Results and Discussion

III. RESULTS AND DISCUSSION

I- Effect of Prey Types on *Euseius scutalis* A.-H. :

1- Duration of *E. scutalis* A.-H, :

Egg stages of *Tetranychus urticae* Koch highly accelerated the predator development than did immature stages. On the contrary, prey eggs of *Bemisia tabaci* (Genn.) highly elongated the predator development than did immature stages. Eggs and immatures of *Chrysomphalus ficus* induced subequal periods of *E. scutalis* immature stages and male longevity. Prey immatures of *C. ficus* elongated the female longevity, than did prey eggs of *C. ficus*.

The duration of female active larva, protonymph, and deutonymph averaged 1.03±0.18 and 1.77±0.06 days; 1.07±0.18 and 1.90±0.05; and 1.07±0.16 and 1.70±0.06 days when the predator was fed on egg and immature stages of *T. urticae*, respectively (Tables 1 & 2 and Figs. 1 & 2).

The quiescent larval, protonymphal and deutonymphal stages lasted 0.7±0.06 and 0.6±0.06 days; 0.73±0.06 and 0.90±0.05 days; and 0.63±0.06 and 0.60±0.05 days on eggs and immature stages of *T. urticae*, respectively, Tables (1 & 2 and Figs 1 & 2).

While those of the predator male durated 1.1±0.17 and 1.2±0.11 days; 1.0±0.20 and 1.4±0.33 days; and 1.2±0.31 and 0.6±0.09 days on egg and immature stages of *T. urticae*, respectively (Tables 3 & 4 and Figs. 3 & 4). The quiescent larval, protonymphal and deutonymphal stages averaged 0.7±0.11 and 0.80±0.24 days; 0.6±0.09 and 0.80±0.37 days; and 1.40±0.33 and 0.80±0.11 days, on the previously mentioned prey, respectively, Tables (3 & 4) and Figs. (3 &4). The total period of

Table (1) : Effect of prey eggs on immature stages of *Euseius scutalis* A.-H. female at 25°C and 65±5 % R.H.

Developmental stages of predator	Average (in days) when fed on egg stages of :		
	T. urticae	*B. tabaci*	*C. ficus*
Incubation period	2.06±0.305	2.095±0.66	2.04±0.31
Active larva	1.03±0.18	0.589±0.12	0.90±0.21
Quiescent larva	0.7±0.06	0.46±0.08	0.90±0.21
Active protonymph	1.07±0.18	1.003±0.15	0.83±0.24
Quiescent protonymph	0.73±0.06	0.53±0.09	0.83±0.24
Active deutonymph	1.07±0.16	1.31±0.51	0.70±0.3
Quiescent deutonymph	0.63±0.06	0.52±0.03	0.60±0.2
Total immature stages	5.23±2.6	4.57±0.49	4.73±0.7

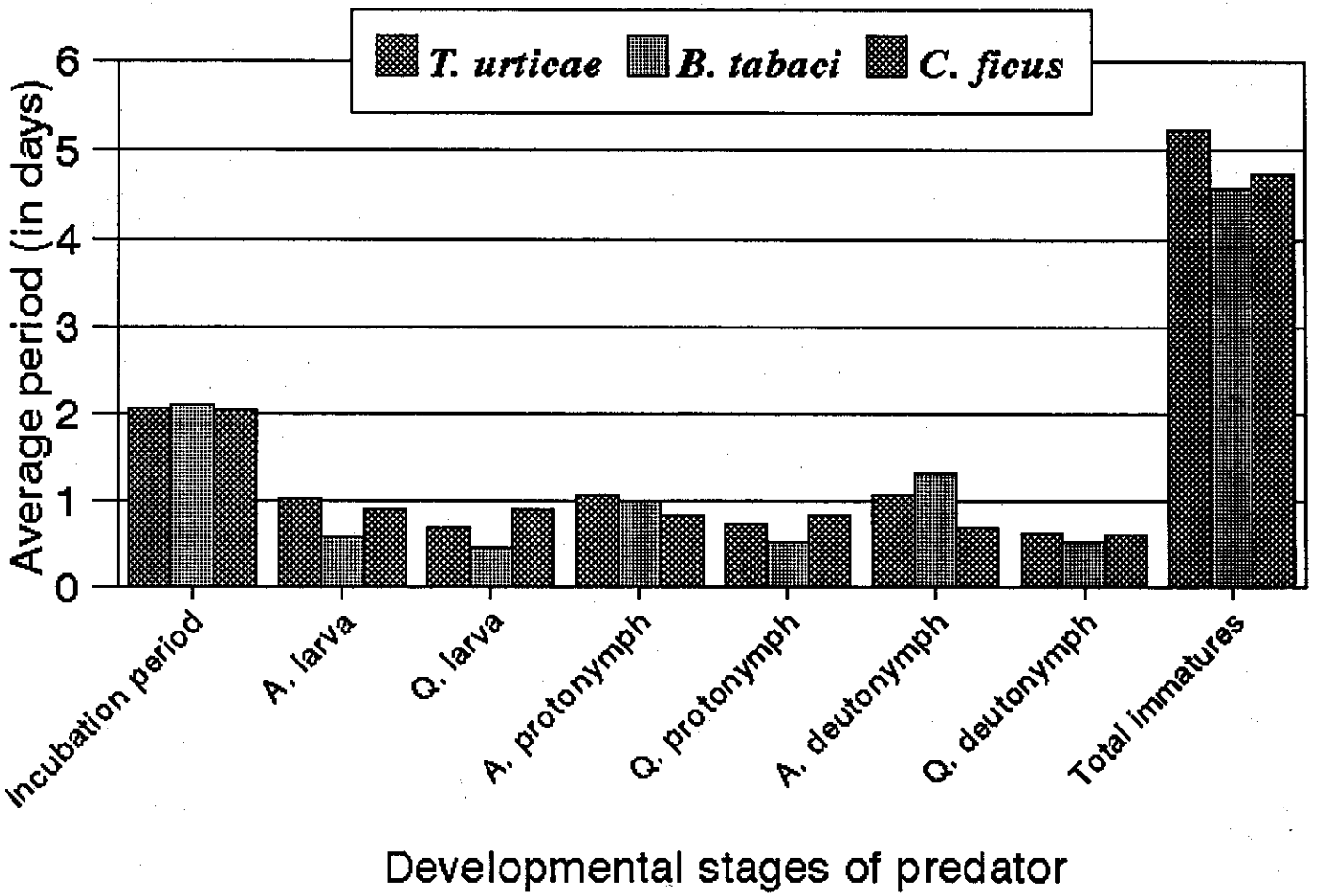

Fig. (1) : Effect of prey eggs on immature stages of ***Euseius scutalis*** A.-H. female at 25°C and 65±5 % R.H.

Table (2) : **Effect of prey immatures on immature stages of *Euseius scutalis* A.-H. female at 25°C and 65±5 % R.H.**

Developmental stages of predator	Average (in days) when fed on immature stages of :			
	T. urticae	*B. tabaci*	*C. ficus*	*A. aurantii*
Incubation period	2.10±0.23	1.97±0.36	2.08±0.32	2.1±0.6
Active larva	1.77±0.06	0.47±0.05	0.60±0.21	0.90±.21
Quiescent larva	0.6±0.06	0.32±0.06	0.60±0.18	0.90±0.21
Active protonymph	1.90±0.05	0.51±0.28	0.60±0.2	0.90±0.21
Quiescent protonymph	0.90±0.05	0.36±0.16	0.53±0.13	0.90±0.21
Active deutonymph	1.70±0.06	0.54±0.02	0.93±0.4	0.80±0.3
Quiescent deutonymph	0.60±0.05	0.49±0.04	0.83±0.24	0.67±0.24
Total immature stages	7.67±1.03	2.74±0.35	4.1±0.53	5.1±1.13

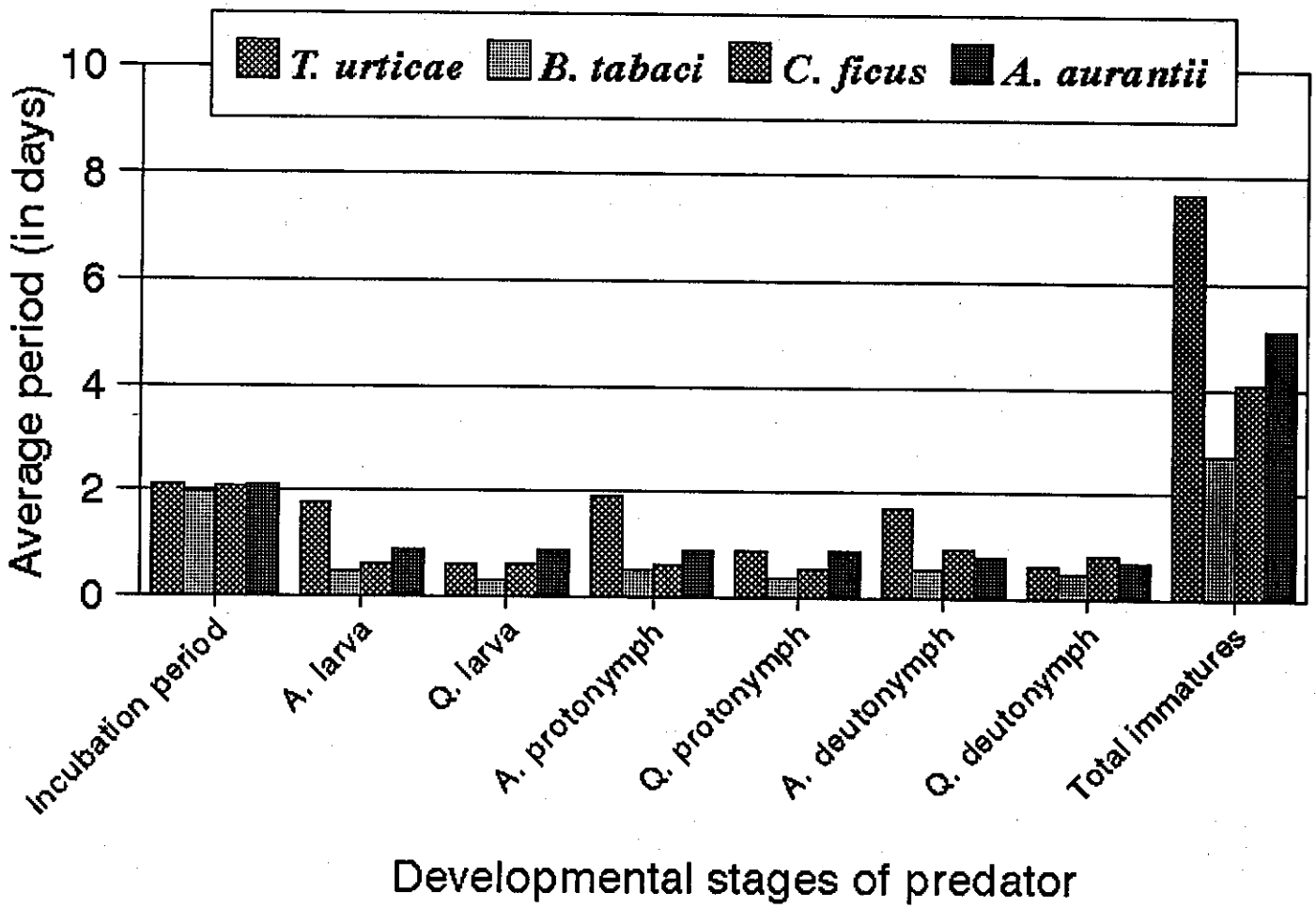

Fig. (2) : Effect of prey immatures on immature stages of ***Euseius scutalis*** A.-H. female at 25°C and 65±5 % R.H.

immature stages of female and male durated for 5.23±2.6 and 5.20±1.25 days on eggs of *T. urticae* (Tables 1 & 3 and Figs. 1 & 3); while these values averaged 7.67±1.03 and 6.40±2.19 days on immature stages of *T. urticae*, respectively (Tables 2 & 4 and Figs. 2 & 4).

The duration of female active larva, protonymph and deutonymph lasted 0.589±0.12 and 0.47±0.05 days; 1.003±0.15 and 0.51±0.28 days; and 1.31±0.51 and 0.54±0.02 days when the predator was fed on egg and immature stages of *B. tabaci*, respectively, (Tables 1 & 2 and Figs. 1 & 2).

The quiescent larval, protonymphal and deutonymphal stages averaged 0.46±0.08 and 0.32±0.06 days; 0.53±0.09 and 0.36±0.16 days; and 0.52± 0.03 and 0.49±0.04 days, respectively, (Tables 1 & 2 and Figs. 1 & 2).

Also, the duration of male active larva, protonymph and deutonymph stages averaged 0.54±0.12 and 0.42±0.04 days; 0.85±0.20 and 0.43±0.20 days; and 1.04±0.23 and 0.6±0.06 days on egg and immature stages of *B. tabaci*, respectively (Tables 3 & 4 and Figs. 3 & 4).

The quiescent larval, protonymphal and deutonymphal stages lasted 0.40±0.1 and 0.30±0.06 days; 0.50±0.11 and 0.32±0.20 days; and 0.53±0.03 and 0.50±0.02 days, respectively, Tables (3 & 4) and Figs. (3 & 4).

The total period of immature stages of female and male predator averaged 4.57±0.49 and 3.84±0.020 days on eggs of *B. tabaci* (Tables 1 & 3 and Figs. 1 & 3); and lasted 2.74±0.35 and 2.53±0.40 days on immature stages of *B. tabaci* (Tables 2 & 4 and Figs. 2 & 4).

Table (3) : Effect of prey eggs on developmental period of *Euseius scutalis* A.-H. male at 25°C and 65±5 % R.H.

Developmental stages of predator	Average (in days) when fed on egg stages of :				
	T. urticae	*B. tabaci*	*C. ficus*	*L. beckii*	*I. purchasi*
Incubation peri1od	1.8±0.27	1.8±0.5	2.01±0.35	-	-
Active larva	1.1±0.17	0.54±0.12	0.8±0.27	-	-
Quiescent larva	0.7±0.11	0.40±0.1	0.7±0.30	-	-
Active protonymph	1.0±0.20	0.85±0.2	0.8±0.30	-	-
Quiescent protonymph	0.6±0.09	0.5±0.11	0.8±0.33	-	-
Active deutonymph	1.2±0.31	1.04±0.23	0.5±0.1	-	-
Quiescent deutonymph	1.4±0.33	0.53±0.03	0.5±0.1	-	-
Total immature stages	5.20±1.25	3.84±0.2	3.99±0.71	-	-
Longevity	13±0.42	13±0.5	8.8±0.18	4.4±0.22	2.8±0.33

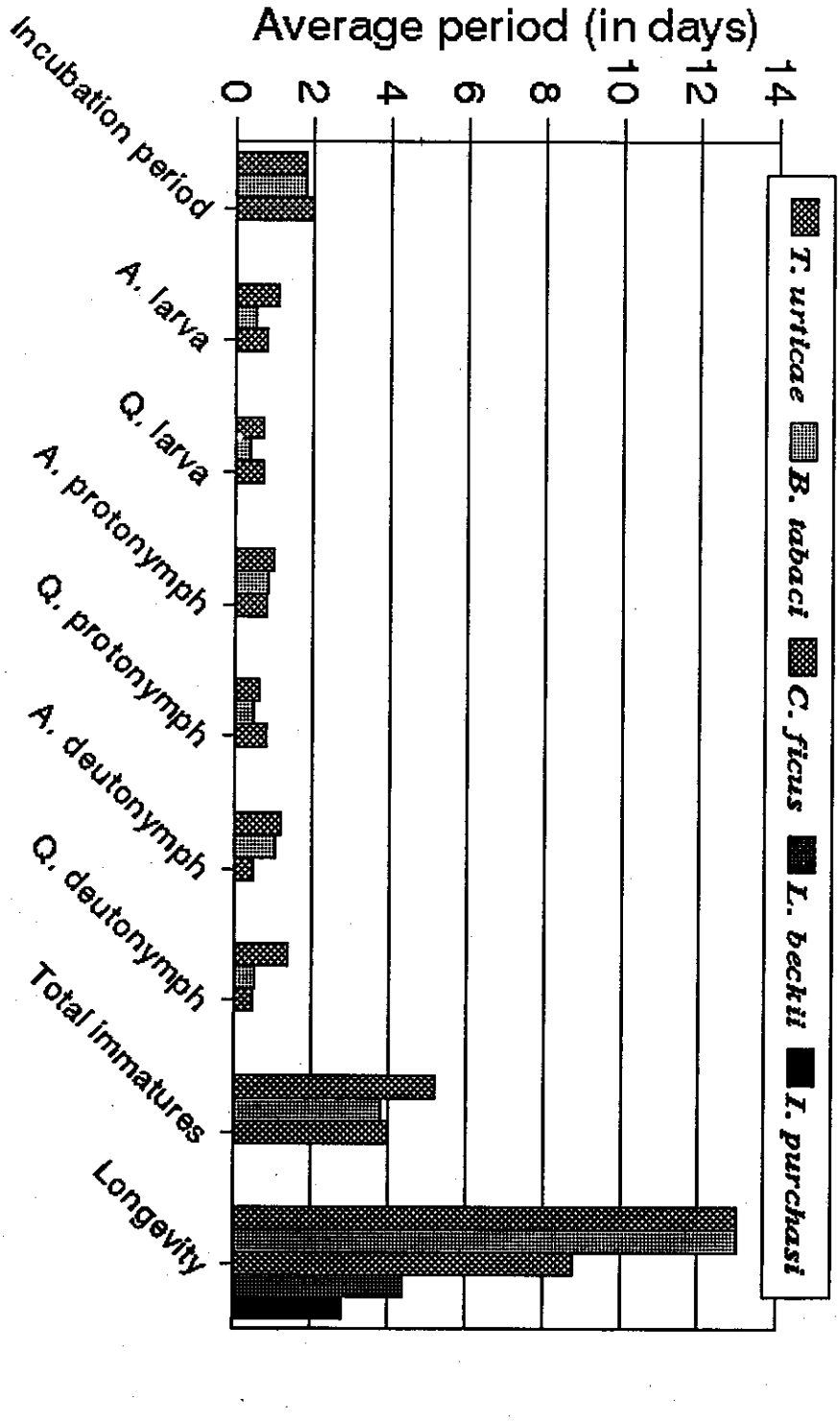

Fig. (3) : Effect of prey eggs on developmental period of *Euseius scutalis* A.-H. male at 25°C and 65±5 % R.H.

