

**FACTORS AFFECTING MASS REARING OF THE
PREDACEOUS MITE EUSEIUS SCUTALIS (ATHIAS-
HENRIOT) (ACARI: PHYTOSEIIDAE)**

THESIS

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SUMMARY

Some factors affecting reproduction of the predaceous mite *E. scutalis* were studied. These factors were a) Temperature, namely 15,20,25,30 and 35°C, b) relative humidity, namely 33, 57, 73, and 95%, C) Food which included 21 diets, d) Competition using one, two and 4 females/limited feeding, and e) availability of food which was manifested by satiation, starvation and partial starvation.

The results obtained were summarized as follows:

I-Temperature

A- Effect of temperature on development:

1- Egg incubation period and % hatch:

This period significantly decreased with increased incubation temperature between 15-35°C, being 6.80- 7.00 days at 15°C and only 1.0 days at 30 or 35°C. The highest temperature 35°C, however, reduced egg hatch by 10% compared with that at 25 and 30 °C which reached 92 and 94%, respectively. The low temperature 15 °C caused more reduction in egg hatch only 73%.

2- Life cycle duration

Low temperature 15°C is an infavorable condition for rearing *E. scutalis* in which life cycle was significantly delayed. Temperatures between 20-30°C were the most suitable in this regard. At 15°C the life cycle was 22.00-24.80 days for males and 24.20-27.10 days for females, whereas at 25, this period was 4.90-5.70 for males and 5.15-6.95 days for females, but at 30°C this period ranged between 4.20-4.90 for males and 4.50-6.15 days for females.

3- Adult longevity:

Longevity of males ranged 8.6-23.0 days, and that for females ranged 13.30- 30.40 days. This wide range was mainly due to the influence of the rearing temperature. Adults lived longer at 25°C than at higher or lower temperature. Meanwhile, females lived considerably longer than males.

4- Life span:

The life span of males ranged 36.10- 44.30 days at 15°C and that for females, ranged 46.10- 49.70 days at 25-35°C. The life span of males was 12.60- 28.00 days while that for females was 17.30-37.30 days. In general, the life span of females longer than that of males.

B- Effect of temperature on female reproductive potential:

1- Preoviposition period:

This period was significantly affected by rearing temperature and ranged between 5.8-8.0 days at 15°C, decreased with increased temperature to reach a range of 2.0-2.5 days only at 35°C.

2- Oviposition period:

This period was prolonged at 25°C compared to other rearing temperature tested and ranged between 12.50-15.30 days. Using 15 and 25 °C and feeding on *T. urticae* eggs resulted into longer oviposition period compared with that at other temperature tested.

3- Postoviposition period:

This period was the longest 12.00 days upon feeding on *T. urticae* eggs at 25 °C and was the shortest at 15°C upon feeding on *E. orientalis* immatures with an average of 3.90 days.

4- Fecundity:

The effect of temperature on fecundity was evident. The number of egg/female averaged 5.90-10.00 at 15°C, increased to 6.00-13.10 at 20°C and was the highest at 25°C reaching 18.00-32.00 egg/female at 35°C, the number of eggs declined to 12.00-16.00/female.

C- The effect of temperature on predation potential of different stages of males:

1- Predation potential on *T. urticae* immatures:

Through the whole period of *E. scutalis* immatures development, the rearing temperature significantly affected the predation potential on *T.*

urticae immatures. Maximum rate occurred at 25°C with an average of 9.80 prey; a rate of 2.45 prey/day. Minimum rate occurred at 15°C; with an average of 4.8 prey; a rate of 0.29 prey/day. Only 5.90-8.30% predation occurred during immatures development.

The total number of *T. urticae* immatures consumed by *E. scutalis* adult males ranged between 54.00 at 15 °C and 154.0 at 25°C. The best rearing temperature for predation was 25°C followed by 30, 20, 35 and 15°C. The adult stage is the most effective in predation since 91.6-94.0% of the prey were consumed during this stage.

2- Predation potential on *E. orientalis* immatures:

During the whole period of *E. scutalis* immatures, maximum prey consumption was at 25 °C with an average of 9.35 prey; a rate of 2.75prey/day. Minimum predation occurred at 15°C with an average of 3.68 prey; a rate of 0.20 prey/day. The three immatures stages of males consumed 5.6- 8.1% of prey utilized throughout the life cycle.

The highest number of *E. orientalis* immatures consumed by *E. scutalis* adult males occurred at 25°C with an average of 148.70 prey; and the lowest was at 15°C with an average of 61.30 prey. Adult males consumed about 91.8- 94.3% of prey. The best rearing temperature for predation was 25°C followed by 30, 20, 35 and 15°C.

D- Effect of temperature on predation potential of different stages of females:

1- Predation potential on *T. urticae* immatures:

During the whole period of *E. scutalis* immatures, the rearing temperature significantly affected the predation on *T. urticae* immatures. Maximum rate occurred at 25°C with an average of 18.45 preys, a rate of 3.51 prey /day. Minimum rate occurred at 35°C with an average of 10.80 preys, a rate of 2.35 prey /day. The three immature stages of *E. scutalis* females consumed 6.3- 19.1 of total predation.

