THE INFLUENCE OF TEMPERATURE AND RELATIVE HUMIDITY ON THE SEASONAL FLUCTUATIONS OF POPULATIONS OF ADULT *LARDOGLYPHUS KONOI*

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POPULATION INCREASING IN A MITE OF STORED FOOD

ABSTRACT : Correlation of the monthly populations of adult *Lardoglyphus konoi* in laboratory cultures with the montly relative humidity and atmospheric temperature has shown no statistical significance. Since correlation between population size and atmospheric parameters is lacking it is pointed out that the prediction of the density of population of *L. konoi* based on R.H. and atmospheric temperature of a place is not possible.

ACCROISSEMENT DE POPULATION CHEZ UN ACARIEN DES DENRÉES ALIMENTAIRES

RÉSUMÉ : Nous n'avons observé aucune valeur statistiquement significative de la corrélation entre humidité relative et température atmosphérique mensuelles, et les populations de *Lardoglyphus konoi* adultes élevés en laboratoire. Sans corrélation entre l'importance de la population et les paramètres atmosphériques, il n'est pas possible, souligne-t-on, de prévoir la densité de population de *L. konoi* en se fondant sur le R.H. et la température atmosphérique du lieu.

INTRODUCTION

Dried and stored fish and prawn deteriorate as a result of mite infestation, depending upon the period of storage. If stored for only short periods the commodities lose weight on account of feeding by the mites upon the dried flesh. If kept for long periods, the greater part of the flesh is eaten away, leaving mainly the bones. The remaining flesh develops a pungent odour and changes colour as it is geting coated with mite excreta. Once deterioration begins, the stored products lose much of their market value. *Lardoglyphus konoi* is one of such mite pests.

A mite species capable of causing such damage should normally have evoked concern among biologists. But only little work has been done on the ecology of the species. MATSUMOTO (1966, 1968, 1970, 1973) studied the breeding, age compositon and hypopus formation of the mite under different conditons of humidity, temperature and diet when it was found in grain. CHMIELEWSKI (1970 ans 1973) has also viewed the species as a stored-grain mite and studied the temperature, relative humidity and nutrition which would influence the formation of its hypopus. VIJAYAMBIKA and JOHN have suited this species on stored fish and extensively studied the morphology of the adult, the developmental stages and

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the environmental regulation of the hypopus formation (VIJAYAMBIKA and JOHN 1973, 1974 *a, b,* 1975 *a, b, c,* 1976 *a* and *b*). In the present paper the influence of relative humidity and atmospheric temperature on the seasonal fluctuation of the adult population of the mite is reported.

MATERIAL AND METHODS

There were several healthy laboratory cultures of the mite in jars (4 × 5 cm), with dried anchovy as food. Three of these cultures were used for the experiment. Each jar was deposited in a box with the sides guarded by meshed wire, against rats and other poachers and the boxes were kept in open, well aerated spaces in the laboratory.

The food in each experimental jar was replenished in the second week of very month by the addition of 10 gm of unsalted and moisture free anchovy flesh into each jar to ensure uniform availability of food in all the jars.

For counting the population of the mite, a whole anchovy was withdrawn from each jar in the first week of every month. The number of adult *L. konoi* that were present on the sub-sample was counted with due precautions against the mites straying during handling. The counting of the mite on all the samples was done by the same person throughout the experiment to avoid individual variation that may happen in counting. For the precautions readers are referred to VIJAYAMBIKA and JOHN (1974 *a*). Since the adults have a tendency to escape, creeping along the walls of the containers during adverse periods and thus vitiating the true density of population in a culture, the sides of the container were brushed down every day. There were only very few individuals on the sides during the study. The experiment was started on the 1st of January 1975 and terminated on 30th December 1976. The relative humidity and atmospheric temperature were recorded daily from the site of the experiment. From the daily readings the average R.H. and atmospheric temperature for a month were calculated.