Table (4) : Effect of prey immatures on developmental period of *Euseius scutalis* A.-H. male at 25°C and 65±5 % R.H.

Developmental stages of predator	Average (in days) when fed on immatures of :					
	T. urticae	*B. tabaci*	*C. ficus*	*A. aurantii*	*L. beckii*	*I. purchasi*
Incubation period	1.8±0.24	1.9±0.41	1.94±0.3	2.01±0.3	-	-
Active larva	1.2±0.11	0.42±0.04	0.6±0.22	0.8±0.45	-	-
Quiescent larva	0.8±0.24	0.3±0.06	0.6±0.22	0.6±0.22	-	-
Active protonymph	1.4±0.33	0.43±0.20	0.6±0.22	0.9±0.42	-	-
Quiescent protonymph	0.8±0.37	0.32±0.2	0.6±0.22	0.7±0.3	-	-
Active deutonymph	0.6±0.09	0.6±0.06	0.8±0.30	1.2±0.53	-	-
Quiescent deutonymph	0.8±0.11	0.5±0.02	0.6±0.22	0.6±0.22	-	-
Total immature stages	6.40±2.19	2.53±0.4	3.8±0.57	4.76±0.9	-	-
Longevity	17.4±0.61	9.7±1.6	9.2±0.30	8.4±0.55	5.4±0.22	1.8±0.33

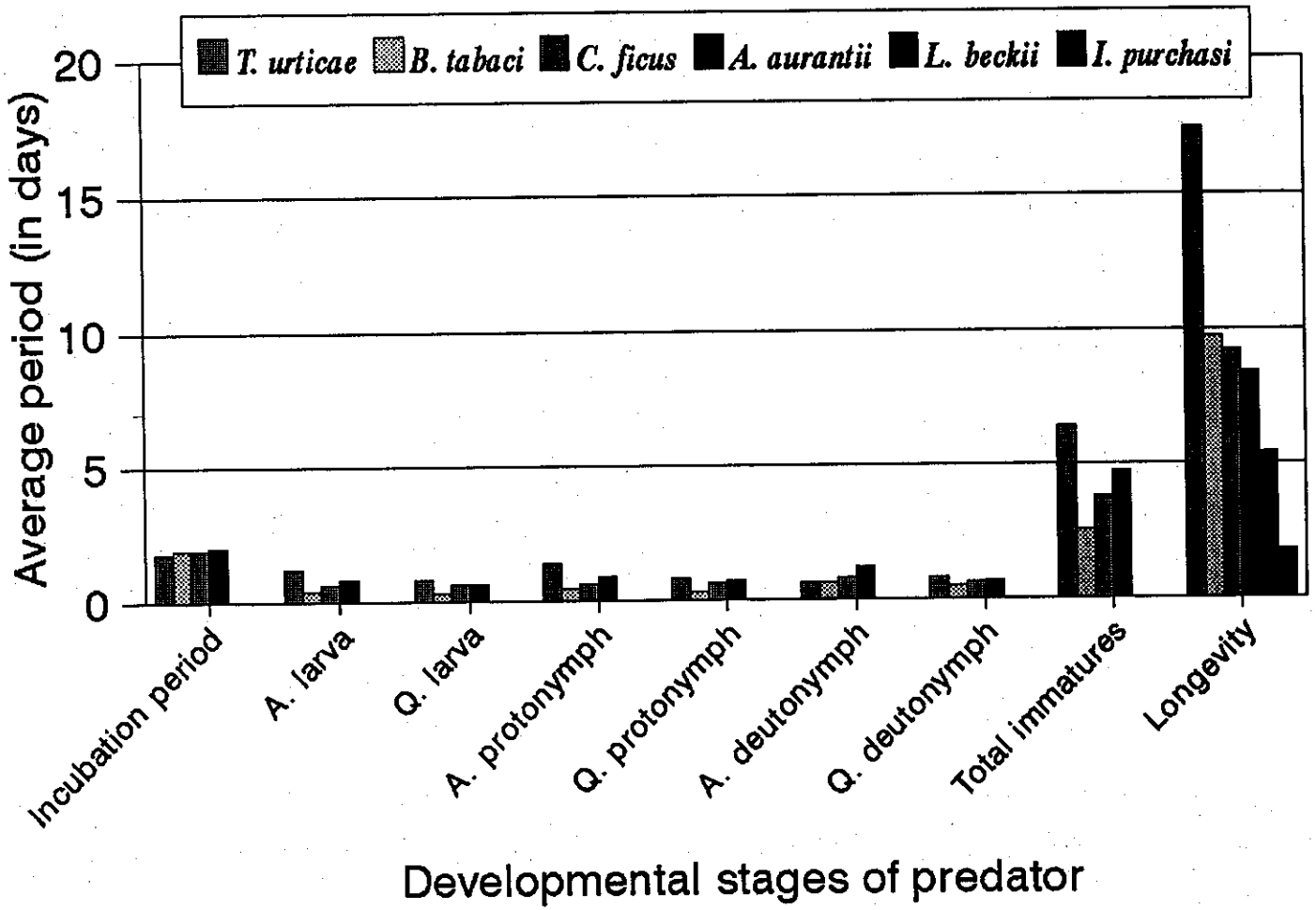

Fig. (4) : Effect of prey immatures on developmental periodof ***Euseius scutalis*** A.-H. male at 25°C and 65±5 % R.H.

The developmental period of active larva, protonymph and deutonymph of female averaged 0.60±0.21 and 0.60±0.21 days; 0.83±0.24 and 0.60±0.20 days; and 0.70±0.30 and 0.93±0.40 days on eggs and immature stages of *C. ficus*, respectively, (Tables 1 & 2 and Figs. 1 & 2).

The quiescent larval, protonymphal and deutonymphal stages lasted 0.90±0.21 and 0.60±0.18 days; 0.83±0.24 and 0.53±0.13 days; and 0.60±0.20 and 0.83±0.24 days, respectively, (Tables 1 & 2 and Figs. 1 & 2).

While those of the male durated 0.80±0.27 and 0.60±0.22 days; 0.80±0.30 and 0.60±0.22; and 0.50±0.10 and 0.80±0.30 days on egg and immature stages of *C. ficus*, respectively, Tables (3 & 4) and Figs. (3 & 4).

The quiescent larval, protonymphal and deutonymphal stages averaged 0.70±0.30 and 0.60±0.22 days; 0.80±0.33 and 0.60±0.22 days; and 0.50±0.10 and 0.60±0.22 days, respectively, (Tables 3 & 4 and Figs. 3 & 4).

The duration period of total immature stage of the female and male predatory mite *E. scutalis* averaged 4.73±0.70 and 3.99±0.71 days on eggs of *C. ficus*, Tables (1 & 3) and Figs (1 & 3); and 4.10±0.53 and 3.80±0.57 days on immature stages of *C. ficus*, respectively, Tables (2 & 4) and Figs. (2 & 4).

The last results agreement with **Swirski *et al.* (1967[a]), Gomaa (1975), Metwally (1976), Yousef and El-Halawany (1982) and Yousef (1990).**

The duration of female active larva, protonymph and deutonymph averaged 0.90±0.21, 0.90±0.21 and 0.80±0.30 days, while those of the male durated 0.80±0.45, 0.90±0.42 and 1.20±0.53 days on immature stages of *Aonidiella aurantii*, respectively, (Tables 2 & 4 and Figs. 2 & 4).

The quiescent female and male larvae lasted 0.90±0.21 and 0.60±0.22 days; the protonymph averaged 0.90±0.21 and 0.70±0.30 days; the deutonymph durated 0.67±0.24 and 0.60±0.22 days, respectively, Tables (2 & 4) and Figs. (2 & 4).

The total period of immature stages for female and male of the predatory mite *E. scutalis* averaged 5.10±1.13 and 4.76±0.90 days on immatures of *A. aurantii*, respectively, Tables (2 & 4) and Figs. (2 & 4).

These results are coincides with those previously obtained by **Swirski *et al.* (1967[a])**.

The pre-oviposition lasted 3.25±0.35, 2.80±0.19, 2.70±0.46, 1.90±0.23 and 1.20±0.41 days on eggs of *B. tabaci, T. urticae, L. beckii, C. ficus,* and *I. purchasi*, respectively (Table 5 and Fig. 5). These values averaged 2.90±0.16, 2.70±0.46, 2.50±0.00, 1.83±0.24, 1.13±0.35 and 1.13±0.23 days when the predator fed on immature stages of *T. urticae, L. beckii, B. tabaci, C. ficus, I. purchasi* and *A. aurantii*, respectively (Table 6 and Fig. 6).

Prey mite especially immatures elongated the oviposition period than did of the other preys. The longest period was obtained when the predator fed on *T. urticae* immatures followed by those of *A. aurantii,*

Table (5) : Effect of prey eggs on the female longevity of *Euseius scutalis* A.-H. at 25°C and 65±5 % R.H.

Developmental stages of predator	Average (in days) when fed on egg stages of :				
	T. urticae	*B. tabaci*	*C. ficus*	*L. beckii*	*I. purchasi*
Pre-oviposition	2.8±0.19	3.25±0.35	1.9±0.23	2.7±0.46	1.2±0.41
Oviposition	11.1±0.48	10.3±0.4	9.2±0.41	2.9±0.35	1.5±0.52
Post-oviposition	12±1.133	2.5±0.7	1.13±0.4	1.13±0.35	1.6±0.63
Longevty	25.97±0.25	16±1.41	12.2±0.561	6.73±0.46	4.3±0.46

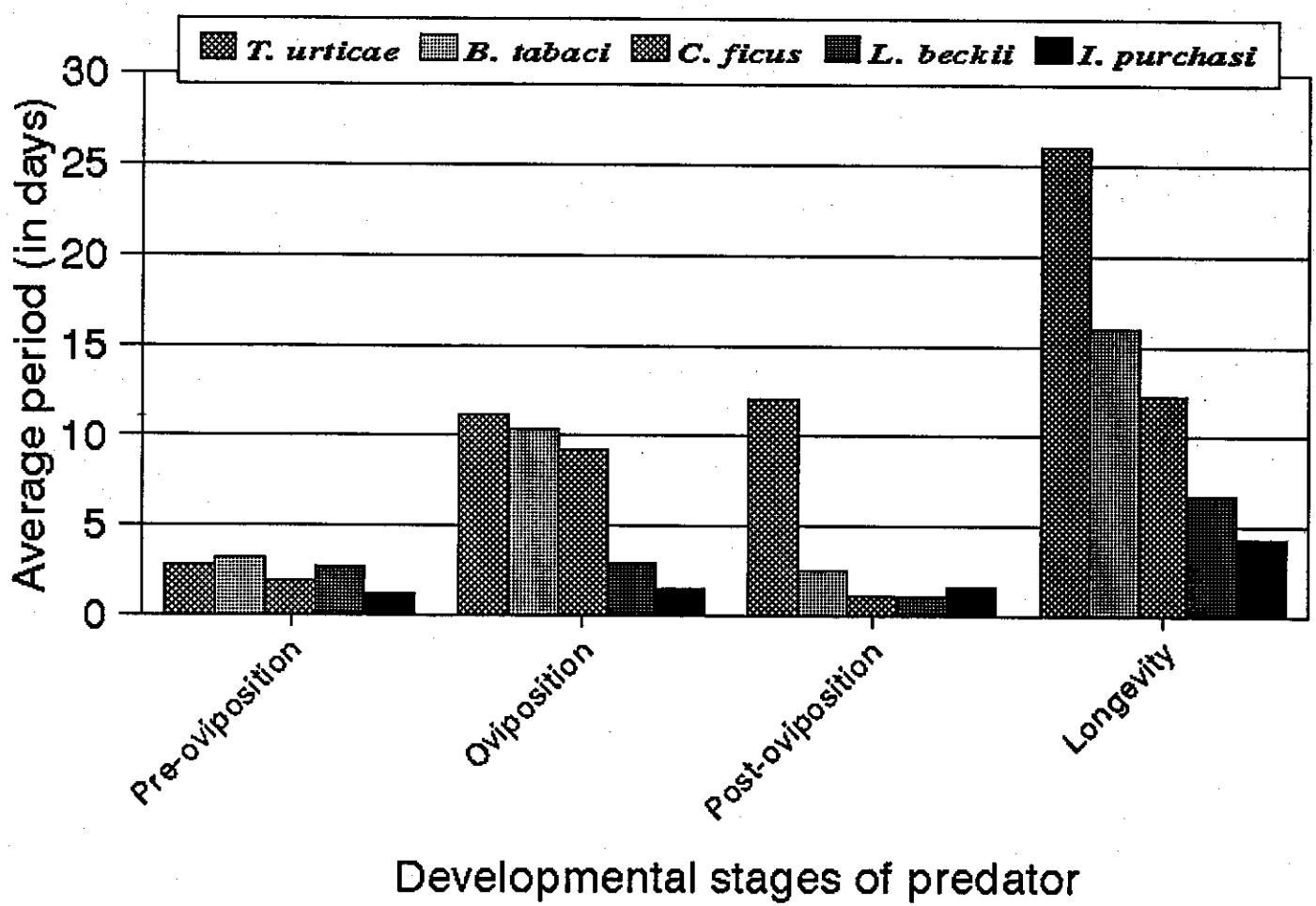

Fig. (5) : Effect of prey eggs on the female longevity of ***Euseius scutalis*** A.-H. at 25°C and 65±5 % R.H.

Table (6) : Effect of prey immatures on the female longevity of *Euseius scutalis* A.-H. at 25°C and 65±5 % R.H.

