

POPULATION FLUCTUATIONS OF THE PEA APHID IN RELATION TO CLIMATE AND PREDATORS

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The pea aphid *Aphis craccivora* Koch. is a serious pest of leguminous crops in Kerala. Much variations in the aphid population are evidenced during the different seasons. Seasonal fluctuations of the populations of *Pentalonia nigronervosa* Goq. (Kolkaila and Soliman 1954, Menon and Christudas 1967 and Nair 1969) and *Aphis craccivora* (David 1957 and Abraham 1963) were studied previously in India. The factors of the environment governing the population fluctuations of aphids in the sub-tropical conditions as existing in Kerala are however, not fully understood. Objective studies were hence made on the factors affecting the fluctuations of *A. craccivora* the results of which are presented below.

Material and Methods

The population of the aphid and its predators was assessed by making weekly counts for a period of 53 weeks during 1968-69 on pea plants grown for the purpose. About 72 pea plants were grown in the experimental plot and divided into three subplots of 24 plants each. New plants were raised every month to provide succulent stages of the plant highly susceptible to aphid infestation, throughout the experimental period. Each week's observation was confined to 30 plants, 10 from each plot selected at random. The aphids present on the one foot length of terminal shoot of each plant were counted, the counting being done between 8 and 9 am.

For counting, a rating system followed by Banks (1954) was adopted. Accordingly the aphid populations were assigned to five classes as follows:-

Nil	No aphid,
Very light.	Aphids in a small colony.
Light	Several small colonies spread out on the shoot and stem,

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Medium	Large but difused colonies spread out on leaves and stem.
Heavy	Large numbers almost covering the leaves and stem.

The estimated number of aphids of each class was found out on every occasion by counting ten samples representing each class and calculating averages. The samples of infested shoots collected were preserved in 95 percent alcohol in bottles for making the detailed counts. All the 72 plants in the plot were then classified under the different classes and total number of aphids calculated based on the estimates obtained from the samples. The predators which consisted of coccinellids, syrphids and hemerobids were directly counted on all the plants in the plot.

Results and Discussion

The fluctuations of population of the aphid and the predators in relation to temperature and rainfall are represented in Fig. 1. In general, it is observed that the population of both the aphid and its predators remained high during the period September to April. During May to August, the population of both aphid and predators remained relatively low. The observations reported on *P. nigronervosa* (Menon and Christudas 1967) also are similar to the present observations.

It is indicated that a dry period following heavy rains was the most favourable condition for the build up of the population of the insects. Towards the tail end of the dry period characterised by maximum temperature the aphid population appeared to be drastically affected. A spurt in the population observed during July (Fig. 1) cannot however, be explained.

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Table 1

Correlation between the population of *Aphis craccivora* and its predators and climatic factors

Correlations	Correlation Coefficient "r"
No. of aphids Vs. No. of predators	+ 0.98 *
No. of aphids Vs. Rainfall	- 0.13
No. of aphids Vs. Temperature	- 0.22
No. of aphids Vs. Humidity	- 0.106
No. of predators Vs. Rainfall	- 0.2645
No. of predators Vs. Temperature	- 0.3233 *
No. of predators Vs. Humidity	+ 0.0313