After counting the mites on each sub-sample, it was washed thoroughly to remove all extraneous matter and then dried to constant weight. From the weight of the sample and the number of mites that was present on them, the number of mites per unit weight of 10 gm was calculated. The data on the density of the mite per unit weight given in the table are the average of the density on unit weigths from three cultures. The monthly values of R.H. and atmospheric temperature are the averages of daily readings.

RESULTS

The population density of the mite on 10 gm samples taken each month with the relative humidity and atmospheric temperature during these months is given in the table 1.

The correlation coefficient between the population density and R.H. were 0.4674 for 1975 and 0.4861 for 1976. The correlation coefficient between population density and atmospheric temperature were — 0.5332 for 1975 and — 0.3664 for 1976. All these values are not significant.

DISCUSSION

According to the correlation coefficients in both years, statistical correlation between the population density of the mite and relative humidity and atmospheric temperature is not significant. MATSUMOTO (1968, 1970) has previously studied the ecology of adult *L. konoi.* He found that R.H. above 75 % will allow an increase of the population of the adult and the most favourable conditions were 30°C and 85 % R.H. There was a decline in the number of mites at lower humidities of 66 and 52 %. However he has not established a correlation between relative humidity or atmospheric temperature and the rate of increase of the mite. A negative trend will be seen in the relation between the atmospheric temperature and the density of population in the present experiment suggesting that the rate of increase of the mite can be dependent on atmospheric temperature. Other factors that could normally affect the rate of

TABLE 1.

The number of adult *L. Konoi* on 10 gm samples and monthly mean R.H. and atmopheric temperature during 1975 and 1976.

1975

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
No. of mites	950.00± 38.48	0	75.00± 40.18	77.00± 30.41	0	0	3708.00± 170.56	2650.00± 198.72	8569.00± 314.26	2894.00± 200.62	7154.00± 274.79	2859.00± 216.24
R.H. %	65.17± 3.97	72.02± 4.46	74.50± 4.42	85.41± 4.95	82.00± 3.02	77.16± 4.68	86.00± 2.37	86.50± 2.85	86.50± 2.89	85.50± 3.32	83.50± 2.98	75.00± 2.87
Atmos, temp. °C	26.06± 0.47	27.45± 0.52	28.10± 0.61	28.60± 0.49	27.70± 0.21	26.75± 0.19	26.00± 0.12	27.75± 0.18	26.10± 0.21	25.90± 0.18	25.90± 0.18	26.25± 0.32

1976

No, of mites	1000.00± 130.89	281.00± 102.47	200.00± 49.79	676.00± 39.76	25.00± 20.68	5450.00± 160.82	2680.00± 201.59	8451.00± 310.68	7471.00± 248.86	3450.00± 282.67	2810.00± 312.68	2725.00± 279.56
R.H. %	63.23± 2.24	64.00± 3.05	69.50± 2.87	75.50± 2.67	77.50± 3.32	74.59± 2.97	64.44± 4.02	82.00± 4.87	79.00± 4.15	83.16± 4.72	87.42± 2.18	74.00± 3.86
Atmos. temp. °C	26.30± 0.74	26.65± 0.29	28.10± 0.36	28.35± 0.42	28.35± 0.37	27.75± 0.18	26.50± 0.21	26.50± 0.21	26.90± 0.32	26.75± 0.17	26.40± 0.18	26.90± 0.27

increase of the mite are density of population on the habitat and food availability. In the present experiment we find that high population density in a month is followed by equally high density in the succeeding month (eg. between July and December). In contrast low density is followed only by low density in the succeeding month (eg. between January and April). So density of population would not have exerted a decisive influence in the rate of increase of the mite in the present experiment. Similarly since the food was replenished with the same quantity of new food every month, it could be presumed that food availability was reasonably uniform throughout the experiment. So only the atmospheric parameters of relative humidity and temperature appear to be the probable causes of the wide fluctuations of the population size in the present experiment. However, since there is no significant correlation between the number of mites and these atmospheric parameters, a prediction on the population size of adult *L. konoi* on a stored commodity at a place, based on R.H. and atmospheric temperature of that place is not feasible.

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