Developmental stages of predator	Average (in days) when fed on immatures of :					
	T. urticae	*B. tabaci*	*C. ficus*	*A. aurantii*	*L. beckii*	*I. purchasi*
Pre-oviposition	2.9±0.16	2.5±0.0	1.83±0.24	1.13±0.23	2.7±0.46	1.13±0.35
Oviposition	15.8±0.30	8.9±0.25	10.4±0.51	10.73±0.5	2.7±0.46	1.1±0.26
Post-oviposition	17.26±1.83	3±0.0	1.5±0.64	1.33±0.5	1.6±0.51	1.1±0.26
Longevity	35.97±0.39	14.37±0.25	13.63±1.17	13.2±0.62	7.1±0.96	3.3±0.46

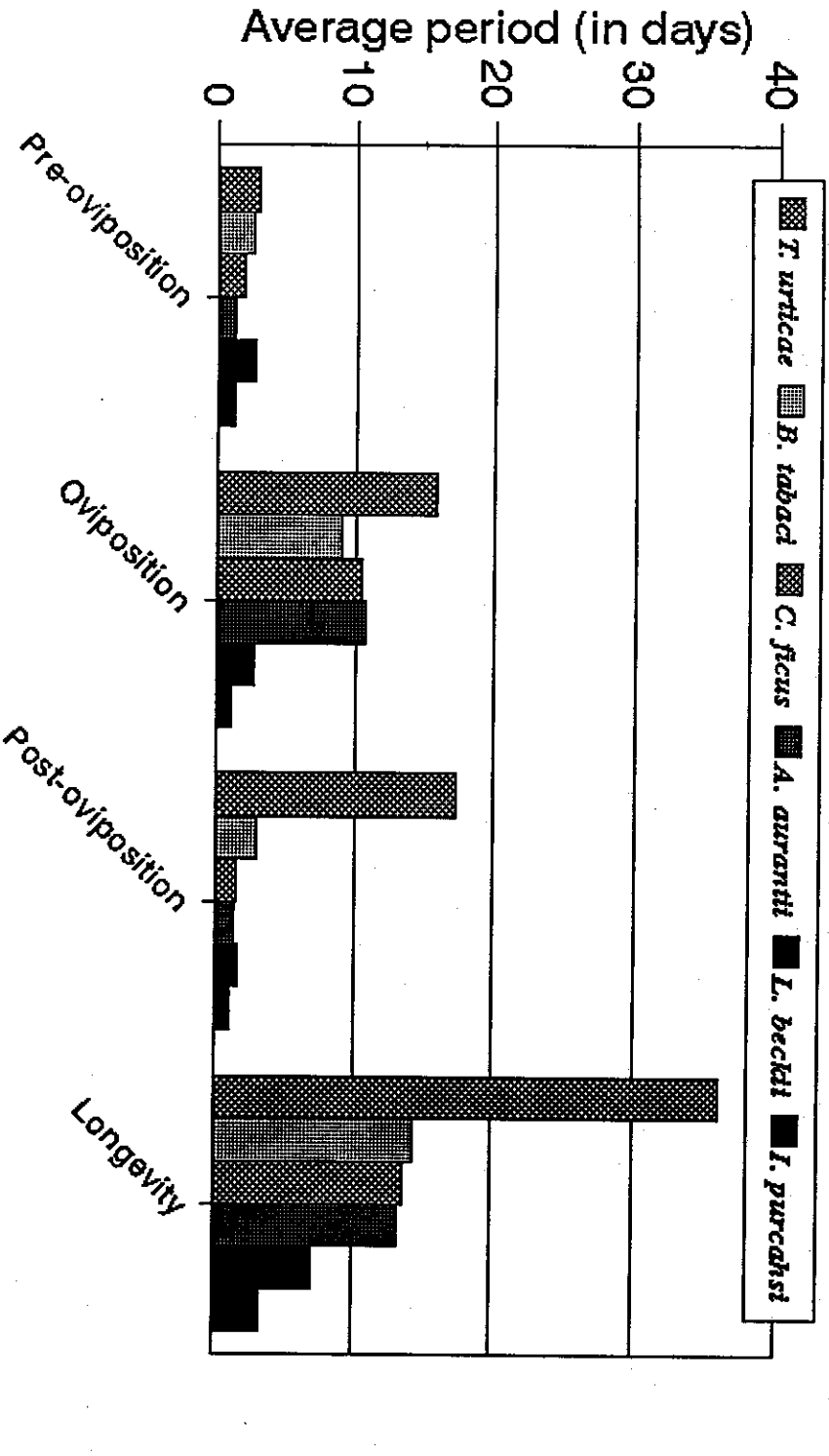

Fig. (6) : Effect of prey immatures on the female longevity of *Euseius scutalis* A.-H. at 25°C and 65±5 % R.H.

C. ficus, B. tabaci, L. beckii and *I. purchasi*; the oviposition period durated for 15.80±0.30, 10.73±0.50, 10.40±0.51, 8.90±0.25, 2.70±0.46 and 1.1±0.26 days, respectively, Table (6) and Fig. (6).

While it averaged 11.10±0.48, 10.30±0.40, 9.20±0.41, 2.90±0.35 and 1.50±0.52 days on eggs of each of *T. urticae, B. tabaci, C. ficus, L. beckii* and *I. purchasi*, respectively, (Table 5 and Fig. 5).

The above results are in agreement with **Gomaa (1975)** and **Abou-Awad and El-sawi (1993)**.

Post-oviposition period of the predator mite *E, scutalis* averaged 17.26±1.83, 3.00±0.00, 1.50±0.64, 1.33±0.50, 1.60±0.51 and 1.10±0.26 days when the predator fed on immature stages of *T. urticae, B. tabaci, C. ficus, A. aurantii, L. beckii*, and *I. purchasi*, respectively, Table (6) and Fig. (6).

These values lasted 12.00±1.133, 2.50±0.70, 1.13±0.40, 1.13±0.35 and 1.60±0.63 days when the predator fed on eggs of *T. urticae, B. tabaci, C. ficus, L. beckii* and *I. purchasi*, respectively, Table (5) and Fig. (5).

The longest longevity was obtained when the predator fed on *T. urticae* immatures The female longevity averaged 35.97±0.39, 14.37±0.25, 13.63±1.17, 13.20±0.62, 7.10±0.96 and 3.30±0.46 days on immature stages of *T. urticae, B. tabaci, C. ficus, A. aurantii, L. beckii* and *I. purchasi*, respectively, Table (6) and Fig. (6).

These values averaged 25.97±0.25, 16.0±1.41, 12.2±0.561, 6.73±0.46 and 4.30±0.46 days on eggs of *T. urticae, B. tabaci, C. ficus, L. beckii* and *I. purchasi*, respectively, Table (5) and Fig. (5).

These results agree with **Gomaa (1975), Soliman *et al.* (1976), Hegab (1980)** and **Yousef *et al.* (1984).**

The female lived for a longer period than that the male. The male longevity durated 13.0±0.42, 13.0±0.50, 8.80±0.18, 4.40±0.22 and 2.80±0.33 days when predator fed on egg of *T. urticae, B. tabaci, C. ficus, L. beckii* and *I. purchasi*, respectively, (Table 3 and Fig. 3). These values averaged 17.4±0.61, 9.70±1.60, 9.20±0.30, 8.40±0.55, 5.40±0.22 and 1.80±0.33 days on immatures of *T. urticae, B. tabaci, C. ficus, L. beckii* and *I. purchasi*, respectively, (table 4 and Fig. 4).

These results agree with **Zaher and El-Badry (1961).**

2- Feeding capacity of *E. scutalis* A.-H, :

The predator tended to fed on greater number of prey eggs, than immatures, except in case of *C. ficus* which presented the greatest number of prey immatures. The predator efficiency increased during the predator developmental stages. Each of protonymph and deutonymph fed on more than times as much as that destroyed by the larvae.

The average number of consumed preys by the predator female larvae was 7.20±0.39 and 3.90±0.15; 3.38±0.92 and 0.0; 6.80±1.01 and 8.60±1.96; and 5.20±1.21 eggs and immatures of *T. urticae, B. tabaci, C. ficus* and immatures of *A. aurantii*, respectively, (Tables 7 & 8 and Figs 7 & 8).

Table (7) : Food consumption of immature stages of *Euseius scutalis* A.-H. female when fed on egg stages of different prey species at 25°C and 65±5 % R.H.

Developmental stages of predator	Average number of individuals when fed on egg stages of :		
	T. urticae	*B. tabaci*	*C. ficus*
Active larva	7.2±0.39	3.38±0.92	6.8±1.01
Active protonymph	25.2±0.88	10.63±4.7	8.8±1.42
Active deutonymph	34.9±0.54	17.13±6.5	13.3±1.9
Total immature	67.3±1.17	31.13±8.1	28.93±4.04

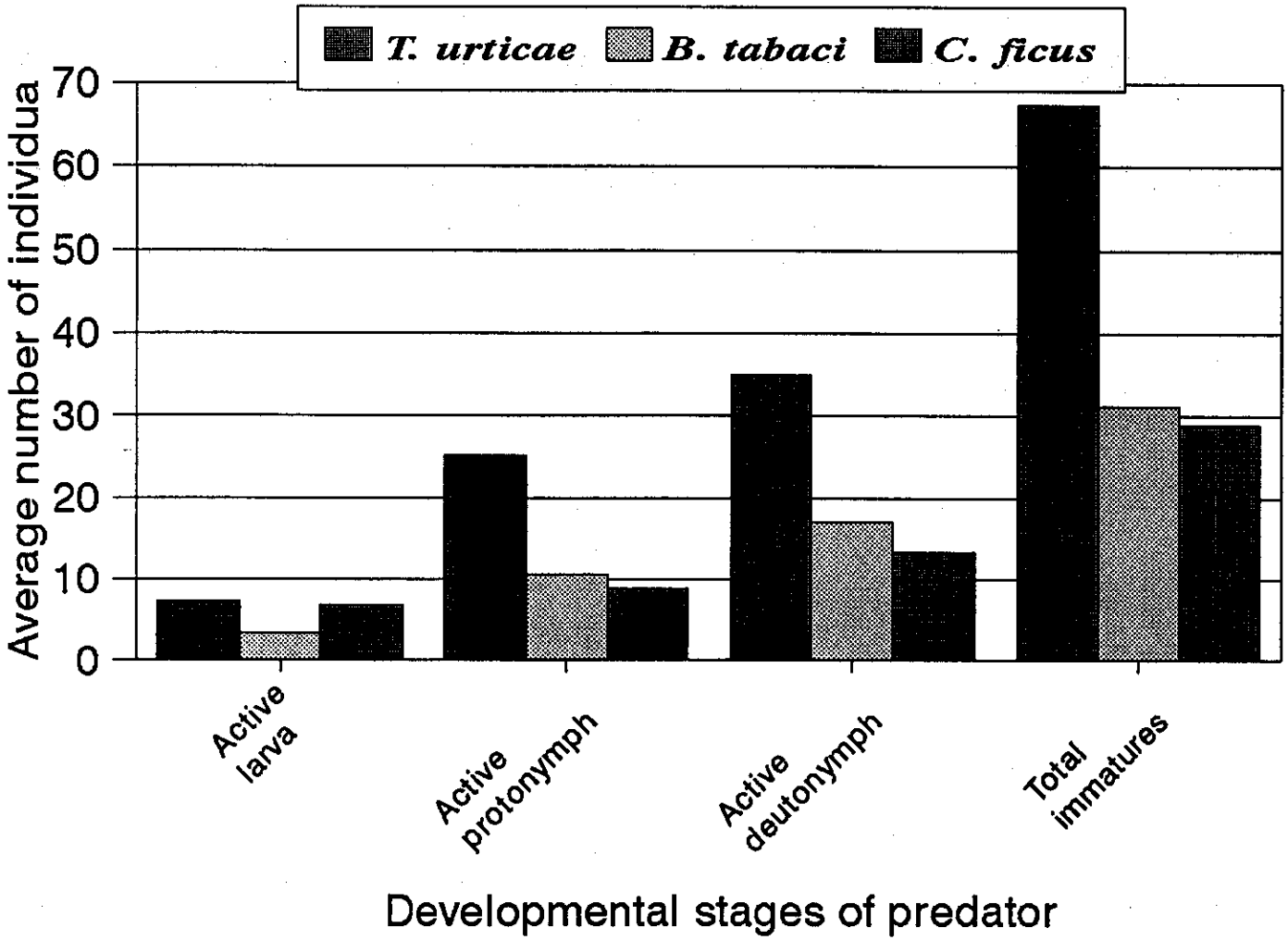

Fig. (7) : Food consumption of immature stages of ***Euseius scutalis*** A.-H. female when fed on egg stages of different prey species at 25°C and 65±5 % R.H.

Table (8) : Food consumption of immature stages of *Euseius scutalis* A.-H. female when fed on immature stages of different prey species at 25°C and 65±5 % R.H.

Developmental stages of predator	Average number of individuals when fed on immature stages of :			
	T. urticae	*B. tabaci*	*C. ficus*	*A. aurantii*
Active larva	3.9±0.15	-	8.6±1.96	5.2±1.21
Active protonymph	14.7±0.70	3.4±1.14	19.13±3.27	7.4±1.5
Active deutonymph	21.9±0.63	5±0.82	32.6±3.02	11.8±1.9
Total immature	40.5±1.09	8±1.41	60.53±6.32	24.4±4.42

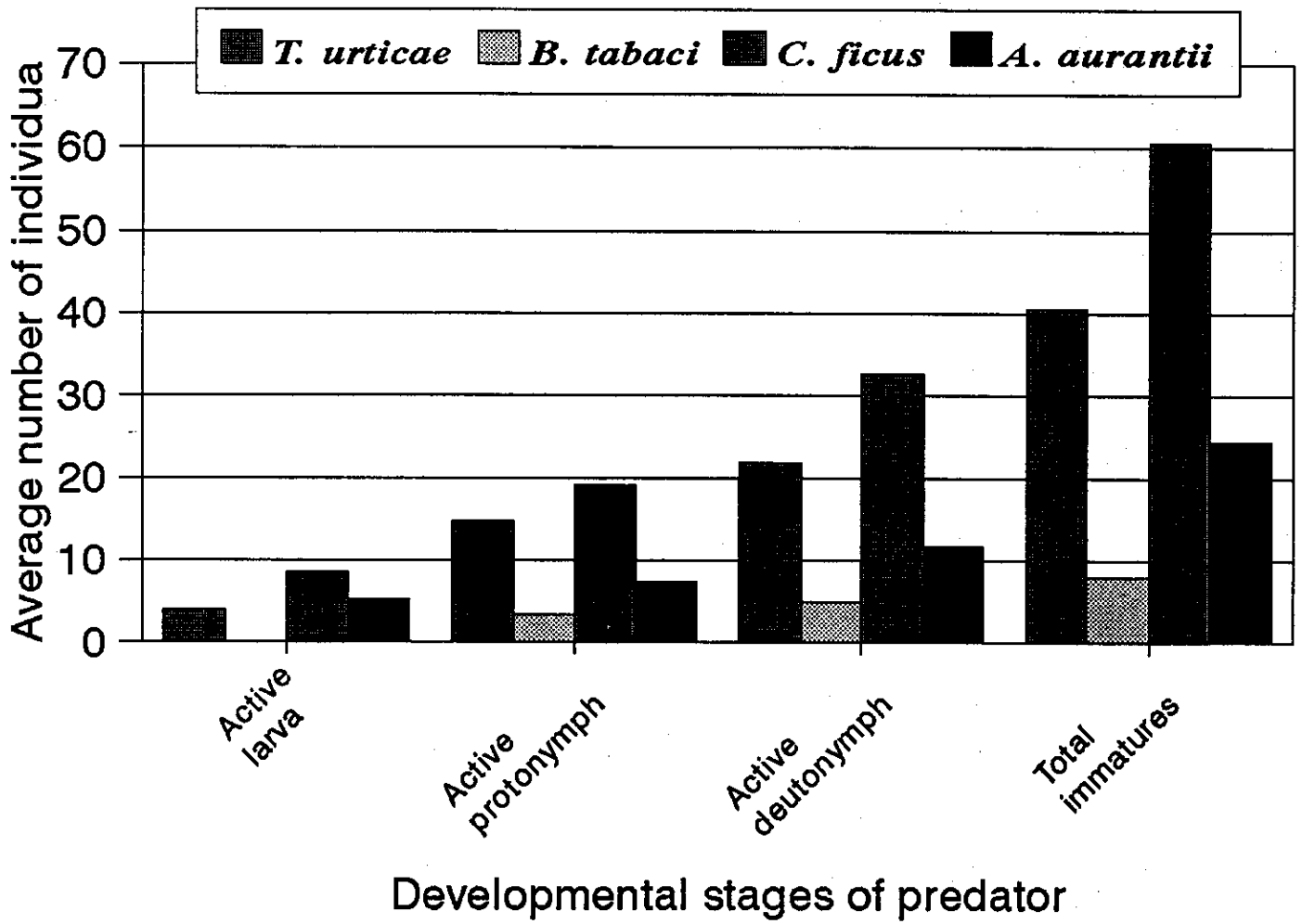

Fig. (8) : Food consumption of female immature stages of ***Euseius scutalis*** A.-H. when fed on immature stages of different prey species at 25°C and 65±5 % R.H.

