Larval and Pupal Periods of *Peckia chrysostoma* and *Adiscochaeta ingens* (Diptera: Sarcophagidae) Reared under Laboratory Conditions

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Peckia chrysostoma *obtained mean viability of 97.0±2.4% for larvae and of 96.9±2.5% for pupae (total viability of 94.0±3.7%).* Adiscochaeta ingens *obtained mean viability of 93.0±7.5% for larvae and of 92.8±7.6% for pupae (total viability of 86.0±7.3%).*

P. chrysostoma *obtained mean larval period of 185±4 hr at 18°C, of 94±2 hr at 27°C and of 88±2 hr at room temperature (range of 23°C and 29°C).* A. ingens *obtained mean larval period of 169±1 hr at 18°C, of 77±1 hr at 27°C and of 84±2 hr at room temperature.*

P. chrysostoma *obtained mean pupal period of 23.5±1.3 days at 18°C, of 12.5±0.7 days at 27°C and of 15.5±0.7 days at room temperature.* A. ingens *obtained mean pupal period of 33.0±2.2 days at 18°C, of 16.0±1.0 days at 27°C and of 19.0±1.0 days at room temperature.*

Key words: larval/pupal period - larval/pupal viability - *Peckia chrysostoma* - *Adiscochaeta ingens* - Sarcophagidae - Diptera

This study is part of a series (Ferraz 1992a, b, 1993, 1994, among others), carried out at the laboratory, on the comparative biology of *Peckia chrysostoma* (Wiedemann 1830) and *Adiscochaeta ingens* (Walker 1849), two caliptratae muscoids. Results shown here compare the larval and pupal period and viability between one autochthonous species, *P. chrysostoma*, and an introduced one, *A. ingens*.

P. chrysostoma, a neotropic and sinantropic species, is widely spread and frequently found in high densities in Rio de Janeiro (d'Almeida 1984, Tavares et al. 1988, Ferraz 1992a, b, 1993). *A. ingens*, originally from the Brazilian "campos cerrados", has been found in Rio de Janeiro, but in numbers of little significance (Lopes 1973, 1974, Linhares 1981, Lopes & Tibana 1982, d'Almeida 1984).

MATERIALS AND METHODS

The methodology adopted for the field collection, colonization and rearing of adults has been previously described (Ferraz 1993).

Larval viability - Five groups of 20 recently laid larvae were maintained in containers with rearing media. The percentage of formed pupae was observed daily. This experiment was carried out at room temperature.

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Larval period at different temperatures - Six containers with rearing media in the proportion of 2g per larva were prepared. Each container had 65 recently laid larvae (totaling approximately 400 larvae) which were maintained at 27°C at 70-80% relative humidity (R.H.) (B.O.D. refrigerators). Every 2 hr, 15 larvae were taken to determine the larval instar by observing the respiratory spiracles. We did not take the last 15 larvae of each container for this purpose as low density of individuals may alter the time of development. Comparisons were made with groups of the same number maintained at 18°C at 70-80% R.H. (B.O.D. refrigerators) and at room temperature (control-groups).

Pupal viability - Five groups of 20 pre-pupae were kept in containers with moist sawdust. The percentage of emerged adults was observed daily. This experiment was carried out at room temperature.

Pupal period at different temperatures - The pre-pupal period begins when the larva leaves the culture media, hides in the moist sawdust and moves up to an appropriate local. There, it stays still, retracts its extremities and begins to darken its tegument, transforming itself into a pupa. Here we considered the pupal period as including the pre-pupal period.

Three groups of 20 pre-pupae were put into a container with moist sawdust and maintained at 27°C at 70-80% R.H. (B.O.D. refrigerator). Every 24 hr they were observed to determine the pupal

period. Comparisons were made with groups of the same number maintained at 18°C at 70-80% R.H. (B.O.D. refrigerator) and at room teperature (control-groups).

