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BIOLOGY, POTENTIAL FOR INCREASE AND PREY CONSUMPTION OF *AMBLYSEIUS CHILENENSIS* (DOSSE) [*ACARINA : PHYTOSEIIDAE*) (*)

BY

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The life history of *Amblyseius chilenensis* was studied in a laboratory at 16.4, 25 and 32 °C. The rates of development, prey consumption and oviposition varied directly with temperature. From the life history data the intrinsic rates of increase were determined to be 0.112, 0.287 and 0.307 at 16.4, 25 and 32° respectively. The net reproductive rates were 12.73, 29.09, 17.82 and the mean generation times were 22.72, 11.74 and 9.38 days at 16.4, 25 and 32° respectively.

The employment of new cultural practices to increase yields and/or the intensive use of chemicals for the control of insect pests promoted severe worldwide spider mite outbreaks on various crops following World War II. The increased abundance of spider mites is thought to have resulted primarily from the adverse effects of insecticides on their predators, although the influence of insecticides such as DDT on leaf chemistry, which can stimulate spider mite fecundity, may have contributed significantly to the problems in many instances (FLESCHNER, 1958, HUFFAKER, VAN DE VRIE & MCMURTRY, 1969). Development of resistance to acaricides by phytophagous mites later aggravated these problems (HELLE, 1965). That spider mite problems are a result of man's extensive misuse of agricultural techniques is illustrated by the observations that spider mites remained under relatively good control in untreated areas (LORD, 1956; PUTMAN & HERNE, 1958; CHANT, 1963; HUFFAKER & FLAHERTY, 1966). In these papers, biological control agents were reported to be very important for the control of phytophagous mites.

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Many studies of predators of phytophagous mites, particularly the phytoseiid predators of our most important *Tetranychus* spp., have been made. However, controversy over the effectiveness of phytoseiids for controlling phytophagous mites exists. CHANT (1959) and KUCHLEIN (1964) felt that the phytoseiids are generally rather poor agents for control of spider mite populations, either because they are not synchronized with their hosts or because their functional or numerical response, or both, are inadequate to control their prey except at very low host densities. In an attempt to avoid drawing misleading conclusions concerning causal relationships between predators and prey populations, detailed studies of the biologies of the organisms and of the mechanisms of their interactions are required. This study was undertaken to furnish some of the data needed in an analysis of the introduced Chilean phytoseiid, *Amblyseius chilenensis* (DOSSE) for the control of tetranychid mites.

The fluctuations of the population of a species in nature are often closely related, not only to changes in the favorability of the environment, but also to the species' inherent capacities for increase. In this study, experiments concerning *A. chilenensis* were carried out at three different temperatures, and studies on the rate of development, fecundity, longevity and rate of prey consumption by the predator were conducted in order to evaluate its potential as a biological control agent. However, the control potential of *A. chilenensis* as suggested by this fundamental study serves only as a reference for field studies. In the field, factors involved in the interactions of predator and prey populations are much more complex, and careful experiments will be required to evaluate predator impact.

Other names given to this predatory phytoseiid include *Typhlodromus ornatus* ATHIAS-HENRIOT (1957) and *Typhlodromus chilenensis* (DOSSE) (1968). CHANT (1959) accepted *T. ornatus* as the correct name. GONZALEZ & SCHUSTER (1962), however, separated the species from *ornatus* and from the genus *Typhlodromus* and placed it in the genus *Amblyseius*, proposing the name *Amblyseius chilenensis* (DOSSE) which will be used throughout this paper.

Materials and Methods

The stock of *A. chilenesis* used in these experiments was obtained from Chile by the Division of Biological Control, University of California, Albany.

