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Biology of *Phytoselulus persimilis* (Acari: Phytoseiidae) on different temperatures

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Abstract

The Phytoseiid mite *Phytoseiulus Persimilis* (Athias-Henriot) (Acari: Phytoseiidae) was reared individually on *Tetranychus urticae* Koch (Acari: Tetranychidae) and its developmental period, the longevity of female, males and also female fecundity was recorded under various temperatures 20 and 25 Cº about 70% RH. The longevity of females and also female fecundity were recorded under alternating temperatures of 10-20 Cº and 15 -20 Cº about 70% RH. The female developed faster when they were reared at a higher temperature of 25 Cº and they showed higher longevity and fecundity at 25 Cº than at 2 Cº also, the fecundity and longevity were higher at 15 -20 Cº than at 10-20 Cº.

Introduction

In Egypt, vegetable and field crops are considered of great economic importance for local consumption and exportation. Vegetable plants harboured many harmful and beneficial organisms (Alatawi *et al*., 2005). Phytophagous mites have earned the attention of astrologists and progressive farmers from all over the world (Walsh *et al*., 1998 and Singh *et al*., 2000). Phytophagous mites are serious pests in indoor and outdoor agricultural ecosystems, and it is well known for causing considerable damage to major crops (Hoy, 2011). It is common in greenhouses where it is an important pest of vegetables (Beans, capsicum, cucumbers, eggplant, tomato, melon, strawberries, etc.). Many investigators surveyed several species of phytophagous mites that infest vegetables all over the world (Rai and Indrajeet, 2011).

The present work aims to study the developmental period, and the longevity of female, male and female fecundity of *P. persimilis* in different temperatures.

Materials and methods

Effect of different on the biological aspects of predatory mites. The predatory mite was transferred from established culture to leaf green bean, *Phaseolus vulgaris* L. discs to lay eggs. The newly deposited eggs of the same age were singly transferred to another green bean disc. Every petri dish contained three discs placed on wet cotton pads in petri dishes. Each leaf disc was surrounded by a wet strip of cotton wool to prevent individuals from escaping and to supply them with water (Castagnoli and Simoni,1999)

Moisture was maintained by adding a few drops of water daily and leaves were replaced every three days. The eggs predatory mites were separated into twi mag or groups according to the temperature, 30 eggs each, where the first group was incubated at 20Cº, the second one was incubated at 25 Cº and the humidity was 70 ±5% RH. for all experiments. In all cases, eggs were left until hatched, and the incubation period was recorded. Approximately 30 newly hatched larvae were reared individually under different temperatures of 20 and 25 Cº (30 replicates as 30 discs for each predator) each replicate was contained on a larva and left to continue their life spans, which supplied with a sufficient known number of prey (Immature stage *T. urticae*) as a food source and the devoured prey individuals were replaced with new ones all over the predator life span and data were recorded for the whole life span at different temperatures where observation were noted twice daily. The duration of immature stages, life cycle, adult longevity and life span. Before the final molt of the female, one adult mole was introduced to the replicate for mating and removed after one day and the female was observed at 6-12hrs. intervals to record the first oviposition data to measure fecundity the number of eggs laid was counted daily. The data obtained were subjected to statistical analysis by Duncan (1955) multiple range tests were used to determine the significance of the differences between mean values of treatment.

Effect of low temperature on egg incubation period, hatchability, female Survive ability and fecundity:

The first group was exposed to an alternating temperatures of 10- 20 Cº and (12 hrs. for each, throughout the life span) for each of the predator the same technique was repeated for the second group except using alternating 15- 20 Cº. Seven groups each of 30 solitary eggs. Each is kept on Acalypha plant leaves situated on cotton wool soaked in water in petri - dish. Leaves were changed by fresh once when needed. All were introduced first by to alternative temperature of 10 and 20Cº every 12 hrs. This period of change in all temperatures lasted for 1,2,3,4,5,6 and 7 days for the seven experiments, respectively after that kept at a constant temperature of 20Cº. Another experiment was conducted with a similar technique except 15-20Cº were used throughout the whole life span from egg to death of adults. The data obtained were subjected to statistical analysis by Duncan (1955) multiple range tests were used to determine the significance of the differences between mean values of the treatment.

Results and discussion

Effect of different temperatures on the biology of *P. persimilis* when fed on *T. urticae* at 70% RH. Developmental duration of *P. persimilis* at different temperatures and 70% RH. is presented in Table (1). All over the study developmental duration of females and males did not very much. The mean male life cycle was shorter with 1.6 and 0.6 days than the female values at 20 and 25 Cº, respectively. Increase of temperature from 20 to 25 Cº reduced the developmental duration of all stages and life cycle as well. The mean female life cycle duration was 12.54 and 8.2 days at the mentioned temperatures, respectively. Data obtained for longevity and fecundity of *P. persimilis* is period decreased as temperature increased from 20 to 25 Cº (Table 2). Fecundity and oviposition daily rates were higher at 25 Cº than 20c At 25 Cº fecundity was 49.0 eggs/female with 3.6 eggs/day a s daily rate compared with 36.0 eggs/ female with 2.29 eggs / female/ day at 20 Cº, respectively in the men time oviposition period, post oviposition period, longevity and life span were shorter at 25 Cº than 20 C̊ these parameters were 13.6, 2.9, 18.1, and 49.0, days at 25 Cº same parameters were 15.7, 3.6, 21.8, and 36.0 days at 20 C.º

Table (1): Developmental duration of *Phytoseiulus persimilis* fed on *Tetranychus urticae* at 25 Cº and 70% RH.