The female protonymph could attack 25.2±0.88 and 14.7±0.70; 10.63±4.70 and 3.40±1.14 and 8.80±1.42; and 19.13±3.27 and 7.40±1.50 egg and immature stages of *T. urticae, B. tabaci, C. ficus* and immatures of *A. aurantii*, respectively, (Tables 7 & 8 and Figs. 7 & 8).

The female deutonymph could fed on 34.9±0.54 and 21.9±0.63; 17.13±6.50 and 5.00±0.82; 13.3±1.90 and 32.6±3.02 and 11.8±1.19 egg and immature stages of the previous preys, respectively, (Tables 7 & 8 and Figs. 7 & 8).

The average number of consumed preys by *E. scutalis* male larva was 6.20±0.52 and 2.40±0.22; 2.25±0.957 and 0.0; 4.2±0.84 and 6.20±1.30 and 3.60±0.60 egg and immature stages of *T. urticae, B. tabaci, C. ficus* and immatures of *A. aurantii*, respectively, (Tables 9 & 10 and Figs. 9 & 10).

The male protonymph could fed on 10.0±1.13 and 7.80±0.52; 7.00±0.50 and 2.40±1.14; 5.80±0.84 and 12.6±2.80 and 5.40±0.60 egg and immature stages of *T. urticae, B. tabaci, C. ficus* and immatures of *A. aurantii*, respectively, (Tables 9 & 10 and Figs. 9 & 10).

The average number consumed by male deutonymph was 19.2±0.99 and 12.8±0.91; 13.6±4.40 and 2.80±0.84; 7.80±1.10 and 20.4±3.80; and 7.00±0.70 egg and immature stages of *T. urticae, B. tabaci, C. ficus* and immatures of *A. aurantii*, respectively, (Tables 9 & 10 and Figs. 9 & 10).

The female young stages fed on greater numbers of preys than the male. The female total immature stages attacked 67.3±1.17 and 40.5±

Table (9) : Food consumption of different stages of *Euseius scutalis* A.-H. male when fed on egg stages of different prey species at 25°C and 65±5 % R.H.

Developmental stages of predator	Average number of individuals when fed on egg stages of :				
	T. urticae	*B. tabaci*	*C. ficus*	*L. beckii*	*I. purchasi*
Active larva	6.2±0.52	2.25±0.957	4.2±0.84	-	-
Active protonymph	10.0±1.13	7±0.5	5.8±0.84	-	-
Active deutonymph	19.2±0.99	13.6±4.4	7.8±1.1	-	-
Total immature	35.4±1.88	22.8±8.61	17.8±2.3	-	-
Longevity	289.0±1.06	150.33±12.9	112.6±8.2	6.2±0.87	6.8±1.31

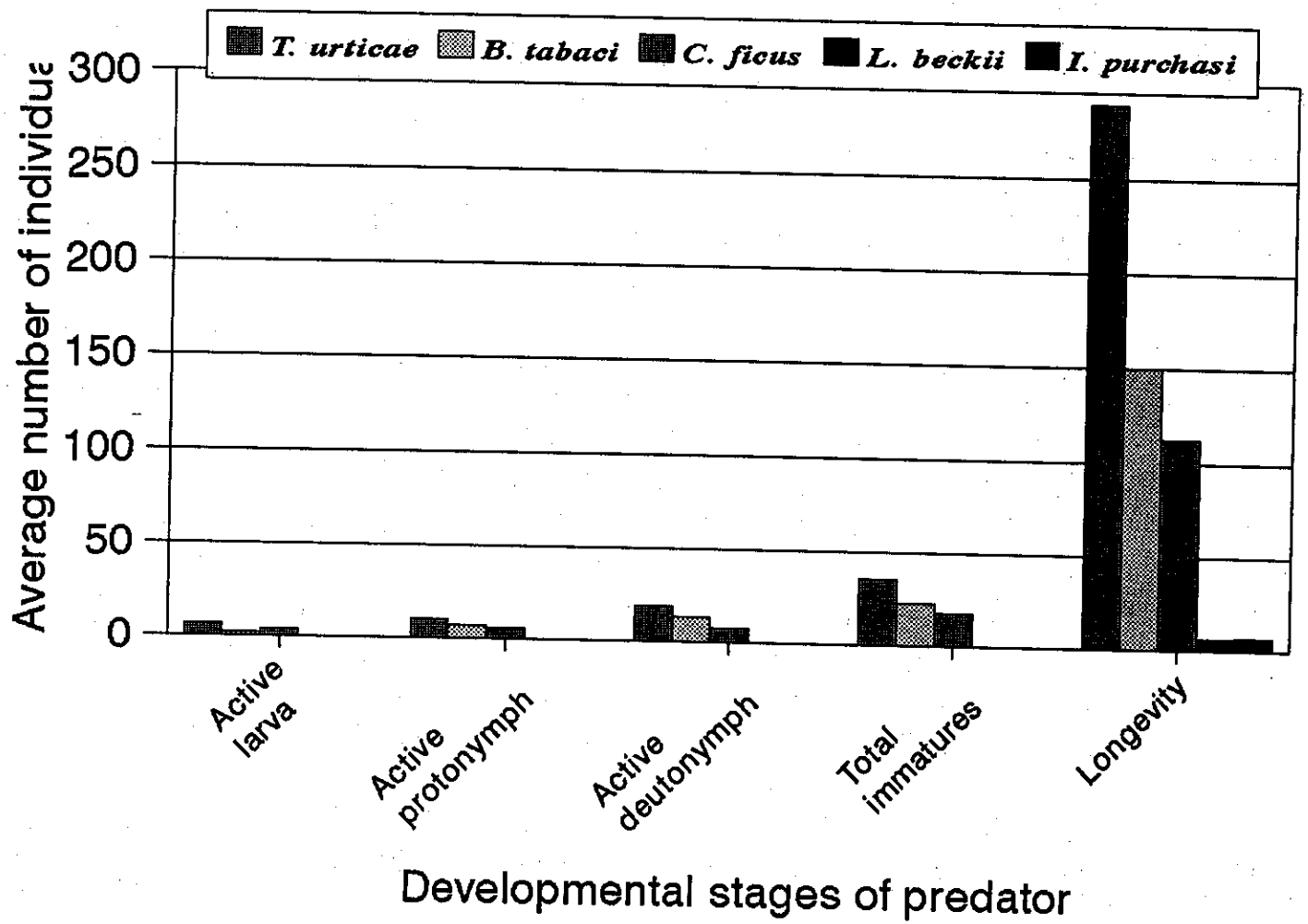

Fig. (9) : Food consumption of different stages of *Euseius scutalis* A.-H. male when fed on egg stages of different prey species at 25°C and 65±5 % R.H.

Table (10) : Food consumption of different stages of *Euseius scutalis* A.-H. male when fed on immature stages of different prey species at 25°C and 65±5 % R.H.

Developmental stages of predator	Average number of individuals when fed on immature stages of :					
	T. urticae	*B. tabaci*	*C. ficus*	*A. aurantii*	*L. beckii*	*I. purchasi*
Active larva	2.4±0.22	-	6.2±1.3	3.6±0.6	-	-
Active protonymph	7.8±0.52	2.4±1.14	12.6±2.8	5.4±0.6	-	-
Active deutonymph	12.8±0.91	2.8±0.84	20.4±3.8	7±0.70	-	-
Total immature	23.0±1.47	6.2±1.92	39.2±5.07	16±1.22	-	-
Longevity	236.2±6.34	114.3±12.06	245.8±39.6	105.4±10.5	9.4±0.61	3.6±1.31

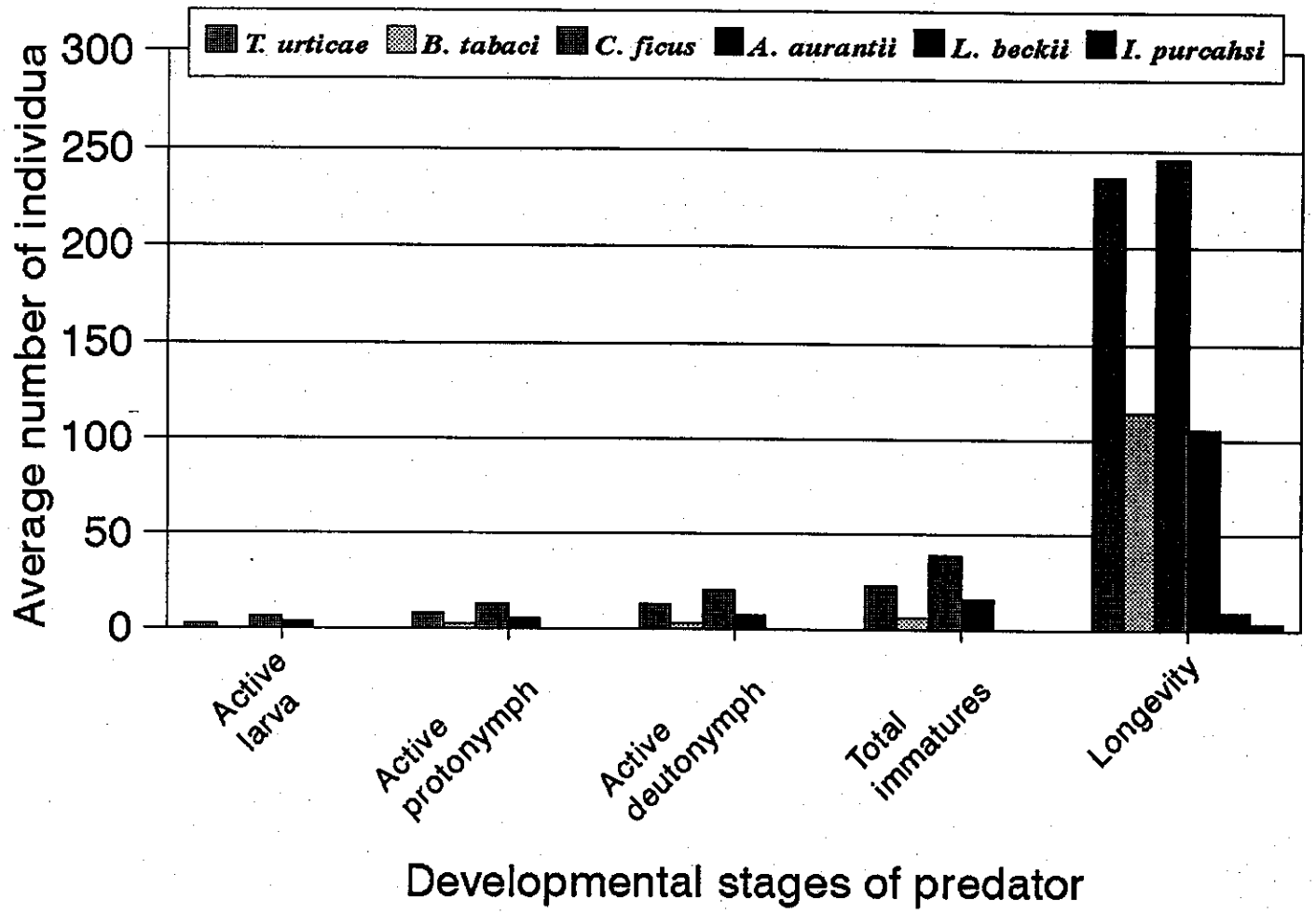

Fig. (10) : Food consumption of different stages of *Euseius scutalis* A.-H. male when fed on immature stages of different prey species at 25°C and 65±5 % R.H.

1.09; 31.13±8.10 and 8.00±1.41; 28.93±4.04 and 60.53±6.32; and 24.4±4.40 numbers of egg and immature stages of *T. urticae, B. tabaci, C. Ficus* and immatures of *A. aurantii*, respectively, (Tables 7 & 8 and Figs. 7 & 8).

The male young stages, followed the same pattern as it attacked 35.4±1.88 and 23.0±1.47; 22.8±8.61 and 6.20±1.92; 17.8±2.30 and 39.2±5.07 and 16.0±1.22 individuals of egg and immature stages of *T. urticae, B. tabaci, C. Ficus* and immatures of *A. aurantii*, respectively, (Tables 9 & 10 and Figs. 9 & 10).

Each of the scale insects *L. beckii* and the mealybug *I. purchasi*, did not suitable for the developmental stages of immature stages of the predatory mite.

The adult female of the predatory mite, *E. scutalis* attacked higher numbers of acarine than those of insects preys.

During the pre-oviposition period the predator attacked 156.6±2.37, 22.5±4.95, 45.06±4.90, 8.70±0.70 and 10.1±0.61 eggs of *T. urticae, B. tabaci, C. Ficus, L. beckii* and *I. purchasi*, respectively, (Table 11 and Fig. 11).

Also, during this period the predator could fed on 124.8±1.77, 28.0±7.70, 89.5±5.01, 25.4±7.14, 12.1±0.90 and 4.50±0.70 immatures of *T. urticae, B. tabaci, C. Ficus, A. aurantii, L. beckii* and *I. purchasi*, respectively, (Table 12 and Fig. 12).

During oviposition period, the female of *E. scutalis* fed on 573.3±5.35, 199.5±12.02, 244.73±31.9, 8.10±0.50 and 8.80±1.30 eggs of *T. urticae, B. tabaci, C. Ficus, L. beckii* and *I. purchasi*, respectively, (Table 11 and Fig. 11).

Table (11) : Food consumption of adult female of *Euseius scutalis* A.-H. when fed on egg stages of different prey species at 25°C and 65±5 % R.H.