In this study, mites were reared in coasters 5.7 cm wide and 1.3 cm deep. Each coaster was filled with cotton which was then saturated with tap water. A circle waxed of construction paper divided by a stamped pattern into pie-shaped sections was set into place on top of the cotton. These markings facilitated observations of the mites

during their development. Nine of these units were placed together in each of several aluminum trays 5.1 × 18.4 × 18.4 cm in size, on the bottom of which a 16.5 × 16.5 × 1.3 cm sponge carpet was glued. Each aluminum tray was covered by 0.6 × 2.9 × 22.9 cm glass plate to reduce evaporation from the saturated cotton. Water was added to the cotton daily to keep it wet continuously. Soaked cotton was used as a barrier to prevent the mites escaping from the rearing units.

Three constant temperature cabinets (modified, unlighted refrigerators measuring 53.3 × 61.0 cm) were used to contain the aluminum trays. The temperatures in the three cabinets were maintained at 32 ± 2 °C, 25 ± 1 °C and 16.4 ± 1 °C, respectively. A Serdex portable electrohygrometer with an extension plug-in sensory device was used to measure the humidities inside the trays, which at temperatures of 32, 25 and 16.4 °C were 83 - 86 and 83 - 87 and 86 - 92 percent, respectively.

One female *A. chilenensis* was put in each of the coaster units in each tray; the aluminum trays were then covered with glass plates and placed in the temperature cabinets. After eggs were laid, each female and all but one egg in each unit were removed. The remaining individuals were then observed at 12 hour intervals until they completed their development.

For uniformity, eggs of *Tetranychus urticae* KOCH served as the prey in this experiment. A more than ample supply of eggs was added to each coaster unit daily and the number eaten by each stage of *A. chilenensis* was recorded. Adult females were observed daily to determine their ovipositional period, number of eggs laid, prey consumption and longevity.

The intrinsic rate of natural increase, r_m, which is the number of female offspring produced per female per unit of time, was determined as a fundamental statistic for explaining the capabilities for numerical increase of *A. chilenensis* at the three different temperatures. The methods of BIRCH (1948), which were also used used by HOWE (1953), WATSON (1964), and LAING (1968, 1969) were followed in compiling the life table for *A. chilenensis*. Life tables were constructed by recording the number of individuals alive at each age interval and the mean number of female offspring produced at each age interval. The intrinsic rate of increase was determined from the formula

$$\Sigma\, e^{-r_m x}\, l_x m_x = 1$$

where e is the base of the national logarithms, x is the age of the individuals in days, l_x is the fraction of the individuals alive at the age of x, and m_x is the mean number of female offspring produced per female during age interval x. The sum of the products $l_x m_x$ is the net reproductive rate, R_0, which is the rate of multiplication of the

population in each generation measured as females produced per generation. The generation time, T, was calculated from the formula $T = \frac{\log_e (R_0)}{r_m}$. Details of this method may be found in BIRCH (1948), HOWE (1953), WATSON (1964) or LAING (1968, 1969).

Results and Discussion

Very little previous research of the nature of this study has been done. DOSSE (1958) studied egg production and length of the various stages of the life cycle of *A. chilenensis* at different constant temperatures but he recorded neither the number of individuals alive at each age interval nor the mean number of female offspring produced per female at each interval. Therefore, the intrinsic rate of increase could not be determined from his data. SWIRSKI, AMITAI & DORZIA (1970) studied feeding habits, postembryonic survival and oviposition but not the developmental rate, the survival rate at each age interval or the mean female offspring produced by each female at each age interval. Again, the intrinsic rate of increase could not be determined from their data. In neither of these papers were the rates of consumption of the predators studied.

THE IMMATURE STAGES AND RATES OF DEVELOPMENT

Egg stage. — The eggs of *A. chilenensis* are oval and translucent and much larger than two-spotted mite eggs. The incubation period was the shortest at 32 °C, taking an average of 1.5 days for males and 1.4 days for females. The average duration of incubation for both males and females at 25 °C was 1.9 days and at 16.4 °C the incubation period was the longest, 3.9 days for males and 3.8 days for females (table 1.).

Larval stage. — The larvae were active but no feeding was observed. At 32 °C males remained larvae for an average of 0.6 day and females 0.5 day. At 25 °C both males and females spent an average of 0.6 day in the larval stage. At 16.4 °C the females and the males remained in this stage for an average of 1.3 and 1.1 days, respectively (table 1).