The experiments conducted at room temperature had mean temperature of 25.9°C (from 23°C to 29°C) and 76% mean R.H. (59% - 88%).

RESULTS

Table I displays the higher larval and pupal viability of *P. chrysostoma* and *A. ingens*. Only viability of the pupae was significantly different between the two species (Table III). Viability of the larvae was not. Furthermore, there was no significant difference between the viability of larvae and pupae for *P. chrysostoma* and *A. ingens* (Table II).

Fig. 1 displays the larval period observed at each temperature, for each stage, every two hours, of *P. chrysostoma* and *A. ingens*, showing the faster larval period of *A. ingens*.

Fig. 2 displays the pupal period observed at each temperature, once a day, of *P. chrysostoma* and *A. ingens*, showing the faster pupal period of *P. chrysostoma*.

Fig. 3 displays the total immature stages of development demonstrating the faster development of *P. chrysostoma* at the three conditions studied and the faster development of both species at 27°C compared to room temperature and to 18°C.

TABLE I

Larval and pupal viability of *Peckia chrysostoma* and *Adiscochaeta ingens* at room temperature

	P. chrysostoma	*A. ingens*
Initial larvae No.	100	100
L	97	93
P	94	86
V	95.5	89.5

L: number of formed pupae (larval viability); P: number of emerged adults (pupal viabitily); V: mean total viability - from larva to adult

TABLE II

Chi-square analysis of viability of *Peckia chrysostoma* and *Adiscochaeta ingens* in relation to the immature stages. Number in parentheses indicate the expected values according to the null hypothesis

		Immature stages		
Species	Viability	Larvae	Pupae	Statistics
Pc	Yes	97 (95.5)	94 (95.5)	$\chi^2 = 1.047$
	No	3 (4.5)	6 (4.5)	$\rho > 0.05$
Ai	Yes	93 (89.5)	86 (89.5)	$\chi^2 = 2.607$
	No	7 (10.5)	14 (10.5)	$\rho > 0.05$

χ^2 : chi-square; ρ: probability; Pc: *Peckia chrysostoma*; Ai: *Adiscochaeta ingens*. Degree of freedom = 1