The highest number of prey consumed during preoviposition and oviposition and postoviposition was at 25°C with average 14.05, 169.85 and 90.50 prey, respectively. The lowest was at 15°C during oviposition and postoviposition periods with average 46.05 and 17.50 prey, respectively. The lowest during preoviposition period was at 35°C with an average of 8.50 prey.

The adult stage of *E. scutalis* females consumed 80.9 -93 % of all prey consumed throughout the life span.

2- Predation potential on *E. orientalis* immatures :

During the whole period of *E. scutalis* immatures , maximum predation occurred at 25°C with an average of 17.80 prey , rate of 0.88/days . the Minimum was at 20°C with an average of 12.75 prey , a rate of 2.06 /day.

Highest total number of *E. orientalis* immatures consumed occurred at 25°C during preoviposition and oviposition and postoviposition period with average 14.80, 170.10 and 118.70 prey, respectively the lowest occurred at 35°C during preoviposition with an average 6.75, and at 15°C during oviposition and postoviposition period with an average of 55.15 and 25.40 prey respectively, the adult female consumed about 83.4-95.0% of the total prey utilized throughout the life span.

II- Relative Humidity

A- Effect of relative humidity on development:

1- Egg Incubation period and %hatch:

This period ranged between 3.1-3.5 days at 33%, 2.6-3.0 days at 57%, only 1.7 days at 73% and 3.1-4.0 days at 95%. The highest egg % hatch was 92% at 73% R.H and was 85% at 95% R.H.

2- The total period of immatures development:

This period was affected by relative humidity. Low and high humidity (33 and 95%) prolonged this period for females to 0.9-9.7 days,

respectively. The shortest period , was for male immatures 5.70 days at 73%.

3- Adult longevity :

Longevity of males or females of *E. scutalis* was prolonged to 17.4 and 30.10 days at 73% R.H and the shortest 15.90 and 21.60 days was at 57% R.H. males longevity was shorter than females.

4- Life span:

For males; the life span increased at 95% to an average of 26.40 days. The shortest, 22.50 days was at 73% R.H. For females, the life span was prolonged at 73% to an average of 37.95 days and the shortest 30.10 days was at 57% R.H. Also, the life span of females was longer than that of males.

B- Effect of relative humidity on female reproductive potential:

1- Preoviposition period:

This period ranged between 2.90- 3.50 days at 73 and 33%, respectively.

2- Oviposition period:-

This period was the longest, 15.30 days at 73% and the shorter at 33% with an average of 11.20 days.

3- Postoviposition period:

This period ranged between 6.50 days at 57% and 11.90 at 73%.

4- Fecundity:

The highest number of eggs laid was at 73% with an average of 32.00 egg/female; a rate of 2.09 egg/day. The lowest number was at 33% with an average of 18.95 egg/female; a rate of 1.69 eggs/day.

C- Effect of relative humidity on predation potential of different stages of *E. scutalis* on *T. urticae* immatures:

1- Male:

During the immature stages of *E. scutalis* males, the highest total number of prey consumed was at 73% with an average of 9.80 prey and the lowest was at 33% with an average of 5.10 prey. Only 3.50-5.60% of predation was utilized by three immature stages of males.

Also the highest number of prey consumed by adults was at 73% with an average of 166.0 preys and the lowest was at 33% with an average of 140.70 prey. The adult male consumed 94.4- 96.5 % the prey utilized throughout the life span.

2- Female:

The number of prey consumed varied significantly with relative humidity. The highest was at 73% with an average of 18.45 prey and the lowest occurred at 33% with an average of 6.80prey. the immature stages of females consumed only 3.6-6.3% prey.

The highest number of *T. urticae*immatures consumed was at 73% with an average of 14.05, 169.85 and 90.50 prey, during preoviposition, oviposition and postoviposition periods, respectively. The adult female consumed about 93.7-96.4 of the prey.

III- Food

A- The effect of food type on colonization:

Reproduction of *E. scutalis* was affected by the type of food used. The polytypic diet, consisted of eggs and immatures of *T. urticae*, eggs and immatures of *E. orientalis*, eggs and nymphs of *B. tabaci*, plus date palm pollen increased the colonization significantly to a total of 41.70 eggs+ moving stages after four weeks.

On the other hand, the smallest colony was obtained with monotypic diets namely maize pollen or date palm pollen alone which gave only 25.1 and 26.7 ehhs+moving stages, respectively after four weeks.

B- Availability of food: Effect of starvation on longevity and fecundity of *E. scutalis* females:

Satiated females laid a total of 32.00 eggs/ female, which decreased to 15.50 eggs/female with partial starvation. No eggs were laid with continuous starvation. Longevity averaged 30.10, 19.90 days and 6.60 days, respectively.

IV- Competition

- Effect of competition on female fecundity:-

Fecundity of females was affected by competition. The solitary reared female was more reproductive than competing females. The number of eggs and moving stages produced in one week averaged 5.65, 4.30 and 3.35 per female upon rearing in one cell of 1, 2, or 4 females, respectively. With avoidance of added competition, the colony of one female contained 10.50 eggs and moving stages compared to 8.65 and 7.40 when two or four females competed for food.