Protonymphal stage. — At 32 °C the protonymphal period of males was 1.0 day and of females 1.1 days. At 25 °C the males and females remained protonymphs for an average of 1.4 and 1.5 days, respectively. At 16.4 °C the males remained for an average of 3.2 days and females for 3.1 days in this stage (table 1).

Deutonymphal stage. — Males and females could not be distinguished when they had just moulted to this stage. After feeding, the abdomen of the female elongates and becomes much larger than that of the male. For both males and females at 32 °C this stage

TABLE 1

The relationship of temperature to the duration of the immature stages of A. chilenensis

Stage	Temp.	Sex	Number observed	Number of days Average	Number of days Range	Standard deviation
Egg	32 °C	Female	38	1.4	1.0-2.0	0.2
		Male	18	1.5	1.0-2.0	0.3
	25 °C	Female	35	1.9	1.0-2.5	0.3
		Male	18	1.9	1.5-2.5	0.3
	16.4 °C	Female	26(19)*	3.8(3.2) *	3.0(3.0)-4.5(4.0)	0.5
		Male	19(10)	3.9(3.4)	2.5(2.5)-5.0(4.0)	0.6
Larva	32 °C	Female	38	0.5	0.25-1.0	0.1
		Male	18	0.6	0.25-2.5	—
	25 °C	Female	35	0.6	0.5-1.0	0.2
		Male	18	0.6	0.5-1.0	0.2
	16.4 °C	Female	26(19)	1.3(1.1)	1.0(0.5)-1.5(1.5)	0.3
		Male	19(10)	1.1(1.1)	1.0(0.5)-2.0(1.5)	0.3
Protonymph	32 °C	Female	38	1.1	0.5-3.0	0.4
		Male	18	1.0	0.4-2.5	0.5
	25 °C	Female	35	1.5	1.0-3.0	0.5
		Male	18	1.4	0.5-3.0	0.6
	16.4 °C	Female	26(19)	3.1(2.7)	2.0(2.0)-5.0(4.0)	0.7
		Male	19(10)	3.2(2.9)	2.0(2.0)-6.0(5.5)	1.1
Deutonymph	32 °C	Female	38	0.9	0.5-1.5	0.3
		Male	18	0.9	0.5-1.5	0.3
	25 °C	Female	35	1.1	0.5-1.5	0.3
		Male	18	1.0	0.5-1.5	0.3
	16.4 °C	Female	26(19)	2.9(2.3)	2.5(2.0)-3.5(3.5)	0.4
		Male	19(10)	2.5(2.4)	2.0(2.9)-3.0(3.0)	0.4
Total developmental time	32 °C	Female	38	3.9	3.0-6.0	0.5
		Male	18	4.0	2.5-6.5	1.0
	25 °C	Female	35	5.1	4.0-7.0	0.6
		Male	18	4.9	4.0-7.5	0.8
	16.4 °C	Female	26(19)	11.9(9.3)	9.5(8.5)-12.5(11.5)	0.7
		Male	19(10)	10.8(9.8)	9.0(8.5)-13.0(13.5)	1.2

* The numbers within the parentheses were individuals provided with 12 hours illumination.

lasted an average of 0.9 day. At 25 °C the females remained in this stage for an average of 1.1 days, the males 1.0 day. The average length of the deutonymphal stage for females at 16.4 °C was 2.9 days; for males it was 2.5 days (table 1).

Total developmental rate. — Table 1 shows that the total developmental time for females varied from 11.9 days at 16.4 °C to 3.9 days at 32 °C while the developmental time for males varied from 10.8 days at 16.4 °C to 4.0 days at 32 °C. The influence of temperature on this important component of the intrinsic rate of increase was therefore substantial.