Developmental stages of predator	Average number of individuals when fed on egg stages of :				
	T. urticae	*B. tabaci*	*C. ficus*	*L. beckii*	*I. purchasi*
Pre-oviposition	156.6±2.37	22.5±4.95	45.06±4.9	8.7±0.7	10.1±0.61
Oviposition	573.3±5.35	199.5±12.02	244.73±31.9	8.1±0.5	8.8±1.3
Post-oviposition	414.0±9.72	33±11.31	21.9±5.95	1.3±0.2	3.3±0.5
Longevity	1143.9±15.53	255±28.28	307.1±22.52	17.5±1.11	22.2±1.4

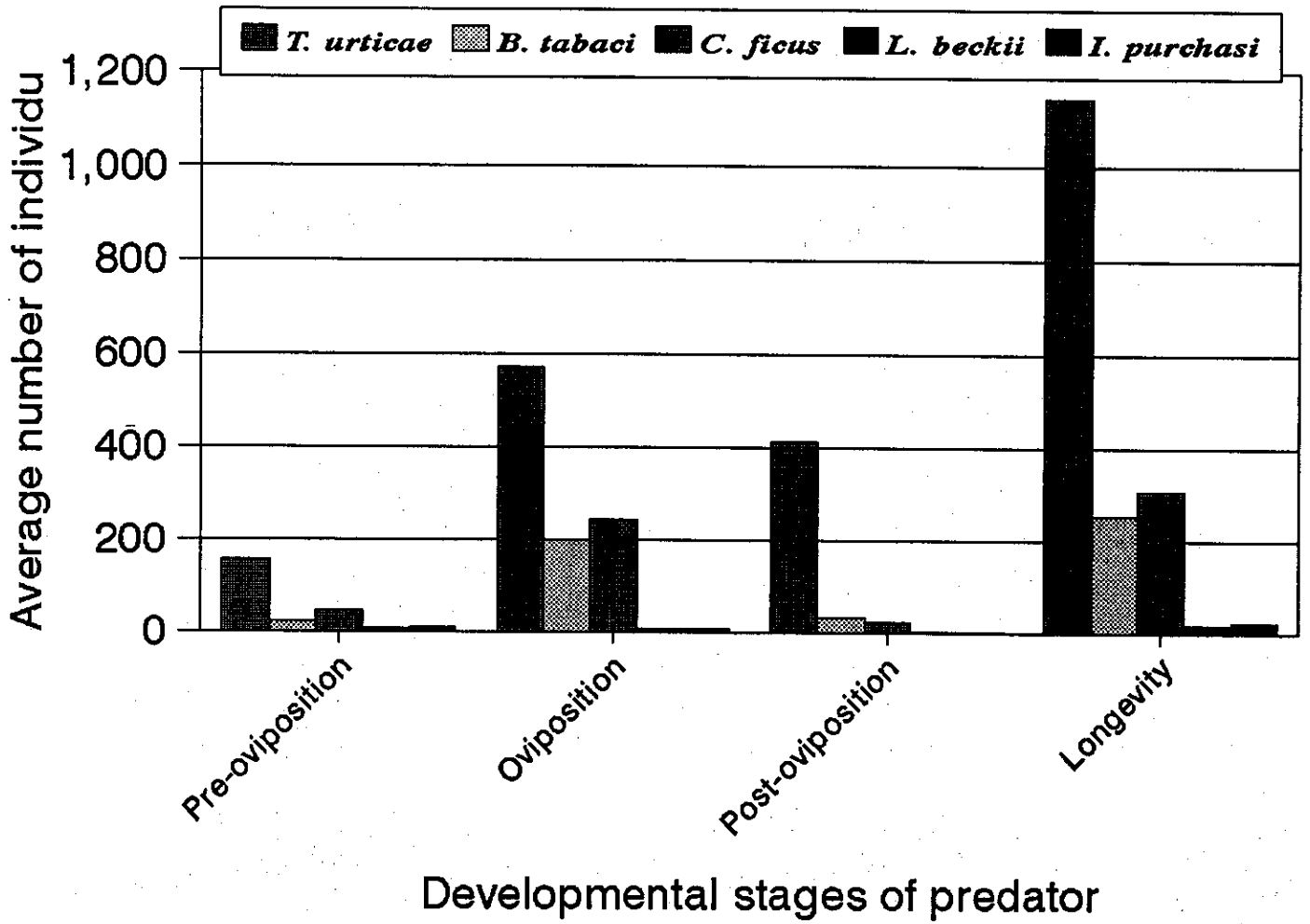

Fig. (11) : Food consumption of adult female of *Euseius scutalis* A.-H. when fed on egg stages of different prey species at 25°C and 65±5 % R.H.

Table (12) : Food consumption of adult female of *Euseius scutalis* A.-H. when fed on immature stages of different prey species at 25°C and 65±5 % R.H.

Developmental stages of predator	Average number of individuals when fed on immature stages of :					
	T. urticae	*B. tabaci*	*C. ficus*	*A. aurantii*	*L. beckii*	*I. purchasi*
Pre-oviposition	124.8±1.77	28±7.7	89.5±5.01	25.4±7.14	12.1±0.9	4.5±0.7
Oviposition	510.1±9.02	228.25±36.5	487.1±19.8	263.93±18.61	11.0±0.7	8.5±0.6
Post-oviposition	241.6±3.35	43.8±4.03	36.53±14.92	23.2±11.16	3.7±0.4	1.7±0.20
Longevity	875.9±9.53	300±45.30	613.13±37.9	312.53±26.14	26.9±1.7	3.6±1.3

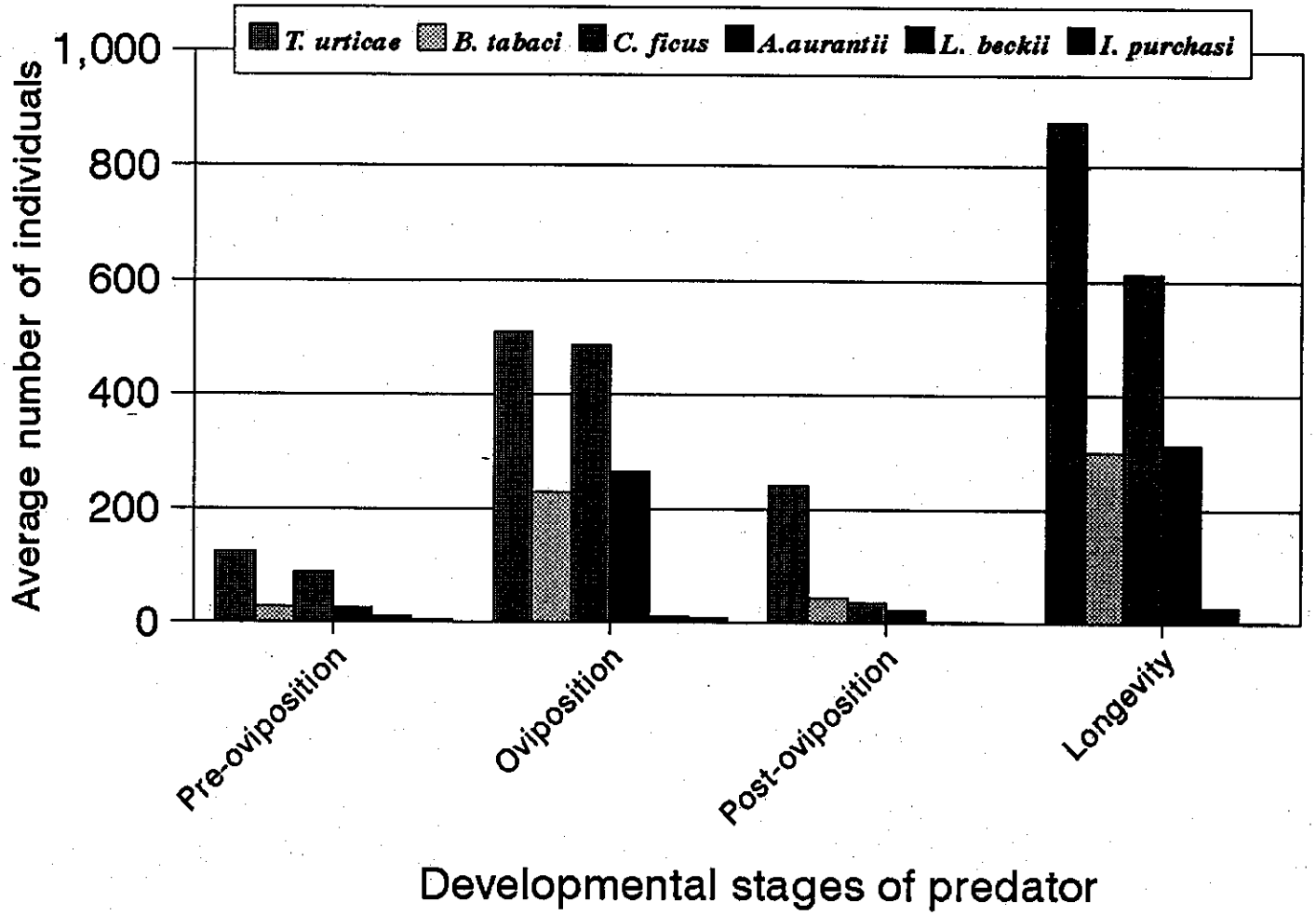

Fig. (12) : Food consumption of adult female of ***Euseius scutalis*** A.-H. when feed on immature stages of different prey species at 25°C and 65±5 % R.H.

With the prey immatures, the female predator was capable to attack 510.1±9.02, 228.25±36.5, 487.1±19.8, 263.93±18.61, 11.0±0.7 and 8.50±0.60 immatures of *T. urticae, B. tabaci, C. Ficus, A. aurantii, L. beckii* and *I. purchasi*, respectively, (Table 12 and Fig. 12).

The female predator could fed on egg stages of preys through the postoviposition period 414.0±9.72, 33.0±11.3, 21.9±5.95, 1.30±0.20 and 3.30±0.50 eggs of *T. urticae, B. tabaci, C. Ficus, L. beckii* and *I. purchasi*, respectively, (Table 11 and Fig. 11).

While these values reached 241.6±3.35, 43.8±4.03, 36.53±14.92, 23.2±11.16, 3.70±0.40 and 1.70±0.20 immatures of *T. urticae, B. tabaci, C. Ficus, A. aurantii, L. beckii* and *I. purchasi*, respectively, (Table 12 and Fig. 12).

The average number of consumed preys by adult female was 1143.9±15.53, 255.0±28.28, 307.1±22.52, 17.5±1.11 and 22.20±1.40 eggs of *T. urticae, B. tabaci, C. Ficus, L. beckii* and *I. purchasi*, respectively, (Table 11 and Fig. 11).

While these values was 875.9±9.53, 300.0±45.30, 613.13±37.9, 312.53±26.14, 26.9±1.70 and 3.60±1.30 immatures of *T. urticae, B. tabaci, C. Ficus, A. aurantii, L. beckii* and *I. purchasi*, respectively, (Table 12 and Fig. 12). These results coincide with **Gomaa (1975) and Abou-Elela (1998)**.

The adult male could fed on 289.0±1.06 and 236.2±6.34, 150.33±12.9 and 114.3±12.6; 112.6±8.20 and 245.8±39.6; 6.20±0.87 and 9.40±0.61; 6.80±1.31 and 3.60±1.31 and 105.4±10.5 numbers of eggs

and immature stages of *T. urticae, B. tabaci, C. Ficus, L. beckii, I. purchasi* and immatures of *A. aurantii*, respectively, (Tables 9 & 10 and Figs. 9 & 10).

The female consumed greater numbers of preys than the male. These results agree with **Zaher and El-Badry (1961), Shehata (1967)** and **Afify *et al.* (1969).**

3- Fecundity of *E. scutalis* A.-H. :

Immature stages specially those of *Tetranychus urticae* highly stimulated the predator fecundity than did prey eggs. The female predator, fed on the greatest number of egg and immature stages of *T. urticae* with average numbers 573.3±5.35 and 510.1±9.02 of eggs and immatures, respectively; and laid the maximum number of eggs which averaged 23.6 and 31.3 eggs during 11.1±0.48 and 15.8±0.30 days, respectively, Tables (13 & 14) and Figs. (13 & 14).

The female predator attacked 244.73±31.9 and 487.1±19.80 eggs and immature stages of *C. ficus* and deposited 15.6 and 23.6 eggs during 9.20±0.41 and 10.4±0.51 days, respectively, Tables (13 & 14) and Figs. (13 & 14).

While the female predator devoured 199.5±12.02 and 228.3±36.5 eggs and immature stages of *B. tabaci* and laid 12.5 and 19.0±2.16 eggs during 10.25±0.40 and 8.90±0.30 days, respectively, Tables (13 & 14) and Figs. (13 & 14).

Table (13) : Effect of prey eggs on the fecundity of *Euseius scutalis* A.-H. at 25°C and 65±5 % R.H.

Prey types	Duration of oviposition period (in days)	Number of consumed eggs	Number of deposited eggs	
			Total	Daily rate
T. urticae	11.1±0.48	573.3±5.35	23.6	2.2
B. tabaci	10.25±0.4	199.5±12.02	12.5	1.22
C. ficus	9.2±0.41	244.73±31.9	15.6	1.7
L. beckii	2.9±0.35	8.1±1.4	3.3±1.2	1.1
I. purchasi	1.5±0.6	8.8±1.6	1.7±0.3	1.1

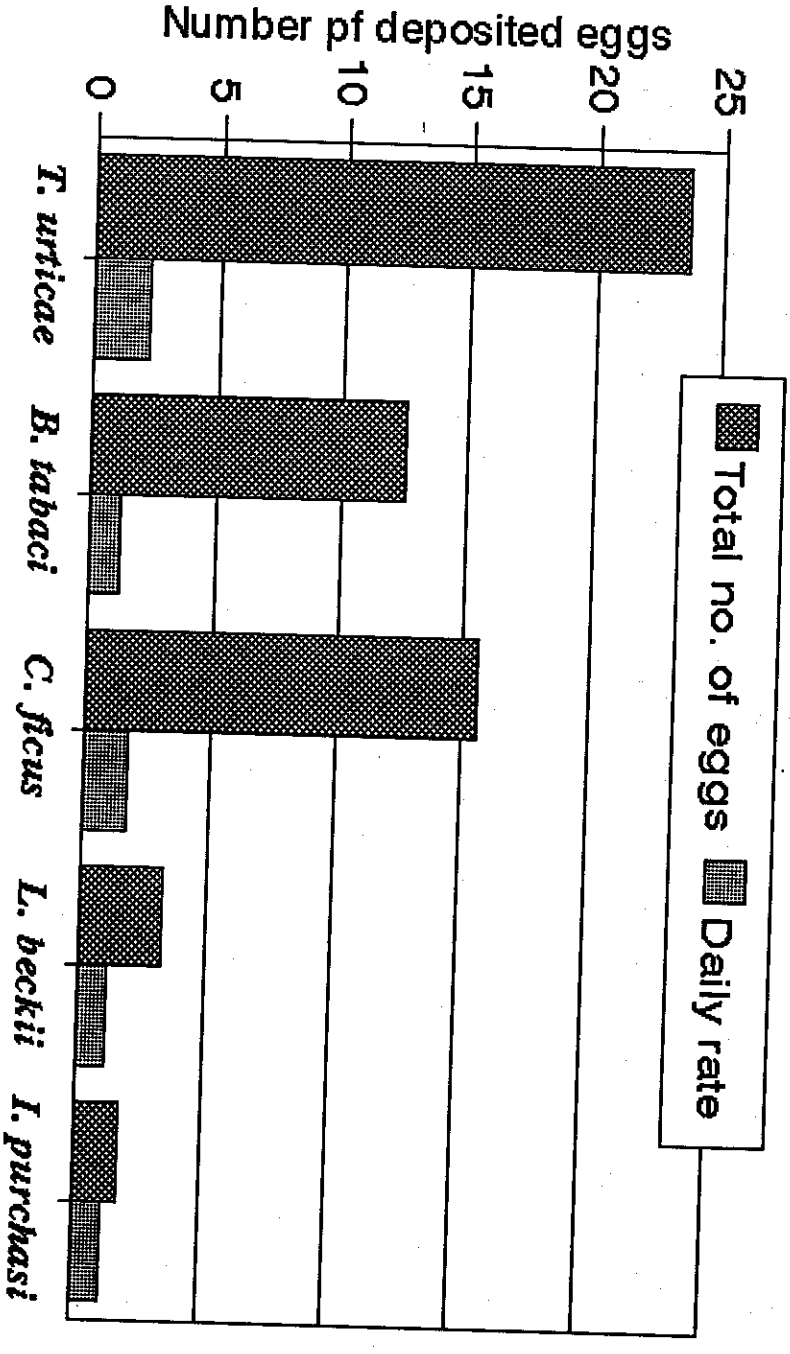

Fig. (13) : Effect of prey eggs on the fecundity of *Euseius scutalis* A.-H. at 25°C and 65±5 % R.H.

Table (14) : Effect of prey immatures on the fecundity of *Euseius scutalis* A.-H. at 25°C and 65±5 % R.H.