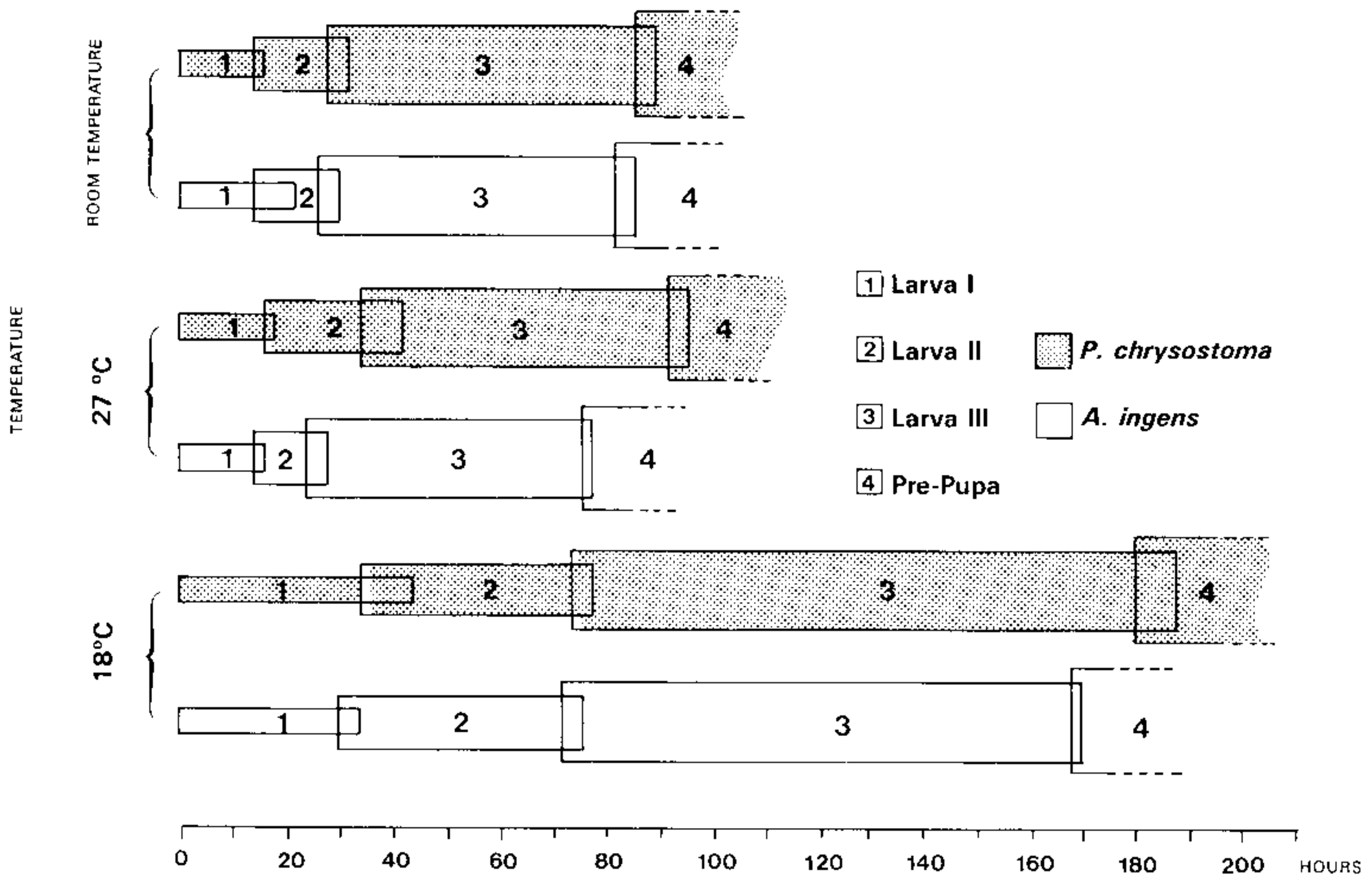

Fig. 1: comparison of larval period between *Peckia chrysostoma* and *Adiscochaeta ingens*, reared at different temperatures.

TABLE III

Chi-square analysis of immature stages in relation to the species. Number in parentheses indicate the expected values according to the null hypothesis

Immature stages	Viability	Species Pc	Species Ai	Statistics
Larvae	Yes	97 (95.0)	93 (95.0)	$\chi^2 = 1.684$
	No	3 (5.0)	7 (5.0)	$\rho > 0.05$
Pupae	Yes	94 (90.0)	86 (90.0)	$\chi^2 = 3.556$
	No	6 (10.0)	14 (10.0)	$\rho < 0.05$

χ^2: chi-square; ρ: probability; Pc: *Peckia chrysostoma*; Ai: *Adiscochaeta ingens*. Degree of freedom = 1