In this experiment the absence of light was not considered to have a dominant influence on the development, longevity or fecundity of *A. chilenensis*, but in order to determine whether light influenced this predator's development some predators were provided with

12 hours illumination per day at 16.4 °C throughout the experiment and their rates of development were compared with those for which no light was provided. At this temperature the predators provided with light developed faster than those kept in the dark (table 1) due probably to the absorption of radiant energy by the developing individuals. DOSSE (1958) found that the total developmental time of *A. chilenensis* from freshly laid egg to adult averaged 4.1 days at 35 °C, which is very close to the results obtained in this experiment at 32 °C (3.9 days). He also found that at 25 °C the immature females took an average of 6 days to mature, which is significantly slower than in the present experiments (5.1 days at 25 °C). Since we do not know his experimental conditions for the photoperiod, humidity, adequacy and quality of prey, and the intervals of time between observations, the reasons for this discrepancy between the results at the same temperature are not known.

Prey consumption. — No feeding was observed during the larval stage at the three temperatures used in this experiment. At 32 °C the average number of *T. urticae* eggs consumed by a female *A. chilenensis* in the protonymphal stage was 4.3 while males consumed an average of only 3.7 eggs. At 25 °C the females consumed an average of 5.3 eggs and the males an average of 3.9 eggs. Thus the difference between the sexes was greater at this moderate temperature than at 32 °C. At 16.4 °C the males also consumed fewer *T. urticae* eggs. Males ate an average of 3.9 eggs and females an average of 5.4 eggs (table 2).

The average number of *T. urticae* eggs consumed by a female deutonymph at 32, 25 and 16.4 °C was 5.5, 6.2 and 6.9, respectively. The male deutonymph consumed an average of 4.2, 4.1 and 3.9 eggs at 32, 25 and 16.4 °C, respectively (table 2).

Predators at 16.4 °C consumed more prey during their immature stages than those at the other two temperatures (table 2). However, since development required the longest period at 16.4 °C (table 1) the immature stages actually consumed fewer prey per day. It is quite clear that on a daily basis the higher the temperature the more prey consumed. That is, females consumed 2.5, 2.3 and 1.0 eggs per day at 32, 25 and 16.4 °C respectively; males consumed 2.0, 1.6 and 0.8 eggs per day at 32, 25 and 16.4 °C respectively. This was to be expected owing to the higher metabolic rate achieved at the higher temperatures.

The adult stage. — Both male and female adults began to feed almost immediately after moulting but mating was never observed to take place immediately. Mating was a prolonged process usually continuing over several hours. Pairs sometimes copulated repeatedly, even on successive days. Mating was necessary for egg laying but multiple matings were not necessary to continue egg production and

TABLE 2

Number of T. urticae *eggs eaten by the immature stages of* A. chilenensis *at three different constant temperatures*

Stage	Temp.	Sex	Number observed	Number of eggs eaten		Standard deviation
				Average	Range	
	32 °C	Female	38	0		
		Male	18	0	0-0	
Larva	25 °C	Female	35	0	0-0	
		Male	18	0	0-0	
	16.4 °C	Female	26	0	0-0	
		Male	19	0	0-0	
	32 °C	Female	29	4.3	2-8	1.2
		Male	13	3.7	2-8	1.7
Protonymph	25 °C	Female	26	5.3	3-8	1.1
		Male	15	3.9	3-6	1.0
	16.4 °C	Female	26	5.4	3-8	1.4
		Male	16	3.9	3-5	0.8
	32 °C	Female	29	5.5	3-10	1.4
		Male	13	4.2	2-7	1.3
Deutonymph	25 °C	Female	26	6.2	3-12	1.1
		Male	14	4.1	1-5	0.5
	16.4 °C	Female	26	6.9	5-10	1.4
		Male	16	3.9	2-7	1.7
	32 °C	Female	29	9.8	6-14	2.2
Total		Male	13	7.8	4-13	2.4
developmental	25 °C	Female	26	11.5	7-16	2.5
time		Male	15	7.8	5-11	2.4
	16.4 °C	Female	26	12.3	9-15	2.1
		Male	16	8.6	5-10	2.7

oviposition. This is consistent with the results reported for certain other phytoseiids (LAING, 1968; SMITH & NEWSOM, 1970).

