pyroglyphid mite *Dermatophagoides farinae* Hughes is commonly found associated with wheat grains and flour in Cairo and Daqahlia Governorates. The present work was carried out to study the effect of

different types of food and temperature on development and female fecundity of the grain mite, *D. farinae* at 25 & 30°C and 60%RH. H.

### MATERIALS AND METHODS

For obtaining pure cultures of the grain mite, male and female of *D. farinae* adults were placed in a rearing plastic chamber (5.5 cm in diameter x 1.5 cm thick) containing dry yeast granules and few drops of water as sources of food and humidity, and covered with soft plastic cover. The cultures were observed daily and kept in an incubator at 25°C and 60%RH. For rearing experiment newly deposited eggs of the mite were transferred singly to plastic cells filled partially with a mixture of plaster of Paris and charcoal (1.3 cm diameter x 0.4 cm high). Newly hatched larvae were reared singly during their life span individuals were fed on each of: dry yeast, crushed wheat and crushed rice. where as thirty five replicates were used for each biological experiment of *D. Farinae* All experiments were carried out in an incubator held at 25 & 30°C and 60% RH. and inspected twice daily.

### RESULTS AND DISCUSSION

Laboratory observation cleared that only copulated females laid eggs. The mite individuals passed through a larval and two nymphal stages before reaching the adult stage. Adult females were usually found searching for a secure and protected place for singly laying elongate oval white eggs. Female immature stages lasted (15.2 & 14.1), (16.4 & 15.8) and (17.6 & 15.8) days when mite fed on dry yeast, crushed wheat and crushed rice, respectively. Thus, at 25°C slightly accelerated the development as female life cycle duration lasted 20.8, 22.6 and 24.0 days at 25°C compared with 19.6, 20.5 and 22.0 days at 30°C when fed on the above mentioned diets, respectively Table 1. Female longevity decreased when temperature increased from 25°C (28.6, 32.1 & 35.4 days) to 30°C (22.8, 27.6 & 31.8 days) when mite fed on dry yeast, crushed wheat and crushed rice, respectively. The oviposition period also followed similar trend. The oviposition period was completed in the shortest duration and the maximum number of eggs were laid when mite fed on dry yeast granules. These results coincided with those of Sinha & Wallace, (1977), Maurya & Jamil (1982), Mathur and Dalal (1985) El-Naggar *et al.*, (1989), Sheref & Fawzy (2001) and Taha

*et al.*, (2002). Data of female fecundity, obtained data showed that dry yeast and 25°C significantly increased the number of deposited eggs giving an average of 65.2 eggs and daily rate 3.5 eggs compared with crushed wheat and rice (53.2&45.5 eggs) and daily rate (2.6&1.9 eggs), respectively. while at 30°C the average number of deposited eggs decreased to 55.9, 44.4 &35.2 eggs when mite fed on the above mentioned diets, respectively Table 2.

Table 1. Duration of different stages of *Dermatophagoides farinae* fed on different types of food at 25 oC & 30 oC and 60% R.H.