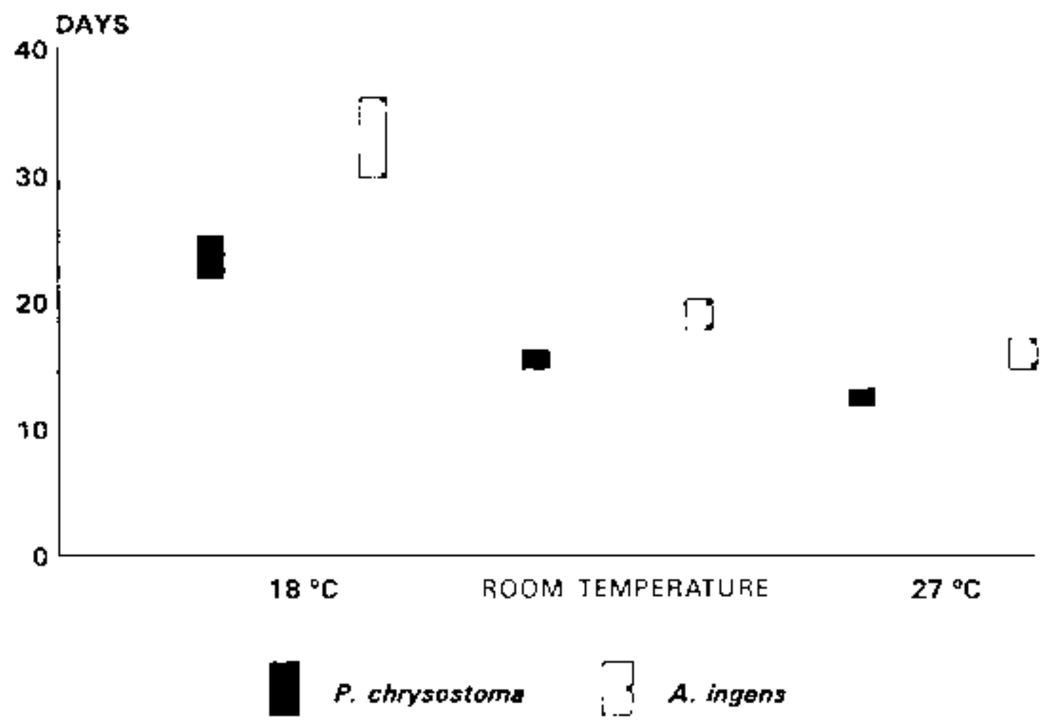

Fig. 2: comparison of pupal period between *Peckia chrysostoma* and *Adiscochaeta ingens*, reared at different temperatures.