Preoviposition period and longevity. — Higher temperatures favored a shorter preovipositional period. At 32 and 25 °C mated females had an average preovipositional period of 1.5 days, while at 16.4 °C mated females had an average preovipositional period of 4.1 days.

Temperature also affected the length of the ovipositional period and the longevity : the higher the temperature the shorter the ovipositional period and longevity (table 3). Females at 32 °C lived an

TABLE 3

Duration of various periods for adult females of A. chilenensis *at different constant temperatures*

Period	Temp.	Individuals observed	Number of days		Standard deviation
			Average	Range	
	32 °C	29	1.5	1.0-3.1	0.5
Preoviposition	25 °C	21	1.5	1.0-3.5	0.5
	16.4 °C	13	4.1	2.5-8.0	1.4
	32 °C	17	10.0	2.0-20.0	—
Oviposition	25 °C	20	13.4	5.0-21.0	5.3
	16.4 °C	10	19.6	3.0-31.0	—
	32 °C	13	11.6	6.0-24.0	—
Adult	25 °C	18	20.2	7.0-42.0	—
longevity	16.4 °C	10	27.3	6.0-50.0	—

average of 11.6 days and oviposited for an average of 10 days. At 25 °C females lived an average of 20.2 days and the duration of the ovipositional period was 13.4 days. At 16.4 °C, ten mated and egg laying females lived an average of 27.3 days and oviposited for 19.6 days. It was assumed that this low temperature was not favorable for reproduction since some of the females raised at this temperature did not lay eggs even though they mated repeatedly. Such females lived much longer than those that did lay eggs. The seven non-ovipositing females lived an average of 40.0 days.

Oviposition. — The number of eggs laid was also affected greatly by temperature. At 32 °C the average number of eggs laid per female was 28.2 and an average of 3.1 eggs per female per day was laid during the ovipositional period. At 25 °C females laid an average of 43.3 eggs during the ovipositional period, an average of 3.1 eggs per female per day. The total number of eggs laid by females at 16.4 °C average 32.8 and the average number per female per day was 1.7 (table 4).

TABLE 4

Number of eggs laid by A. chilenensis *at three different constant temperatures*

	Temp.	No. of female observed	Number of eggs		Standard deviation
			Average	Range	
Total no. of eggs laid per female	32 °C	17	28.2	3-49	—
	25 °C	20	43.3	12-73	—
	16.4 °C	12	32.8	6-62	—
No. of eggs laid per female per day	32 °C	17	3.1	1.5-4.4	0.6
	25 °C	20	3.1	2.2-3.9	0.5
	16.4 °C	12	1.7	1.0-2.0	0.3

DOSSE (1958) reported that at 35 °C the total number of eggs laid by a female was 24 and the daily egg production was 2.7 eggs per female per day. He also determined the oviposition at 30 and 25 °C; the average total number of eggs laid by a female was 28 and 68, respectively, and the daily production was 3.3 and 2.7 eggs, respectively.

Consumption rates. — The number of two-spotted mite eggs consumed per female *A. chilenensis* per day is quite different during the preovipositional, the ovipositional and the postovipositional periods. During the average preovipositional period of 1.5 days, females ate an average of 11.3 and 9.5 eggs per day at 32 and 25 °C, respectively. Females, during an average preovipositional period of 4.1 days at 16.4 °C, ate an average of 5.4 eggs per day (table 5).

The rate of egg consumption increased during the egg laying period. Females ate an average of 16.3 eggs per day during an average

TABLE 5

Feeding of adult female A. chilenensis *on eggs of* T. urticae *at three different constant temperatures*

Period	Temperature	Number observed	Eggs eaten per female per day		Standard deviation
			Average	Range	
Preoviposition	32 °C	18	11.3	6.0-18.7	3.5
	25 °C	21	9.5	5.0-15.3	2.6
	16.4 °C	12	5.4	4.0-8.6	1.6
Oviposition	32 °C	19	16.3	7.5-23.4	3.8
	25 °C	16	16.2	10.7-19.5	2.5
	16.4 °C	12	8.4	7.4-10.0	1.4
Post-oviposition	32 °C	8	2.6	0-4.0	1.7
	25 °C	7	1.9	0-3.5	1.2
	16.4 °C	8	2.3	1.0-4.0	1.3

of 10 days of oviposition at 32 °C; 16.2 eggs per day during an average of 13.4 days of oviposition at 25 °C; 8.4 eggs per day during an average of 19.6 days of oviposition at 16.4 °C (table 5).