Developmental stages	Male	Female
Egg	2.6 ± 0.32	2.9 ± 0.70
Larvae	0.80 ± 0.03	1.1 ± 0.32
Protonymph	1.6 ± 0.66	2.1 ± 0.70
Deutonymph	2.6 ± 0.32	2.7 ± 0.46
Total immature	5.0 ± 0.53	5.9 ± 0.77
Life Cycle	7.6 ± O.75	8.2 ± 0.49
Pre oviposition	-	1.6 ± 0.69
Oviposition	-	13.6 ± 1.85
Post oviposition	-	2.9 ± 0.70
Longevity	11.7 ± 1.70	18.1 ± 0.64
Life span	19.3 ± 0.00	26.3 ± 0.00
No. of eggs	-	49. ± 0.7
Daily rate	-	3.6 ± 0.49

Table (2): Effect of temperature on *Phytoseiulus persimilis* female longevity (Days) and fecundity when fed on *Tetranychus urticae* at 20 C̊ and 70% RH.

Developmental stages	Male	Female
Egg	4.9 ± 0.48	5.04 ± 0.41
Larvae	1.1 ± 0.30	1.8 ± 0.11
Protonymph	2.2 ± 0.41	2.6 ± 0.24
Deutonymph	2.9 ± 0.99	3.1 ± 0.19
Total immature	6.2 ± 0.83	7.5 ± 0.63
Life Cycle	11.1 ± 1.95	12.54 ± 1.28
Pre oviposition	-	2.50 ± 0.34
Oviposition	-	16.70 ± 1.54
Post oviposition	-	3.60 ± 0.55
Longevity	-	21.80 ± 2.07
Life span	26.1 ± 1.67	34.30 ± 2.95
No. of eggs	-	36.00 ± 3.12
Daily rate	-	2.29 ± 0.40

Effect of alternating temperature on *Phytoselulus persimilis* stages duration when fed on *Tetranychus urticae*:

The results of these experiments are presented in Table (3). It was noticeable that exposure to alternating temperatures reduced the developmental speed of all stages and reduced fecundity as well. life cycle was increased by 75 and 60% when 10 /20 Cº and 15/20 Cº regimes were used, respectively, when the obtained values were compared with similar obtained values at 20 Cº (Constant temperature). In the meantime, the life span was elongated by 29% and 12% under the same regimes compared with constant temperature (Tables 1 and 3). Oviposition period was similar but fecundity per female to 60 and 79% (Tables 1 ,3 and 4).

Table (3): Developmental duration Of *Phytoseiulus persimilis* fed on *Tetranychus urticae* at alternative temperatures 10/20 Cº and 70% RH.

Developmental stages	Male	Female
Egg	3.4 ± 0.66	4.1 ± 0.30
Larvae	2.6 ± 0.69	3.1 ± 0.00
Protonymph	3.2 ± 0.60	3.5 ± 0.50
Deutonymph	3.9 ± 0.30	5.1 ± 0.54
Total immature	9.7 ± 1.03	11.7 ± 0.8
Life Cycle	13.1 ± 0.62	15.8 ± 1.45
Pre oviposition	-	3.2 ± 0.40
Oviposition	-	17.7 ± 1.15
Post oviposition	-	4.3 ± 0.43
Longevity	19.7+_1.39	25.2 ± 2.6
Life span	32.8+_4.47	38.3 ± 3.00
No. of eggs	-	29.9 ± 4.85

Table. (4): Developmental duration of *Phytoseiulus persimilis* fed on *Tetranychus urticae* at alternative temperatures 15/20 Cº and 70% RH.

Developmental stages	Male	Female
Egg	3.6 ± 0.50	3.9 ± 0.30
Larvae	2.1 ± 0.70	2.5 ± 0.50
Protonymph	2.9 ± 0.70	3.5 ± 0.50
Deutonymph	3.6 ± 0.67	4.4 ± 0.49
Total immature	8.5 ± 1.07	10.4 ± 0.60
Life Cycle	12.1 ± 0.87	14.3 ± 1.29
Pre oviposition	-	2.9 ± 0.54
Ovi position	-	15.0 ± 1.25
Post oviposition	-	3.6 ± 0.38
Longevity	-	21.5 ± 4.25
Life span	28.46 ± 4.10	35.8 ± 0.95
No. of eggs	-	30.0 ± 0.40

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