Prey types	Duration of oviposition period (in days)	Number of consumed individuals	Number of deposited eggs	
			Total	Daily rate
T. urticae	15.8±0.30	510.1±9.02	31.3	2.0
B. tabaci	8.9±0.3	228.3±36.5	19±2.16	2.23
C. ficus	10.4±0.51	487.1±19.8	23.6	2.3
A. aurantii	10.73±0.5	263.93±18.6	11.8±1.31	1.1
L. beckii	2.7±0.39	11±2.1	6.2±1.8	2.3
I. purcahsi	1.1±0.89	8.5±2.1	1.2±0.8	1.1

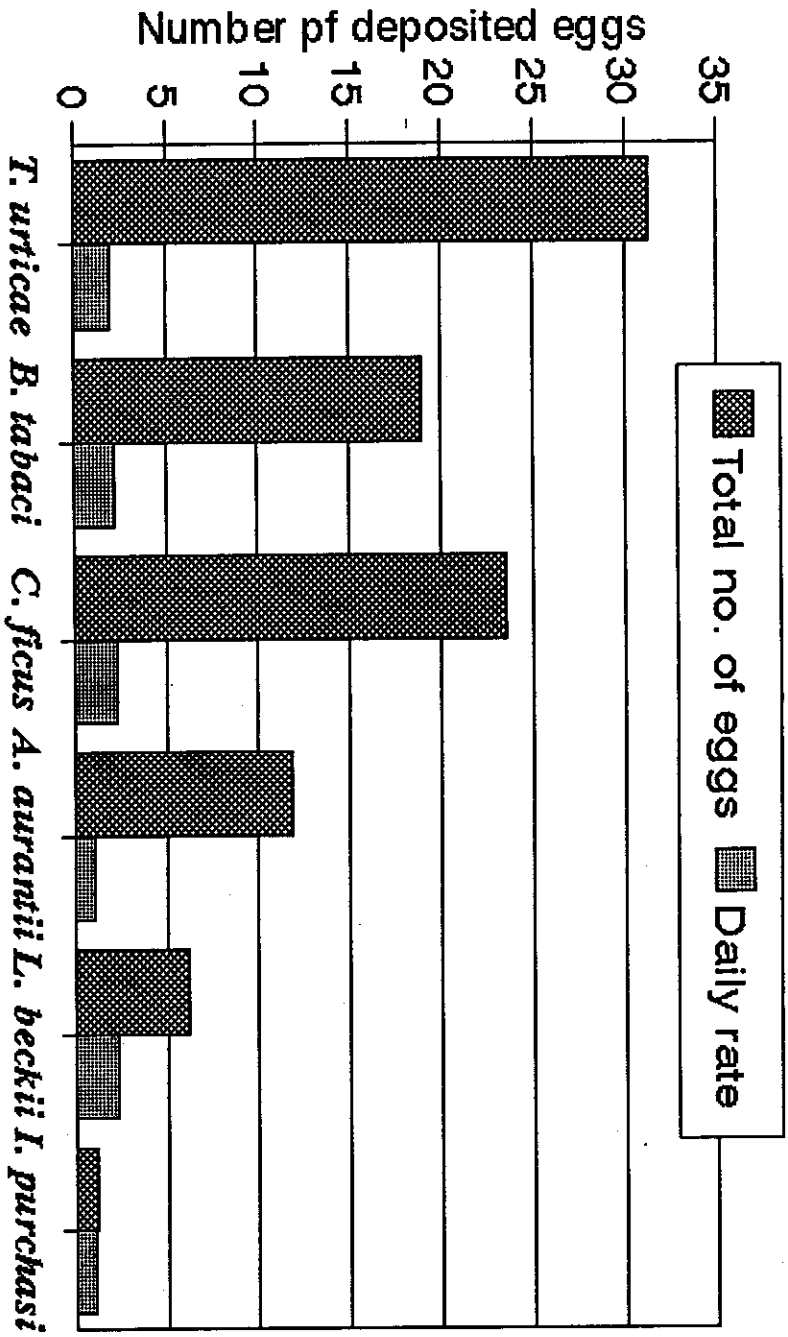

Fig. (14) : Effect of prey immatures on the fecundity of *Euseius scutalis* A.-H. at 25°C and 65±5 % R.H.

The female predator attacked 263.93±18.6 immature stages of *A. aurantii* and deposited 11.8±1.31 eggs, during 10.73±0.50 days, (Table 14 and Fig. 14).

The female predator did not prefer each of *L. beckii* and *I. purchasi* which induced a very low numbers of deposited eggs. The female consumed 8.10±1.40 and 11.0±2.10 egg and immature stages of *L. beckii* and laid 3.30±1.20 and 6.20±1.80 eggs during 2.90±0.35 and 2.70±0.39 days, respectively. While in case of egg and immature stages of *I. purchasi*. The female predator attacked 8.80±1.60 and 8.50±2.10 eggs and deposited 1.70±0.30 and 1.20±0.80 eggs during 1.50±0.60 and 1.10±0.89 days, respectively, (Tables 13 & 14 and Figs. 13 & 14).

The above mentioned results agree with **Gomaa (1975), Metwally (1976), Yousef (1990), Abou-Awad and El-Sawi (1993)**and **Abou-Elela (1998)**.

II- Biological Studies on *Phytoseiulus persimilis* A.-H. at 22 C and 60 % R.H. :

1- Longevity on immature stages of *Tetranychus urticae* Koch :

Results showed that when predatory mite *P. persimilis* fed on immature stages of *T. urticae*, the incubation period averaged 3.60±0.10 days for female and 3.43±0.03 days for male at 22°C (Tables 15 & 16 and Fig. 15).

The duration of female and male active larva lasted 0.51±0.023 and 0.485±0.038 days; the protonymph averaged 0.61±0.09 and 0.487±0.024 days; the deutonymph lasted 0.93±0.04 and 0.90±0.02 days, (Tables 15 & 16 and Fig. 15).

The quiescent larval, protonymphal and deutonymphal stages averaged 0.35±0.03 and 0.395±0.09 days; 0.43±0.03 and 0.45±0.10; and 0.51±0.04 and 0.49±0.02 days, for female and male, respectively, (Tables 15 & 16 and Fig. 15).

The duration of total immature stages of the predatory mite *P. persimilis* averaged 3.33±0.10 and 3.20±0.02 days for female and male, respectively, (Tables 15 & 16 and Fig. 15). These findings coincide with those obtained by **El-Laithy (1991)**.

The pre-oviposition, oviposition and post- oviposition periods of *P. persimilis* lasted 2.02±0.02, 10.8±0.83 and 1.90±0.22 days, respectively (Table 17 and Fig. 15).

The female of predatory mite *P. persimilis* lived for a longer period than that of the male. The female and male longevity averaged 14.72± 0.97 and 11.5±0.70 days, respectively, (Tables 16 & 17 and Fig. 15).

Table (15) : Effect of prey immatures of *Tetranychus uticae* Koch on immature stages of *Phytoseiulus persimilis* A.-H. female at 22°C and 60 % R.H.

Developmental stages of predator	Average (in days) when feed on immature stages of *T. urticae*
Incubation period	3.6±0.10
Active larva	0.51±0.023
Quiescent larva	0.35±0.03
Active protonymph	0.61±0.09
Quiescent protonymph	0.43±0.03
Active deutonymph	0.93±0.04
Quiecent deutonymph	0.51±0.04
Total immature stages	3.33±0.10

Table (16) : Effect of prey immatures of *Tetranychus uticae* Koch on immature stages of *Phytoseiulus persimilis* A.-H. male at 22°C and 60 % R.H.

Developmental stages of predator	Average (in days) when feed on immature stages of *T. urticae*
Incubation period	3.43±0.03
Active larva	0.485±0.038
Quiescent larva	0.395±0.09
Active protonymph	0.487±0.024
Quiescent protonymph	0.45±0.10
Active deutonymph	0.90±0.02
Quiecent deutonymph	0.49±0.02
Total immature stages	3.20±0.02
Longevity	11.5±0.70

Table (17) : Effect of prey immatures of *Tetranychus uticae* Koch on the female longevity of *Phytoseiulus persimilis* A.-H. at 22°C and 60 % R.H.

Developmental stages of predator	Average (in days)
Pre-oviposition	2.02±0.02
Oviposition	10.8±0.83
Post-oviposition	1.90±0.22
Longevity	14.72±0.97

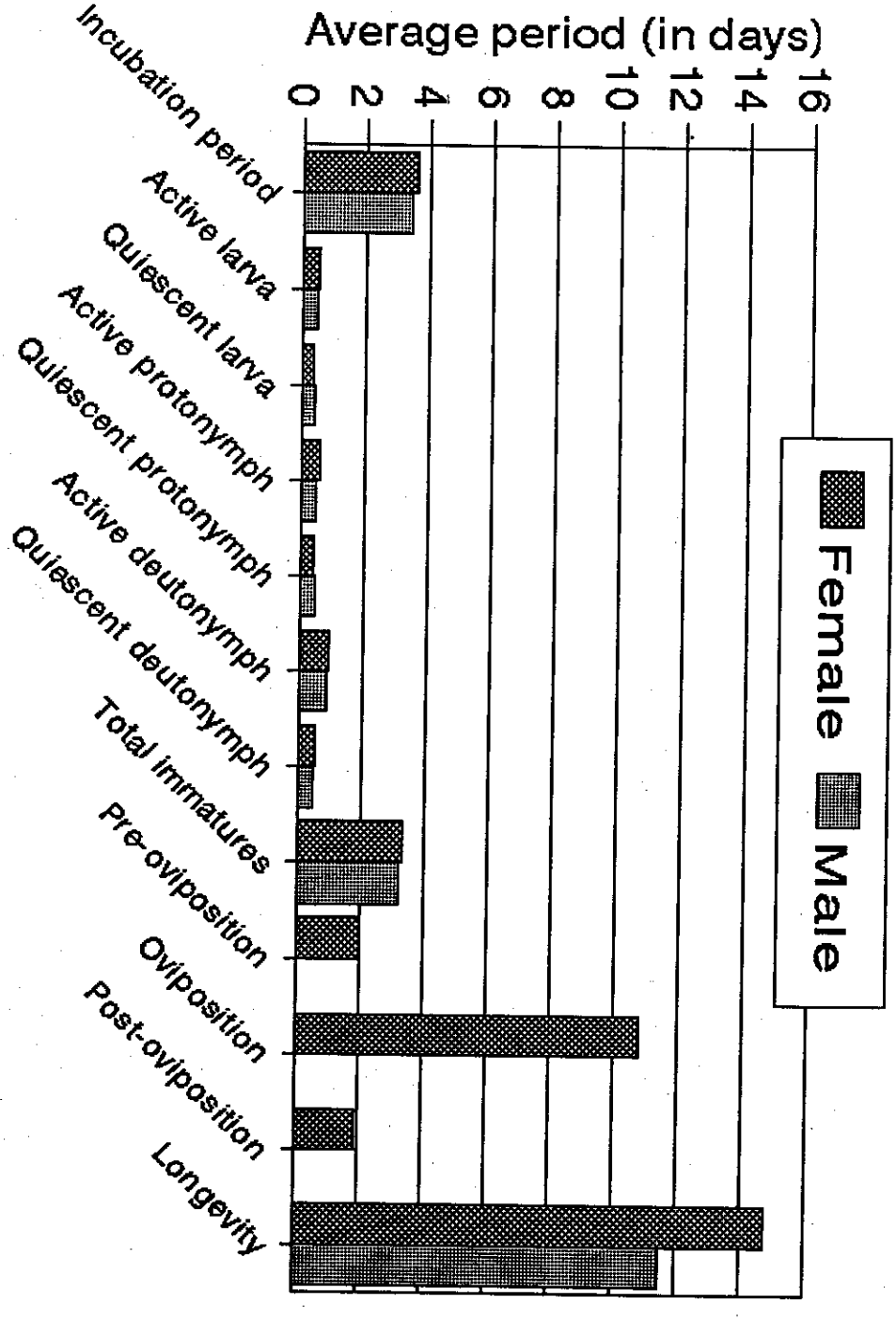

Fig. (15) : Effect of prey *T. urticae* immmtures on immatures stages and longevity of *Phytoseiulus persimilis* female and male at 22°C and 60 % R.H.

2- Food consumption :

The total average from consumed immature stages of *T. urticae*, increased with successive developmental stages. This means that adult female fed on greater number of immature stages of *T. urticae* than immatures, deutonymph more than protonymph, and female more than male.

The predator female and male larva did not feed on immature stages of *T. urticae*, but the protonymph and deutonymph of the predatory mite female and male could attack 2.0±1.41 and 2.0±1.4 and 6.8±3.2 and 5.0±1.4 individuals of immature stages of *T. urticae*, respectively, Tables (18 & 19 and Fig. 16).

The average number of consumed prey immature stages by *P. persimilis* female and male young stages averaged 7.8±3.2 and 7.0±2.8 immature preys, respectively, (Tables 18 & 19 and Fig. 16).

During pre-oviposition, oviposition and post- oviposition period, the total number of prey consumed by the female predator averaged 11.0±5.24, 62.6±10.3 and 3.8±1.3 immatures of *T. urticae*, respectively, (Table 20 and Fig. 16).

The adult female of the predatory mite *P. persimilis*, proved to be more efficient than the male, as the former, it fed on more than three times as much as those attacked by the latter. *P. persimilis* adult female and male consumed 77.4±11.10 and 27.5±2.12 immatures of *T. urticae*, respectively, (Tables 19 & 20 and Fig. 16).

Table (18) : Food consumption of immature stages of *Phytoseiulus persimilis* A.-H. female when fed on immature stages of *Tetranychus urticae* Koch at 22°C and 60 % R.H.

Developmental stages of predator	Average number of consumed individuals when feed on immature stages of *T. urticae*
Larva	-
Protonymph	2.00±1.41
Deutonymph	6.80±3.20
Total immature	7.80±3.20

Table (19) : Food consumption of different stages of *Phytoseiulus persimilis* A.-H. male when fed on immature stages of *Tetranychus urticae* Koch at 22°C and 60 % R.H.

Developmental stages of predator	Average number of consumed individuals when feed on immature stages of *T. urticae*
Larva	-
Protonymph	2.00±1.40
Deutonymph	5.00±1.40
Total immature	7.00±2.80
Longevity	27.5±2.12

Table (20) : Food consumption of adult female of *Phytoseiulus persimilis* A.-H. when fed on immature stages of *Tetranychus urticae* Koch at 22°C and 60 % R.H.

Developmental stages of predator	Average number of consumed individuals when feed on immature stages of *T. urticae*
Pre-oviposition	11.0±5.24
Pviposition	62.6±10.30
Post-oviposition	3.8±1.30
Longevity	77.4±11.10

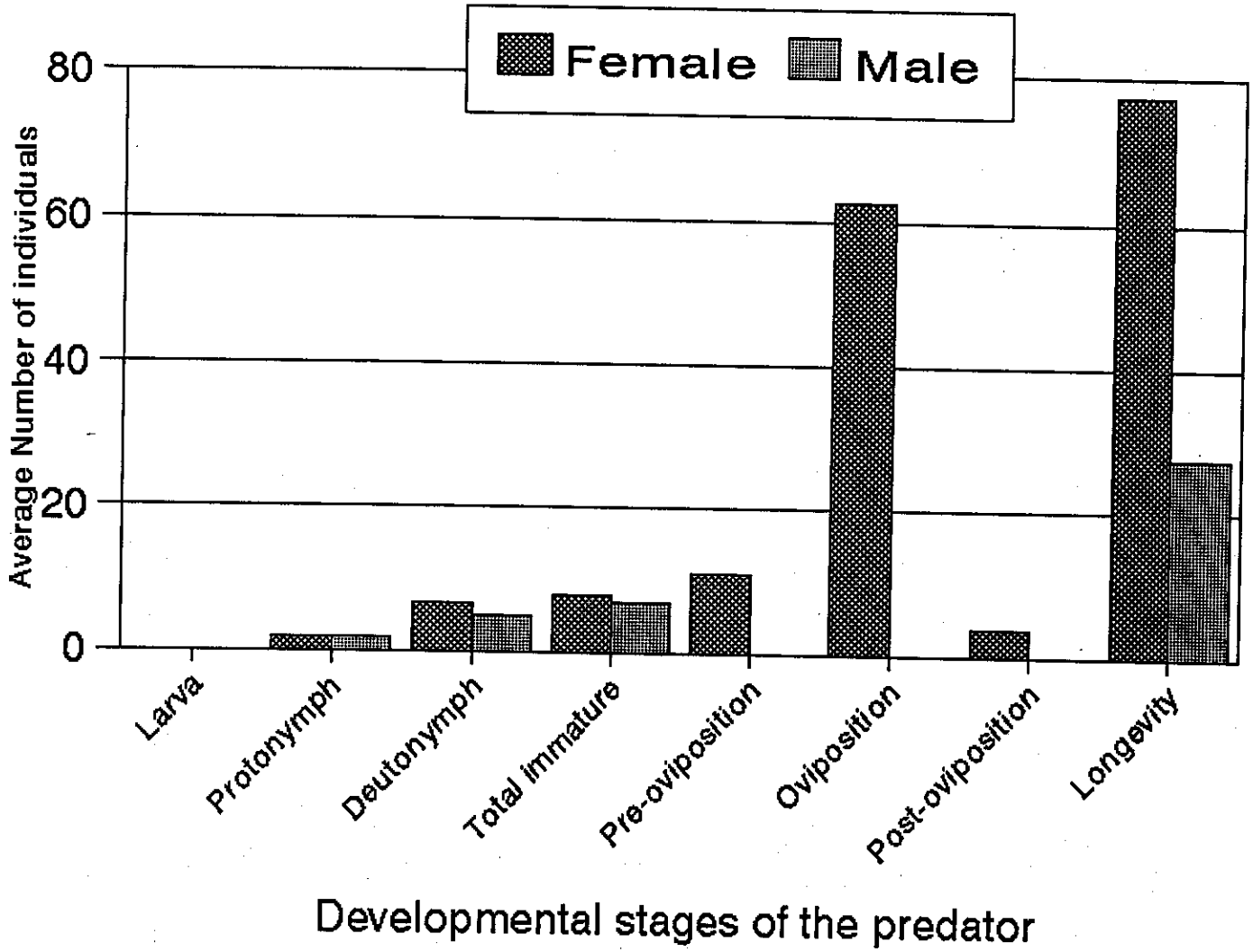

Fig. (16) : Effect of prey ***T. urticae*** immmtures on food consumption of immature stages of ***Phytoseiulus persimilis*** female and male at 22°C and 60 % R.H.