After oviposition ceased the rate of egg consumption greatly declined. At 32 °C the females consumed an average of 2.6 eggs per day during the post-ovipositional period of 1.6 days. At 25 °C females ate an average of 1.9 eggs per day in the postovipositional period of 6.8 days. At 16.4 °C the females ate an average of 2.3 eggs a day during the postovipositional period of 7.7 days. The differences in prey consumption by adults were striking and varied directly with temperature. The females under all three temperatures consumed the most prey per day during the ovipositional period presumably because more food is required for egg production (table 5).

SWIRSKI, AMITAI & DORZIA (1970) showed that *A. chilenensis* can feed and reproduce on pollen. No experiment was conducted to determine the preference for this or other food sources. However, if the predator's acceptance of alternate foods does not result in its neglecting a specific prey then feeding on pollen can increase rather than decrease the efficiency of a population of such predators (HUFFAKER, VAN DE VRIE & MCMURTRY, 1969).

Sex ratio. — Eggs of the stock females produced during a 12 hour period were raised to adults to determine their sex. At 32 °C the sex ratio of the 65 progeny was 2F : 1M; at 25 °C the sex ratio based on 43 progeny was 2.1F : 1M; and for 90 progeny at 16.4 °C the sex ratio was 1.6F : 1M. The lowest temperature thus produced a sex ratio less conducive to a high intrinsic rate of increase.

THE LIFE-TABLES

Table 6 gives the summary of the pertinent data obtained from the life-tables. The generation time is a summary measure of the effect of temperature on all components of development. The gene-

ration times for *A. chilenensis* at three different temperatures were determined by using the life table data. At 32 °C the mean generation time was the shortest, 9.38 days compared to 11.74 and 22.72 days at 25 and 16.4 °C, respectively (table 6). Within this thermal range the higher temperature favored the higher developmental rate; however, from figure 1 it is unknown whether 32 °C is beyond the optimum temperature for development, but it probably is not in view of DOSSE's (1958) results at 35 °C.

TABLE 6

The relationship of different constant temperatures to developmental rate, prey consumption, fecundity, net reproductive rate, intrinsic rate of increase and generation time for A. chilenensis

Temperature		Developmental time (days) $\bar{X}$	Eggs consumed by immature stages $\bar{X}$	Fecundity $\bar{X}$	Generation time (T)	Net reproductive rate (R_o)	Intrinsic rate of increase (r_m)
32 °C	F	3.9	9.8	28.2	9.38	17.82	0.307
	M	4.0	7.8				
25 °C	F	5.1	11.5	43.3	11.74	29.09	0.287
	M	4.9	7.8				
16.4 °C	F	11.0	12.3	32.8	22.72	12.73	0.112
	M	10.8	8.6				
20 °C* (*P. persimilis*)	F	7.4	10.5	53.5	17.32	44.36	0.219
	M	7.5					
20 °C* (*M. occidentalis*)	F	8.3	10.2	34.0	17.43	24.29	0.183
	M	8.7	9.0				

* Average of 24-hr temperature cycle (from LAING, 1968, 1969)

At 32 °C the population multiplied 17.82 times per generation (the net reproductive rate, R_0) and the intrinsic rate of increase r_m was determined (figure 1a) to be 0.307 individuals per female per day. At 25 and 16.4 °C the multiplication per generation (R_0) was 29.09 and 12.73, respectively. From figures 1b and 1c, intrinsic rates of increase at 25 and 16.4 °C were shown to be 0.287 and 0.112, respectively.