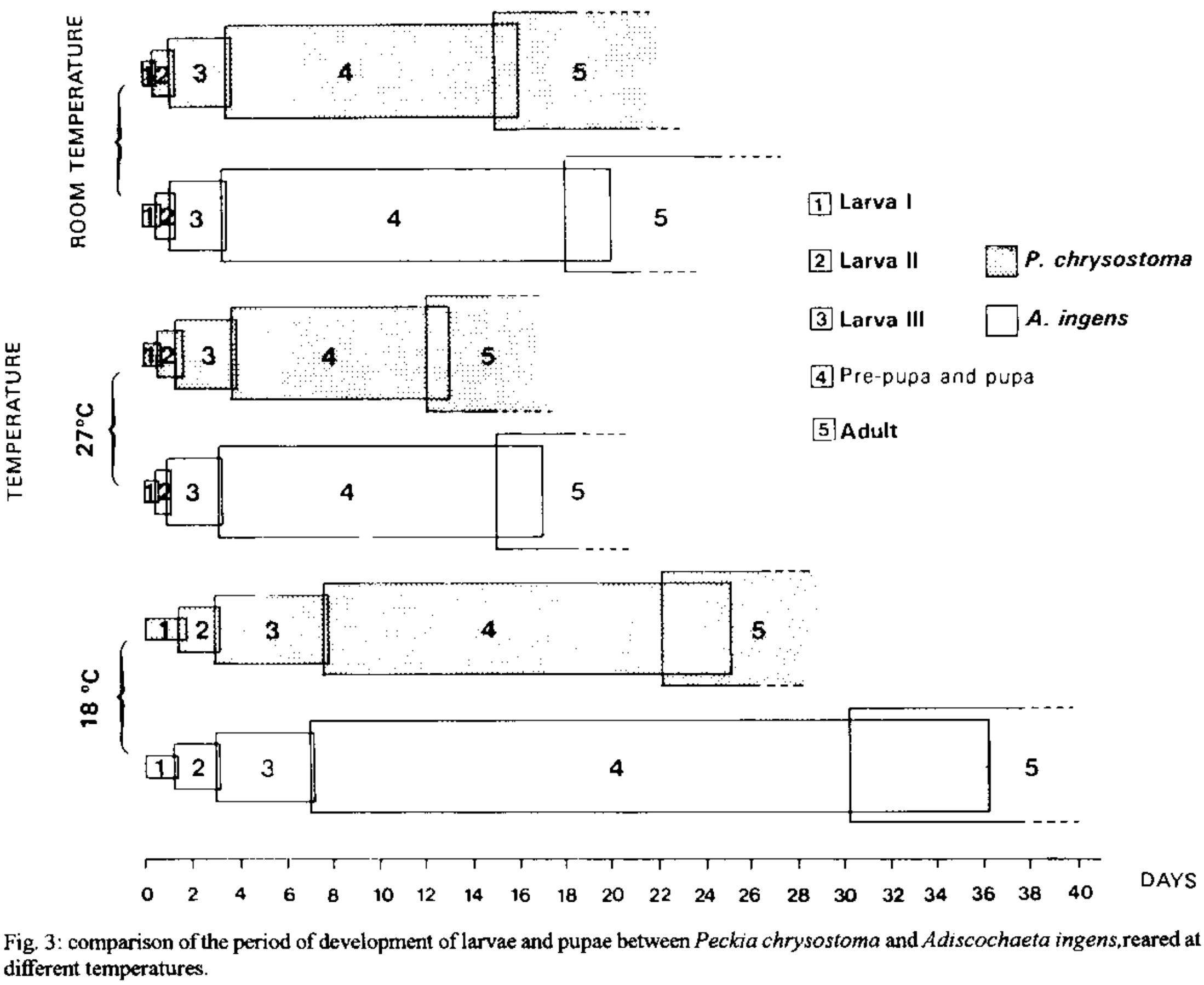

Fig. 3: comparison of the period of development of larvae and pupae between *Peckia chrysostoma* and *Adiscochaeta ingens*, reared at different temperatures.

DISCUSSION

Several authors have already observed that viability of immature stages varies according to the species. Viability of larvae and pupae here was relatively high for both species. Despite the higher viability of *P. chrysostoma*, it was not significantly different, for the larvae, than that of *A. ingens*. For *Sarcophaga cooleyi*, *S. shermani* and *S. bullata* (Kamal 1958) the viabilities of the pupae was of 74-91%, 81-93% and 64-87%, respectively. *S. haemorrhoidalis* (Madubunyl, 1986) obtained viability of 80.69±3.20 for the larvae and 89.83±3.80 for the pupae.

The time of development of muscoid diptera differs greatly according to the species. For *S. cooleyi*, *S. shermani* and *S. bullata*, Kamal (1958) also found differences: an average of 24, 22 and 26 hr, respectively, for the development of the first

larval instar; 18, 16 and 18 hr for the second larval instar; 48, 48 and 54 hr for the third larval instar; 96, 104 and 112 hr for the pre-pupa stage; and 9, 8 and 12 hr for the pupal period. For *S. haemorrhoidalis* (Madubunyl, 1986) the pupal period lasted four days and, from the egg to the adult, lasted approximately 32 days (= 768 hr).

As expected here, both species developed faster in a higher temperature (27°C) than in a low one (18°C). Comparing with these results, Sutherland (1979, 1980) observed that pupae of *Stomoxys calcitrans* bore temperatures between 20°C and 30°C and the larvae prefered temperatures between 19.5°C and 32.5°C. Cook et al. (1980) and Cook and Spain (1982) observed that *Haematobia irritans* pupae bore temperatures between 17.5 and 35°C. Survival of larvae and pupae was optimized at 25°C. Excluding the *P. chrystosoma* larvae, the life cycle of larvae and pupae for both species was faster under constant and controlled higher temperatures than under variable conditions. Kamal, in 1958, observed the same: constant and controlled temperatures speeded the life cycle but shortened the lifespan of adults of some calliphorid and sarcophagid, compared to results obtained under variable temperature conditions.

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