Stage	Sex	Dry yeast		Crushed wheat		Crushed rice	
		25°C	30°C	25°C	30°C	25°C	30°C
Incubation period	F	5.6 ± 0.51	5.5 ± 0.52	6.2 ± 0.44	6.0 ± 0.32	6.4 ± 0.52	6.2 ± 0.45
	M	4.9 ± 0.31	5.0 ± 0.30	5.5 ± 0.52	5.3 ± 0.50	5.4 ± 0.52	5.6 ± 0.50
Larva	F	5.8 ± 0.42	5.0 ± 0.30	6.0 ± 0.35	5.1 ± 0.33	5.6 ± 0.51	5.4 ± 0.51
	M	4.9 ± 0.31	4.1 ± 0.31	5.5 ± 0.53	5.2 ± 0.44	5.6 ± 0.51	4.4 ± 0.51
Protonymph	F	4.8 ± 0.42	4.9 ± 0.31	5.6 ± 0.54	4.2 ± 0.44	5.8 ± 0.45	5.6 ± 0.50
	M	4.6 ± 0.51	4.3 ± 0.48	4.6 ± 0.52	4.9 ± 0.35	5.8 ± 0.45	4.2 ± 0.45
Tritonymph	F	4.6 ± 0.51	4.2 ± 0.42	4.8 ± 0.51	5.2 ± 0.44	6.2 ± 0.45	4.8 ± 0.47
	M	4.3 ± 0.48	4.1 ± 0.31	4.1 ± 0.33	4.5 ± 0.52	4.6 ± 0.51	3.8 ± 0.41
Total immature	F	15.2 ± 0.42	14.1 ± 0.1	16.4 ± 0.45	14.5 ± 0.52	17.6 ± 0.51	15.8 ± 0.47
	M	13.8 ± 0.51	12.5 ± 0.5	14.2 ± 0.44	14.6 ± 0.32	16.0 ± 0.35	12.4 ± 0.51
Life cycle	F	20.8 ± 0.42	19.6 ± 0.51	22.6 ± 0.53	20.5 ± 0.52	24.0 ± 0.34	22.0 ± 0.34
	M	19.3 ± 0.48	17.5 ± 0.52	19.7 ± 0.44	19.9 ± 0.33	21.4 ± 0.51	18.0 ± 0.34
Generation period	F	23.3 ± 0.42	22.1 ± 0.31	25.4 ± 0.51	23.5 ± 0.51	27.0 ± 0.34	26.4 ± 0.51
	M	--	--	--	--	--	--
Longevity	F	28.6 ± 0.51	22.8 ± 0.42	32.1 ± 0.33	27.6 ± 0.52	35.4 ± 0.51	31.8 ± 0.47
	M	25.8 ± 0.42	21.1 ± 0.31	27.7 ± 0.53	23.1 ± 0.33	29.0 ± 0.34	27.0 ± 0.34
Life span	F	49.4 ± 0.51	42.4 ± 0.51	54.7 ± 0.53	48.1 ± 0.33	59.4 ± 0.51	33.8 ± 0.47
	M	44.5 ± 0.31	38.6 ± 0.51	47.4 ± 0.52	43.0 ± 0.32	50.4 ± 0.51	45.0 ± 0.34

- F : female

- M : Male

Table 2. Adult female longevity and fecundity of *Dermatophagoides farinae* fed on different foods and temperature.

Diet	Average duration (days)			Longevity	Fecundity		Sex ratio (% females /total)	
	Preoviposition Period	Oviposition period	Postoviposition period		Eggs/female	Daily rate		
Dry yeast	25°C	2.5+0.52	18.6+0.51	7.5+0.52	28.6+0.51	65.2+0.42	3.5+0.52	69.2 %
	30°C	2.5+0.52	15.0+0.31	5.3+0.48	22.8+0.42	55.9+0.31	2.6+0.51	63.6 %
Crushed wheat	25°C	2.8+0.45	20.2+0.44	9.1+0.33	32.1+0.33	52.8+0.45	2.60+0.50	58.3 %
	30°C	3.0+0.32	17.4+0.52	7.2+0.44	27.6+0.50	44.4+0.52	2.55+0.52	53.4 %
Crushed rice	25°C	3.0+0.34	22.8+0.47	9.6+0.52	35.4+0.51	45.5+0.53	1.9+0.35	61.9 %
	30°C	4.4+0.51	18.8+0.46	8.6+0.50	31.8+0.47	35.2+0.45	1.8+0.47	60.1 %

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تأثير أنواع مختلفة من الغذاء و الحرارة على تطور وخصوبة حلم الحبوب  
*Dermatophagoides farinae*

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تلعب الأكاروسات التي تصيب الحبوب والمواد المخزونة دورا هاما فى إتلاف وتدمير هذه المواد حيث تتغذى على أجنة ومحتويات هذه البذور هذا بالإضافة الى ما تسببه من أفساد لهذه المواد نتيجة لمخلفاتها من إخراج وجلود الانسلاخ والافراد الميتة لذا فإن البحث أستهدف إجراء بعض الدراسات البيولوجية على حلم الحبوب *Dermatophagoides farinae Hughes* حيث تم تربيته على ثلاثة أنواع من الغذاء هي :

الخميرة الجافة - جريش القمح وجريش الأرز على درجتى حرارة ٢٥م° / ٣٠م° ورطوبة نسبية ٦٥%.

أوضحت الدراسة أن أفضل أنواع الغذاء لتطور الحلم هي الخميرة الجافة المحببة بالمقارنة عند التغذية على القمح المجروش والأرز المجروش. كما أن معدل وضع البيض للأناث كان مرتفعا عند درجة حرارة ٢٥م° عنها عند ٣٠م° مما يوضح أن هذا المعدل من الحرارة أدى الى زيادة الخصوبة للأناث.