Females at 25 °C had the longest ovipositional period combined with the highest daily reproductive rate and therefore had the highest net reproductive rate. The net reproductive rate was lower at 16.4 °C than at 32 °C due to a higher female sex ratio at 32 °C even though fecundity at 16.4 °C was higher. Comparisons of the intrinsic rates of increase indicated that the highest temperatures provided the highest intrinsic rates of increase regardless of the lower net reproductive rates. The more rapid developmental rate at the higher temperature is responsible for this effect and it more than offsets the effect of reduced progeny production on the statistic r_m.

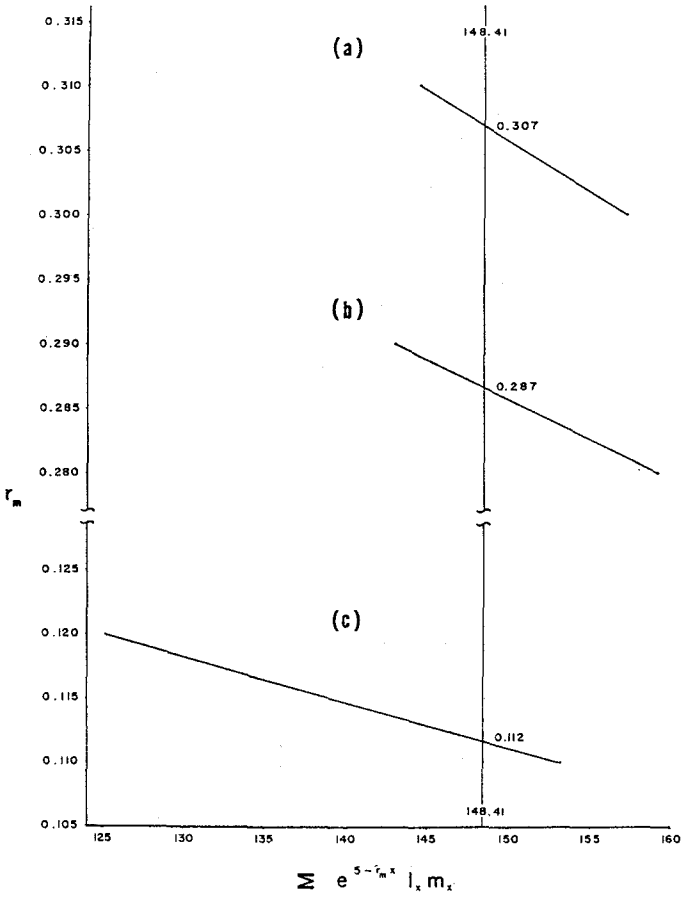

FIG. 1. Détermination of the intrinsic rates of increase of *A. chilenensis* at a) 32° C, b) 25° C and c) 16.4° C.

In figure 2 the data for *Metaseiulus occidentalis* and *Phytoseiulus persimilis* (LAING, 1968, 1969), fall in line with the r_m values for *A. chilenensis*. It is not known, however, what the exact comparative r_m values would be since the results were obtained under different temperature regimes. It has been recorded by FORCE (1967) that the effectiveness of *P. persimilis* against the two-spotted mite at high temperatures is much reduced. This leads one to speculate that *P. persimilis* might have a lower r_m at 32 °C than shown here for *A. chilenensis* and that *A. chilenensis* might be the more effective predator at high temperatures. However, when the *A. chilenensis* stock became

contaminated by *P. persimilis* in the insectary at room temperatures the latter soon took over and built up a high population. This information suggests that *A. chilenensis* failed to compete with *P. persimilis* as a predator of *T. urticae* at room temperature. Further conclusions require comparative studies of each predator in continuous interactions with populations of the same host species. Also, this aspect concerns only the capacity to cause a rapid decline in the prey population. The capacity to survive at low prey density and maintain the prey at low density is at least equally important and these data do not directly bear upon this question. But the facts that the food requirements of *A. chilenensis* are lower than those of *P. persimilis* and that it utilizes alternate foods whereas *P. persimilis* does not, suggest that *A. chilenensis* may survive better than *P. persimilis* at low host densities in the field.