* Significant

Table 2

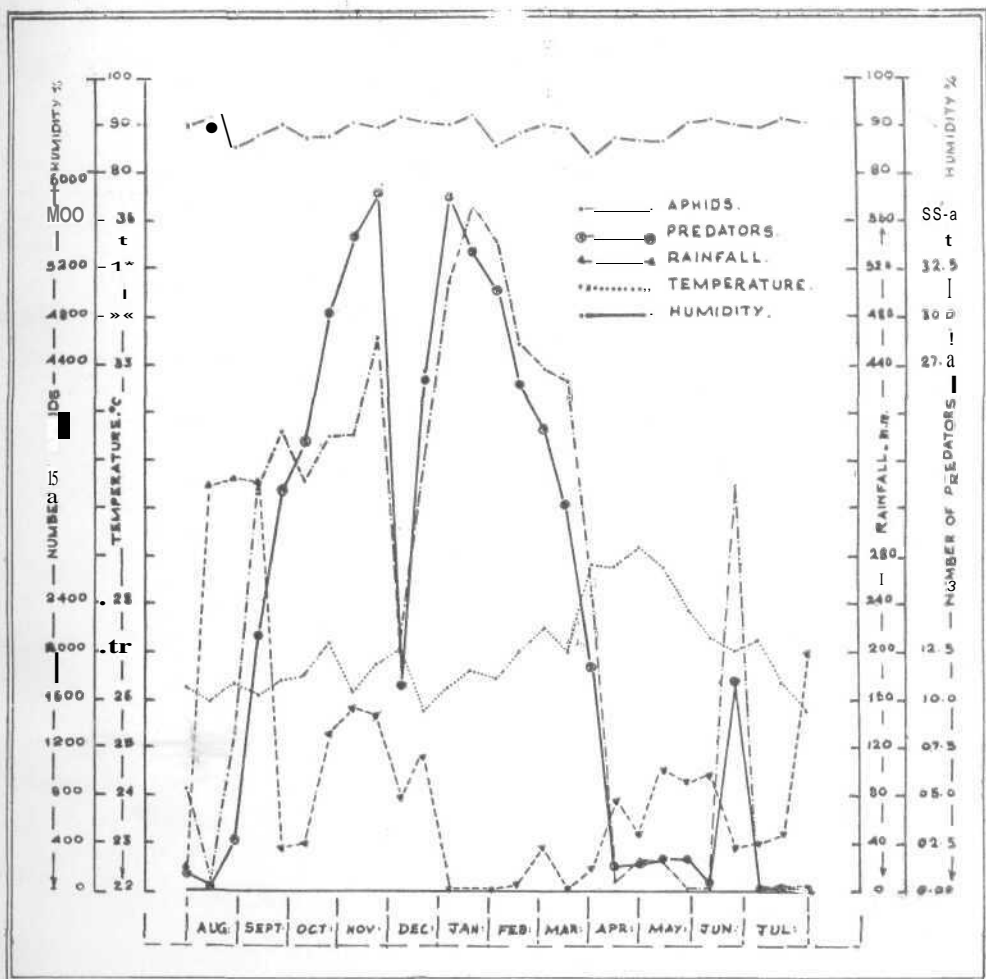
Partial correlation between population of *Aphis craccivora* and climatic factors eliminating the effect of predators.

Correlations	Correlation Coefficient "r"
No. of aphids Vs. Rainfall	+ 0.6736 *
No. of aphids Vs. Temperature	+ 0.5138 *
No. of aphids Vs. Humidity	0.0100 *

* Significant

Table 1 gives the correlation coefficients worked out between different factors affecting the population of the insects. It may be observed that none of the climatic factors influenced the aphid population. However, it is observed that temperature had a significant negative correlation with the aphid predators. There was also a strong correlation between the number of aphids and their predators. The partial correlation between number of aphids and climatic factors eliminating the effect of predators were hence worked out, the results of which are presented in Table 2. It may be

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observed that the partial correlations of temperature and rainfall were significant indicating that the effect of these two factors of the climate on the incidence of the aphid was masked by the effect of predators. It is thus evident that the ultimate size of the population is the resultant of the interaction of the climatic and biotic (predators) factors of the environment of the aphid. It is also significant to observe that an important climatic factor, temperature, affects the aphid and its predator differently.

Summary

Studies on fluctuations of population of *Aphis craccivora* on cowpea in relation to climate and predators (at Vellayani, Kerala) showed that the population of the aphid and its predators was high during September to April. There was no correlation between population of aphid and predators on the one hand and temperature, humidity and rainfall on the other. There was strong positive correlation between aphid population and predator population. Partial correlation studies showed that effects of climatic factors were modified by the presence of predators.

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