3- Fecundity of the predatory mite *Phytoseiulus persimilis* A.-H. :

Result showed that, the female predator attacked 77.4±11.10 individuals of immature stages of *T. urticae*, and deposited 62.6±10.26 eggs, during 10.8±0.83 days (Tables 20 & 21).

These results agree with those obtained by **El- Laithy (1991).**

Table (21) : Effect of immature stages of *Tetranychus urticae* Koch on the fecundity of *Phytoseiulus persimilis* A.-H. at 22°C and 60 % R.H.

Duration of oviposition period	Food consumption during oviposition period	Number of deposited eggs	
		Total	Daily rate
10.8±0.83	62.6±10.3	178	3.296

2- Effect of low temperature storage on egg hatchability percentages of *Phytoseiulus persimilis* A.- H. at 10 and 5°C cold storage :

a) Cold storage at 10°C :

Data in Table (22) indicated that when the egg stages of the predatory mite, *P. persimilis* stored at 10°C to different times one, two three and four weeks, the hatchability percentage reached 2.7, 8.57, 25.0 and zero %, respectively, and when stored eggs transferred at 25°C, the hatchability percentage increased to 100.0, 87.5 and 70.0 %, respectively, in case of storage for one, two and three weeks; but in case of storage four weeks it produced the same percent of hatchability zero %.

This confirm that the egg storage at 10°C to four weeks kill the eggs for 100 %, so we can recommend to be not storage the eggs to four weeks at 10°C. On the other hand, the result clear that the predatory eggs can be stored at 10°C to one, two and three weeks successfully, and the proper time of storage at this degree is one week only because it produced 100 % of hatching after it transferred at 25°C, Table (22).

b) Cold storage at 5°C :

Data present in Table (23) reported that when the egg stages of the predatory mite *P. persimilis* stored at 5°C for one, two, three and four weeks, the percentage of hatchability affected as follows, it reached zero %, 21.87 %, zero % and 5.71 %, respectively, and when the stored eggs transferred to incubator at 25°C the percent hatchability were 84.9, 10.0, 2.5 and zero %, respectively, as the same previous time of storage.

Table (22) : Effect of different time of cold storage of egg stages of *Phytoseiulus persimilis* A.-H. on percent hatchability at 10°C and after incubation at 25°C.

Time of storage	Cold storage at 10°C				At 25°C after cold storage			
	Total number	No. of unhatched eggs	No. of hatched eggs	% of hatch-ability	Total number	No. of unhatched eggs	No. of hatched eggs	% of hatch-ability
One week	37	36	1	2.70	36	zero	36	100.0
Two weeks	35	32	3	8.57	32	4	28	87.5
Three weeks	40	30	10	25.0	30	9	21	70.0
Four weeks	41	41	-	zero	41	41	-	zero

Table (23) : Effect of different time of cold storage of egg stages of *Phytoseiulus persimilis* A.-H. on percent hatchability at 5°C and after incubation at 25°C.

Time of storage	Cold storage at 5°C				At 25°C after cold storage			
	Total number	No. of unhatched eggs	No. of hatched eggs	% of hatch-ability	Total number	No. of unhatched eggs	No. of hatched eggs	% of hatch-ability
One week	86	86	zero	zero	86	13	73	84.9
Two weeks	64	50	14	21.87	50	45	5	10.0
Three weeks	40	40	zero	zero	40	39	1	2.5
Four weeks	35	33	2	5.71	33	33	zero	zero

From the above mentioned result, we can recommend that the proper time for storage the egg stages of the predatory mite at 5°C is for one week only, because it gave 84.9 % of hatchability after it incubated at 25°C.

In conclusion, eggs hatchability percentage decrease as cold storage period increased and the storage temperature decrease.

These finding result is in agreement with **Aly (1994)** who stated that the low temperature affected egg incubation and hatchability.

3- Effect of low temperature storage on the biological aspects of predatory mite *Phytoseiulus persimilis* A.-H. :

The biological aspects of the predator *P. persimilis* after cooling storage of its eggs at 5°C for one week and transferred at 25°C were studied and compared with the biological aspects of *P. persimilis* at 25°C.

Data in Table (24) and Fig. (17) indicated that incubation period averaged 1.60±0.51 and 2.74±0.44 days, respectively, for cooling eggs and uncooling eggs. Total immature period increased in cooling treatment averaged 3.70±0.80 days, but in uncooling treatment it slightly decrease to 3.24±0.44 days.

The generation period in cooling treatment slightly decreased than in control averaged 6.71±0.7 and 6.91±0.6 days, respectively.

The oviposition period highly decreased to 6.11±1.7 days, while in control they were increased to 12.53±1.4 days.

Table (24) : Biological aspects of the predatory mite *Phytoseiulus persimilis* A.-H. at 25°C after cold storage of eggs at 5°C for one week.

Parameter	Treated	Control
Incubation period	1.60±0.51	2.74±0.44
Active larva	0.56±0.24	0.50±0.0
Quiescent larva	0.50±0.0	0.50±0.0
Active protonymph	0.56±0.17	0.50±0.0
Quiescent protonymph	0.50±0.0	0.50±0.0
Active deutonymph	1.14±0.46	0.71±0.41
Quiescent deutonymph	0.54±0.133	0.52±0.11
Total immatures	3.70±0.8	3.24±0.44
Pre-oviposition	1.23±0.42	0.97±0.13
Generation period	6.71±0.7	6.91±0.6
Oviposition	6.11±1.7	12.53±1.4
Post-oviposition	1.50±0.7	1.00±0.0
Longevity	8.90±1.74	14.50±1.5
Life span	14.32±1.7	20.40±0.99
Total eggs/female	19.36±6.6	45.40±4.99

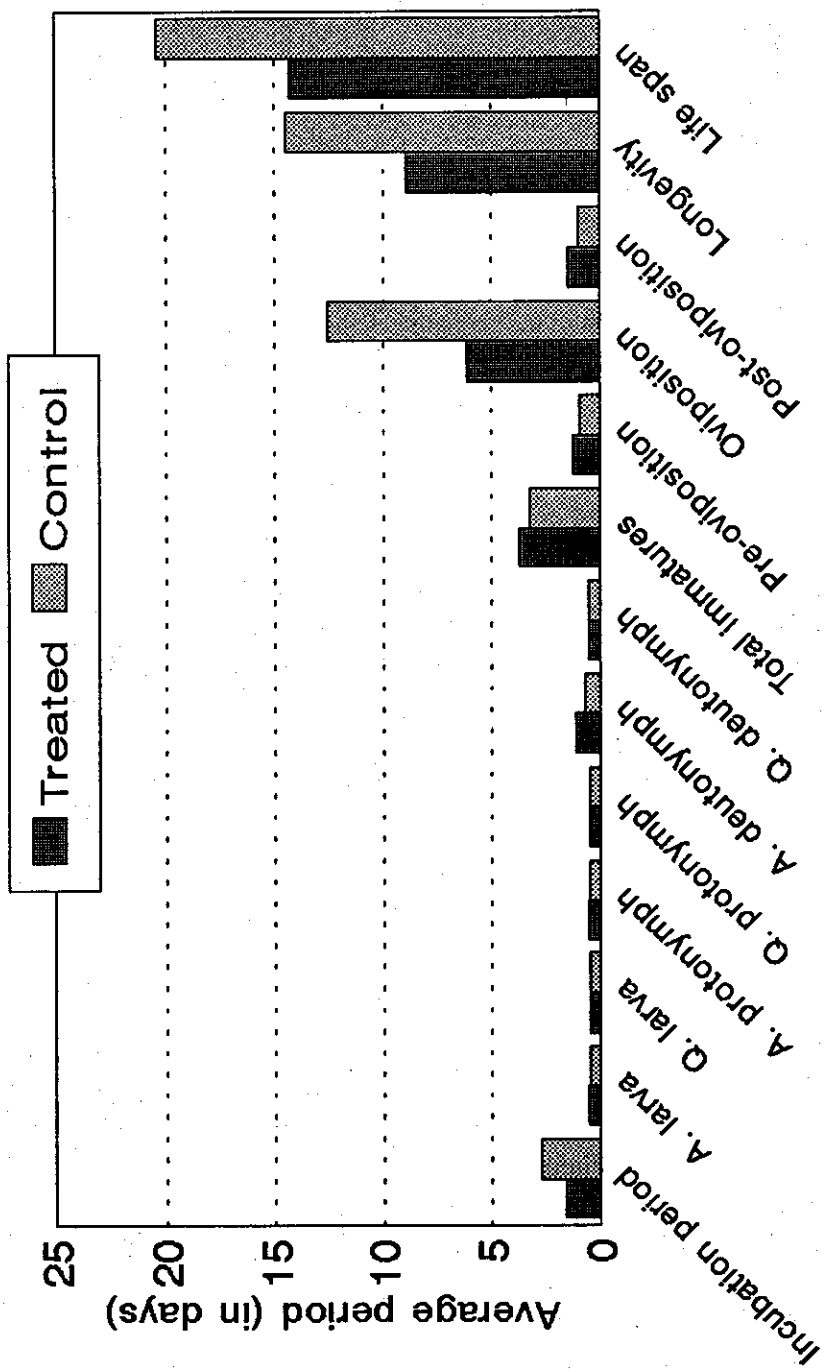

Fig. (17) : Biological aspects of the predatory mite ***P. persimilis*** at 25°C after cold storage of eggs at 5°C for one week.

Also, the same trend was obtained with longevity. This period lasted 8.9±1.74 days in cooling treatment and 14.50 days in uncooling treatment. The mean life span for treated female averaged 14.32±1.70, while in control it was 20.4.±0.99 (Table 24 and Fig. 17).

The fecundity of the female reduced the number of deposited eggs per female reduced to 19.36±6.60 eggs but it was in control 45.40±4.99 eggs per female.

In conclusion, the cold storage of egg stages of the predatory mite, *P. persimilis* at 5°C for one week causing reduction in female fecundity reached about 42.2 %, so that we can recommend that, we must not make this storage except in obligated case when their are a high number of predatory egg stages will be damaged only. These results are coincide with **Aly (1994), Shoeib (1996)** and **El-Khateeb (1998).**

III- Susceptibility of 1-day Old Eggs and Adult Stages of *Phytosciulus persimilis* A.-H. to Some Compounds Under Laboratory Conditions :

1- Susceptibility of 1-day Old Eggs and Adult Stages of *Phytoseiulus persimilis* A.-H. to Some Acaricides Under Laboratory Conditions :

a) On 1-day old eggs :

Data in Table (25) indicated that the acaricides fenpyroximate (Ortus) 5 % EC, abamectin (Vertimec) 1.8 % EC, and bromoprophylate (Neoron) 50 % EC tested against the egg stages of the predatory mite *P. persimilis* at recommended concentration exhibited harmless effect for the all toxicant induced 2.77, 0.0 and 0.0 % unhatchability, respectively.

b) On adult stages :

The same acaricides tested also on the adult stages of the predatory mite. Data in Table (26) indicated that fenpyroximate (Ortus) 5 % SC was harmful, caused 100 % mortality, bromoprophylate (Neoron) 50 EC was harmful produced 93.75 % mortality; while abamectin (Vertimec) 1.8 % EC was slight harmful caused 46.4 % mortality.

From the above mentioned results, Vertimec can be used through integrated pest management using this predatory mite because it induced slight harmful effect on the predatory mite. This study is in agreements with **Zhi-Qianc and Sanderson (1990)** who indicated that Abamectin was much less toxic to predatory mite than to the spider mite. **Kilincer *et al.* (1990)** stated that Neoron (bromophylate) was highly toxic to *P. persimilis*.

Table (25) : Suspectibility of 1-old eggs of *Phytoseiulus persimilis* A.-H. to some acaricides, under laboratory conditions.

Acaricides		Recommended concentration used/100 litre of water	Percentages of unhatch-ability	Toxicity
Trade name	**Active ingredient**			
Ortus 5 % EC	Fenpyroximate	5o cc	2.77 %	1
Vertimec 1.8 % EC	Abamectin	40 cc	zero	1
Neoron 50 % EC	Bromoprophylate	150 cc	zero	1

1- Harmless < 25 %

2- Slightly harmful 25-50 %

3- Moderately harmful > 50-75 %

4- Harmful > 75 %

Table (26) : Suspectibility of adult stages of *Phytoseiulus persimilis* A.-H. to some acaricides, under laboratory conditions.

Acaricides		Recommended concentration used/100 litre of water	Percentages of mortality	Toxicity
Trade name	**Active ingredient**			
Ortus 5 % EC	Fenpyroximate	5o cc	100.0 %	4
Vertimec 1.8 % EC	Abamectin	40 cc	46.4 %	2
Neoron 50 % EC	Bromoprophylate	150 cc	93.75 %	4

1- Harmless < 25 %

2- Slightly harmful 25-50 %

3- Moderately harmful > 50-75 %

4- Harmful > 75 %

2- Susceptibility of 1-day Old Eggs and Adult Stages of *Phytoseiulus persimilis* A.-H. to Some Fungicides Under Laboratory Conditions :

a) On 1-day old eggs :

The susceptibility of 1-day old eggs of predatory mite *P. persimilis* against some fungicides using the recommended concentrations (Table 27), to evaluate their efficiency on hatchability percentages of egg stages.

Data in Table (27) indicated that the toxicant used captan (Captan) 50 % WP, benomyl (Benlate) 50 % WP, propiconazole (Tilt 100) 10 % EC, triforine (Saprol) 19 % EC, fenarimol (Rubigan) 12 % EC, bupirimate (Nimrod) 25 % EC, Mancozeb + copper oxychloride (Mancoper) 75 % DG, Fosetylal + Folpet (Mikal) 75 % WP, Mancozeb (Tridex) 75 % DG, procymidone (Sumisclex) 50 % WP, dromoconazole (Vectra) 40 % FL, triadimefon (Bayleton) 25 % WP, and chlorothalonil (Bravo 500) 50 % FL.

All former fungicides exhibited very good effect on the hatchability percentage of the egg stage of the predatory mite, *P. persimilis*. They induced 0.0 % of unhatchability. But, they were two fungicides only, tridemorph (Calixin) 75 % WP and Thiovit 70 % WP caused slightly effect the percent of eggs unhatchability were 14.3 and 5.5 %, respectively.

b) On adult stage :

The toxic effect with the recommended concentrations of same fungicides (Table 28) on adult stages of the predatory mite, *P. persimilis*

Table (27) : Suspectibility of 1-old eggs of *Phytoseiulus persimilis* A.-H. to some fungicides, under laboratory conditions.