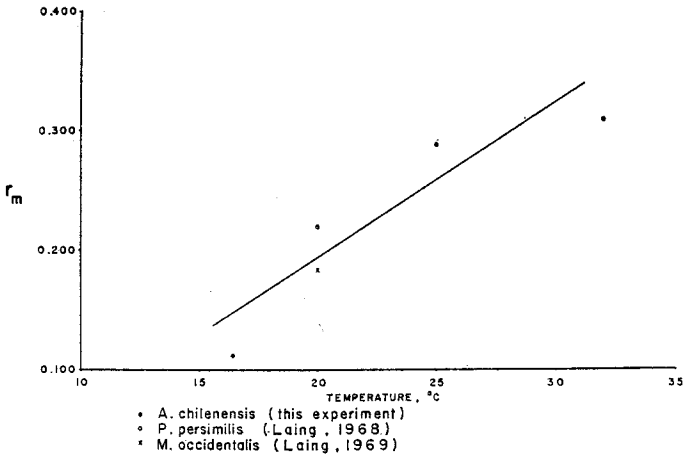

FIG. 2. Comparison of the intrinsic rates of increase of three predatory mites.

RÉSUMÉ

Biologie, puissance de développement et de consommation de proies de *Amblyseius chilenensis* (DOSSE) [*Acarina* : *Phytoseiidae*]

La biologie d'une espèce chilienne de Phytoseiide, *Amblyseius chilenensis* a été étudiée à trois températures constantes : 32°, 25° et 16,4 °C, en l'alimentant avec des œufs de *Tetranychus urticae*.

A 32 °C, les stades larvaires durent 4,0 jours pour les mâles et 3,9 jours pour les femelles, pendant lesquels les femelles consomment en moyenne 9,8 œufs de *T. urticae* et les mâles, 7,8 œufs. La consommation moyenne journalière des femelles adultes est respectivement de 11,3 et 16,3 œufs pendant la période de préoviposition (1,5 jours) et de ponte (10 jours) et la fécondité moyenne journalière est de 3,1 œufs.

A 25 °C, les stades larvaires demandent 5,1 jours pour les femelles et 4,9 jours pour les mâles, pendant lesquels la consommation est respectivement de 11,5 et 7,8 œufs.

Au cours de la période de préoviposition de 1,5 jours, les femelles mangent en une journée 9,5 œufs; pendant la période de ponte de 13,4 jours, elles mangent 16,2 œufs et déposent 3,1 œufs par jour.

A 16,4 °C, les stades larvaires se développent en 11 jours pour les femelles et 10,8 jours pour les mâles. Les femelles absorbent en moyenne 12,3 œufs et les mâles 8,6 œufs pendant cette période. Pendant la phase de préoviposition de 4,1 jours chaque femelle consomme 5,4 œufs par jour; au cours de la période de ponte de 19,6 jours, elle pond 1,7 œufs par jour et en mange 8,4.

Des tables de vie ont été établies afin de déterminer le taux intrinsèque d'accroissement, les taux nets de reproduction et les durées d'une génération pour les trois températures constantes. Le taux intrinsèque d'accroissement, (r_m) est plus élevé à 32 °C (0,307) qu'à 25 ° (0,287) et à 16,4 °C (0,112). A 32° une population de *A. chilenensis* s'accroît de 17,8 fois au cours d'une génération qui dure 9,4 jours. A 25°, le taux de multiplication est de 29,1 fois en 11,7 jours et à 16,4° de 12,7 fois en 22,7 jours. Du fait de la plus grande vitesse de développement c'est à la température la plus élevée que le taux intrinsèque d'accroissement est le plus important. Ce paramètre compense la moindre fécondité et le plus faible taux de reproduction mesurés à la plus forte température.

Ces données seront utiles pour l'estimation de l'efficacité de ce prédateur dans la nature.

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