Fungicides compounds		Recommended concentration used/100 litre of water	Percentages of unhatch-ability	Toxicity
Trade name	Active ingredient			
Captan 50 % WP	Captan	240 gm	zero	1
Benlate 50 % WP	Benomyl	80 gm	zero	1
Tilet 100 10 % EC	Propiconazole	50 cc	zero	1
Saprol 19 % EC	Triforine	150 cc	zero	1
Calixin 75 % WP	Tridemorph	45 gm	14.3 %	1
Rubigan 12 % EC	Fenarimol	10 cc	zero	1
Nimrod 25 % EC	Bupirimate	40 cc	zero	1
Mancoper 75 % DG	Mancozeb 52 % + copper oxycloride 7.5 %	200 gm	zero	1
Mikal 75 % WP	Fosetylal + Folpet	150 gm	zero	1
Tridex 75 % DG	Mancozeb	200 gm	zero	1
Sumisclex 50 % WP	Procymidone	50 gm	zero	1
Vectra 40 % FL	Dromoconazole	60 cc	zero	1
Bayleton 25 % WP	Triadimefon	25 gm	zero	1
Thiovet 70 % WP	Sulphur	250 gm	5.5 %	1
Bravo 500 50 % FL	Chlorothalonil	350 cc	zero	1

Table (28) : Suspectibility of adult stages of *Phytoseiulus persimilis* A.-H. to some fungicides, under laboratory conditions.

Fungicides compounds		Recommended concentration used/100 litre of water	Percentages of mortality	Toxicity
Trade name	Active ingredient			
Captan 50 % WP	Captan	240 gm	zero	1
Benlate 50 % WP	Benomyl	80 gm	zero	1
Tilet 100 10 % EC	Propiconazole	50 cc	zero	1
Saprol 19 % EC	Triforine	150 cc	zero	1
Calixin 75 % WP	Tridemorph	45 gm	zero	1
Rubigan 12 % EC	Fenarimol	10 cc	6.6 %	1
Nimrod 25 % EC	Bupirimate	40 cc	33.3 %	1
Mancoper 75 % DG	Mancozeb 52 % + copper oxycloride 7.5 %	200 gm	34.78 %	1
Mikal 75 % WP	Fosetylal + Folpet	150 gm	19.5 %	1
Tridex 75 % DG	Mancozeb	200 gm	34.6 %	1
Sumisclex 50 % WP	Procymidone	50 gm	8.33 %	1
Vectra 40 % FL	Dromoconazole	60 cc	zero	1
Bayleton 25 % WP	Triadimefon	25 gm	60.0 %	1
Thiovet 70 % WP	Sulphur	250 gm	8.3 %	1
Bravo 500 50 % FL	Chlorothalonil	350 cc	zero	1

was evaluated as follows, captan (Captan) 50 % WP, benomyl (Benlate) 50 % WP, propiconazole (Tilt 100) 10 % EC, triforine (Saprol) 19 % EC, tridemorph (calixin) 75 % WP, dromoconazol (Vectra) 40 % FL, and chlorothalonil (Bravo 500) 50 % FL. produced no bad effect on the predatory mite, the mortality percentage were zero %; while the fungicides fenarimol (Rubigan) 12 % EC, procymidone (Sumisclex) 50 % WP, sulphur (Thiovet) 70 % WP, Fosetylal + Folpet (Mlkal) 75 % WP, induced mortality percentage 6.60, 8.33, 8.30 and 19.50 %, respectively. These toxicant considered with harmless effect on the predatory mite, while tested fungiccides, bupirimate (Nimrod) 25 % EC, Mancozeb 52 % + copper oxychloride 7.5 % (Mancoper) 75 % DG, Mancozeb (Tridex) 75 % DG and triadimefon (Bayleton) 25 % WP exhibit mortality percent 33.30, 34.78, 34.60 and 60.0 %, respectively.

From the above mentioned results, we can use the fungicide which produced no effect or slight effect on eggs and adult stages of the predatory mite or which gave killing effect less than 25 % during integrated pest management programme, of which we release this predator against the two spotted spider mite, *T. urticae* with safety effect. The previous results revealed that, the effect of these compounds against the egg hatchability were higher than that of adult stages of the predatory mite *P. persimilis*. These results are in accordance with **Abdel-Samad *et al.* (1996)** who indicated that fungicides were harmless to adult females of the predator.

3- Susceptibility of 1-day Old Eggs and Adult Stages of *Phytoseiulus persimilis* A.-H. to Some Organophosphorus Compounds Under Laboratory Conditions :

a) On 1-day old eggs :

The toxicity effect of some organophosphorus compounds with recommended concentrations on 1-day old eggs of the predatory mite, *P. persimilis* was tested under laboratory condition.

Results in Table (29) indicated that S-fenvalerate (Sumi-Gold) 20 % EC and fenpropathrin (Meothrin) 20 % EC. The percentages unhatchability of eggs were 2.17 % and 5.30 %, respectively. Sumi-Gold and Meothrin were harmless effect to the predatory mite *P. persimilis*. Malathion (malathion) 57 % EC and pirimiphos-methyl (Actellic) 50 % were moderately harmful which producing 65.0 and 72.72 % unhatchability of tested eggs.

Triazophos (Hostathion) 40 %, phenthioate (Cidial) 50 % EC were harmful to the predatory mite, *P. persimilis*. The percentages unhatchability of tested eggs were 84.61 % and 100 %, respectively.

b) On adult stages :

Data in Table (30) demonstrated that the recommended organophosphorus compounds when tested against adult stages of the predatory mite, *P. persimilis* were harmful which induced 100 % mortality of the tested adult stages. Thus, we recommend that Malathion, Hostathion, Sumi-Gold, Cidial, Meothrin and Actellic showed not be used in the presence of the predatory mite, *P. persimilis*. The previous results are in agreement with **Abdel-Samad *et al.* (1996).**

Table (29) : Suspectibility of 1-old eggs of *Phytoseiulus persimilis* A.-H. to some organophophorus, under laboratory conditions.

Organophosphorus compounds		Recommended concentration used/100 litre of water	Percentages of unhatch-ability	Toxicity
Trade name	Active ingredient			
Malathion 57 % EC	Malathion	150 cc	65.00 %	3
Hostation 40 % EC	Triazophos	150 cc	84.61 %	4
Sumi-Gold 20 % EC	S-fenvalerate	150 cc	2.17 %	1
Cidial 50 % EC	Phenthioate	300 cc	100.0 %	4
Meothrin 20 % EC	Fenpropathrin	150 cc	5.30 %	1
Actellic 50 % EC	Pirimiphos-methyl	150 cc	72.72 %	3

1- Harmless < 25 %

2- Slightly harmful 25-50 %

3- Moderately harmful > 50-75 %

4- Harmful > 75 %

Table (30) : Suspectibility of adult stages of *Phytoseiulus persimilis* A.-H. to some organophophorus, under laboratory conditions.

Organophosphorus compounds		Recommended concentration used/100 litre of water	Percentages of mortality	Toxicity
Trade name	**Active ingredient**			
Malathion 57 % EC	Malathion	150 cc	100 %	4
Hostation 40 % EC	Triazophos	150 cc	100 %	4
Sumi-Gold 20 % EC	S-fenvalerate	150 cc	100 %	4
Cidial 50 % EC	Phenthioate	300 cc	100 %	4
Meothrin 20 % EC	Fenpropathrin	150 cc	100 %	4
Actellic 50 % EC	Pirimiphos-methyl	150 cc	100 %	4

1- Harmless < 25 %

2- Slightly harmful 25-50 %

3- Moderately harmful > 50-75 %

4- Harmful > 75 %

4- Susceptibility of 1-day Old Eggs and Adult Stages of *Phytoseiulus persimilis* A.-H. to Some Herbicides Under Laboratory Conditions :

a) On 1-day old eggs :

Results in Table (31) indicated that oxyfluofen (Goal) 24 % EC and glyphosate (Round-up) 36 % EC at the recommended concentration against the egg stages of the predatory mite, *P. persimilis* gave 0.0 % of eggs unhatchability.

b) On adult stages :

This trial was carried out to evaluate the toxic effect of recommended herbicides Goal and Round-up on the adult stages of *P. persimilis*.

Data in Table (32) indicated that, oxyfluofen (Goal) 24 % EC was harmless to the adult stages of the predatory mite *P. persimilis*. Glyphosate (Round-up) 36 % EC was slightly harmful which gave 33.3 % mortality against *P. persimilis*.

The above mentioned results clearly demonstrated that, the effect of these compound against the egg stages were harmless, but low toxic on adult stages. These results are in agreement with **Abdel-Samad *et al.* (1996).**

Table (31) : Suspectibility of 1-day old eggs of *Phytoseiulus persimilis* A.-H. to some herbicides, under laboratory conditions.

Herbicides		Recommended concentration used/100 litre of water	Percentages of unhatch-ability	Toxicity
Trade name	**Active ingredient**			
Goal 24 % EC	Oxyfluorfen	1 lit./200 lit.	Zero	1
Round-up 36 % EC	Glyphosate	4 lit./200 lit.	Zero	1

1- Harmless < 25 %

2- Slightly harmful 25-50 %

3- Moderately harmful > 50-75 %

4- Harmful > 75 %

Table (32) : Suspectibility of adult stages of *Phytoseiulus persimilis* A.-H. to some herbicides, under laboratory conditions.

Herbicides		Recommended concentration used/100 litre of water	Percentages of mortality	Toxicity
Trade name	**Active ingredient**			
Goal 24 % EC	Oxyfluorfen	1 lit./200 lit.	Zero	1
Round-up 36 % EC	Glyphosate	4 lit./200 lit.	33.3	2

1- Harmless < 25 %

2- Slightly harmful 25-50 %

3- Moderately harmful > 50-75 %

4- Harmful > 75 %

5- Susceptibility of 1-day Old Eggs and Adult Stages of *Phytoseiulus persimilis* A.-H. to Some Mineral Oils Under Laboratory Conditions :

a) On 1-day old eggs :

The toxic effect of some mineral oils with recommended concentrations on 1-day old eggs of the predatory mite, *P. persimilis* was tested under laboratory condition, Table (33).

The present data in Table (33) shows that Shokrona 95 % EC, K.Z. oil 95 % EC, Natur'l oil 93 % EC, and Paraffinic oil induced 0.0 % unhatchability of tested 1-day old eggs. So that they are with harmless effect and other mineral oils Shokrona Super 95 % EC, Nathional oil 75 % EC and Kemisol 95 % EC induced 3.50, 48.14 and 3.70 % unhatchability of tested 1-day old eggs of the predatory mite *P. persimilis*, so that they are with harmless effect on the eggs. So, these mineral oils can be used through integrated pest management using this predator.

b) ON adult stages :

Data in Table (34) reported that mineral oil Shokrona 95 % EC, Natur'l oil 93 % EC, Paraffinic oil and Kemisol 95 % EC when tested with recommended concentration on adult stages of the predator *P. persimilis* gave 23.5, 13.33, zero and 3.84 % mortality, respectively, they are with harmless toxic effect. While mineral oils Shokrona Super 95 % EC was slightly harmful, it produced 50.0 % mortality, and Nathional oil 75 % EC and K.Z. oil 95 % EC were with moderately harmful, produced 55.6 and 52.3 % mortality, respectively.

Table (33) : Suspectibility of 1-old eggs of *Phytoseiulus persimilis* A.-H. to some mineral oils, under laboratory conditions.

Mineral oils		Recommended concentration used/100 litre of water	Percentages of unhatch-ability	Toxicity
Trade name	**Active ingredient**			
Shokrona oil 95 % EC	Shokrona	1.5 litre	zero	1
Shokrona Super oil 95 % EC	Shokrona	1.5 litre	3.50 %	1
Nathional oil 75 % EC	Nathional	2.0 litre	48.14 %	1
KZ oil 95 % EC	KZ oil	1.5 litre	zero	1
Natur'l oil 93 % EC	Natur'l	625 cc	zero	1
Paraffinic oil 95 % EC	Paraffinic	1.6 litre	zero	1
Kemisol oil 95 % EC	Kemisol	1.6 litre	3.70 %	1

1- Harmless < 25 %

2- Slightly harmful 25-50 %

3- Moderately harmful > 50-75 %

4- Harmful > 75 %

Table (34) : Suspectibility of adult stages of *Phytoseiulus persimilis* A.-H. to some mineral oils, under laboratory conditions.

Mineral oils		Recommended concentration used/100 litre of water	Percentages of mortality	Toxicity
Trade name	Active ingredient			
Shokrona oil 95 % EC	Shokrona	1.5 litre	23.5	1
Shokrona Super oil 95 % EC	Shokrona	1.5 litre	50.00 %	2
Nathional oil 75 % EC	Nathional	2.0 litre	55.60 %	3
KZ oil 95 % EC	KZ oil	1.5 litre	52.30 %	3
Natur'l oil 93 % EC	Natur'l	625 cc	13.33 %	1
Paraffinic oil 95 % EC	Paraffinic	1.6 litre	zero	1
Kemisol oil 95 % EC	Kemisol	1.6 litre	3.84 %	1

1- Harmless < 25 %

2- Slightly harmful 25-50 %

3- Moderately harmful > 50-75 %

4- Harmful > 75 %

From the above mentioned results, we can use mineral oils Shokrona, Natur'l oil, Paraffinic oil and Kemisol by recommended concentration through integrated pest management programme using this predatory with safety effect on adult stage of the predatory mite *P. persimilis*. These results are agreement with **Abdel-Samad *et al.* (1996)**.

6- Susceptibility of 1-day Old Eggs and Adult Stages of *Phytoseiulus persimilis* A.-H. to Some Insect Growth Regulators Under Laboratory Conditions :

a) On 1-day old eggs :

Data in Table (35) showed that Insect growth regulators compound lufenuron (Match) 5 % EC, triflumuron (Al-Systin) 48 % SC, hexaflumuron (Consult) 10 % EC, tebufenzoide (Memic 2-F) 5 % EC and pyriproxyfen (Admiral) 10 % EC when tested against the egg stages of the predatory mite, *P. persimilis* with the recommended concentration gave zero of egg unhatchability, while flucycloxuron (Andalin) 25 % EC, flufenoxuron (Cascade) 10 % EC produced 12.76 % and 5.26 % of egg unhatchability.

b) On adult stages :

Data in Table (36) indicated that Andalin 25 % EC, Match 5 % EC, Al-Systin 48 % SC, Memic 2-F 5 % EC, Admiral 10 % EC and Consult 10 % EC were harmless to the adult stages of the predatory mite *P. persimilis*. The percentages mortality were 0.0, 0.0, 0.0, 0.0, 0.0 and 2.85 % on adult females of *P. persimilis*, respectively.

Table (35) : Suspectibility of 1-old eggs of *Phytoseiulus persimilis* A.-H. to some Insect growth regulators, under laboratory conditions.

Insect growth regulators		Recommended concentration used/100 litre of water	Percentages of unhatch-ability	Toxicity
Trade name	Active ingredient			
Andalin 25 % EC	Flucycloxuron	25 cc	12.76 %	1
Match 5 % EC	Lufenuron	100 cc	zero	1
Al-Systin 48 % EC	Triflumuron	50 cc	zero	1
Consult 10 % EC	Hexaflymuron	52.5 cc	zero	1
Memic 2-F 5 % EC	Tebufenzoide	87.5 cc	zero	1
Cascade 10 % EC	Flufenoxuron	50 cc	5.26 %	1
Admiral 10 % EC	Pyriproxyfen	75 cc	zero	1

1- Harmless < 25 %

2- Slightly harmful 25-50 %

3- Moderately harmful > 50-75 %

4- Harmful > 75 %

Table (36) : Suspectibility of adult stages of *Phytoseiulus persimilis* A.-H. to some Insect growth regulators, under laboratory conditions.

Insect growth regulators		Recommended concentration used/100 litre of water	Percentages of mortality	Toxicity
Trade name	Active ingredient			
Andalin 25 % EC	Flucycloxuron	25 cc	zero	1
Match 5 % EC	Lufenuron	100 cc	zero	1
Al-Systin 48 % EC	Triflumuron	50 cc	zero	1
Consult 10 % EC	Hexaflymuron	52.5 cc	2.85 %	1
Memic 2-F 5 % EC	Tebufenzoide	87.5 cc	zero	1
Cascade 10 % EC	Flufenoxuron	50 cc	27.30 %	2
Admiral 10 % EC	Pyriproxyfen	75 cc	zero	1

1- Harmless < 25 %

2- Slightly harmful 25-50 %

3- Moderately harmful > 50-75 %

4- Harmful > 75 %