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POPULATION FLUCTUATIONS OF THREE SPECIES OF ANTHOPHILOUS THYSANOPTERA WITH NOTES ON THE BIOLOGY OF THE SEED FEEDING SPECIES *CHIROTHRIPS MEXICANUS* CRAWFORD

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ABSTRACT

Fluctuations in natural population of *Chirothrips mexicanus* Crawford along with two associated species, *Exothrips hemavarna* and *Haplothrips apicalis* on *Chloris barbata*, observed in the year 1977 are noted. High incidence of all the three species in June denotes their preference to high temperature, low humidity and optimum rain fall. Males outnumber through out the life cycle of *Chirothrips mexicanus*.

Available information relating to the fluctuations in natural populations with particular reference to anthophilous Thysanoptera (Evans 1935, Ottingen 1942, Davidson and Andrewartha 1948 a, b ; Smith 1953, Andrewartha and Birch 1954 ; Raizada 1961 ; Ananthakrishnan and Jagadish, 1965 ; Ward 1966 ; Ananthakrishnan and Viswanathan 1976 ; Viswanathan and Ananthakrishnan 1976) appear to indicate that in the total absence of density dependent factors, density independent factors such as rainfall, humidity and temperature could exert a control on the thrips population. The present observations include the population fluctuations involved in the regular annual rhythm in the rise and fall of the population of *Chirothrips mexicanus* Crawford, infesting *Chloris barbata* Sw., along with the periodicity and abundance of *Exothrips hemavarna* R. & M. and *Haplothrips apicalis* (Bagnall) also inhabiting the spikelets of *Chloris barbata*.

In an attempt to study the population fluctuations of different thrips species on *Chloris barbata*, from the field in which *Pennisetum* crop was previously raised, regular collections were made during the year 1977 (January to December) with samples taken from 100 plants of almost the same age. Studies on the life cycle and post embryonic development were carried out in the laboratory.

POPULATION TRENDS

Chirothrips mexicanus in view of its occur-

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rence almost throughout the year (January to October) is the primary species in *Chloris barbata*, while the associated species *Exothrips hemavarna* and *Haplothrips apicalis* occurring only during a five month period (May to September) are the secondary and tertiary species on the basis of their relative incidence. The maximum abundance of the primary species was in June, and the minimum was in October when the maximum and minimum temperature were 36.7°C and 27.1°C respectively. Further, the average rainfall and humidity in June were comparatively lower (86.4 mm. and 60%) than in October when the rainfall and humidity were high (638 mm. and 93%). The associated secondary and tertiary species *E. hemavarna*, *H. apicalis* also had their maximum abundance in conformity with the primary species *Chirothrips mexicanus* (Fig. 1). The higher incidence of

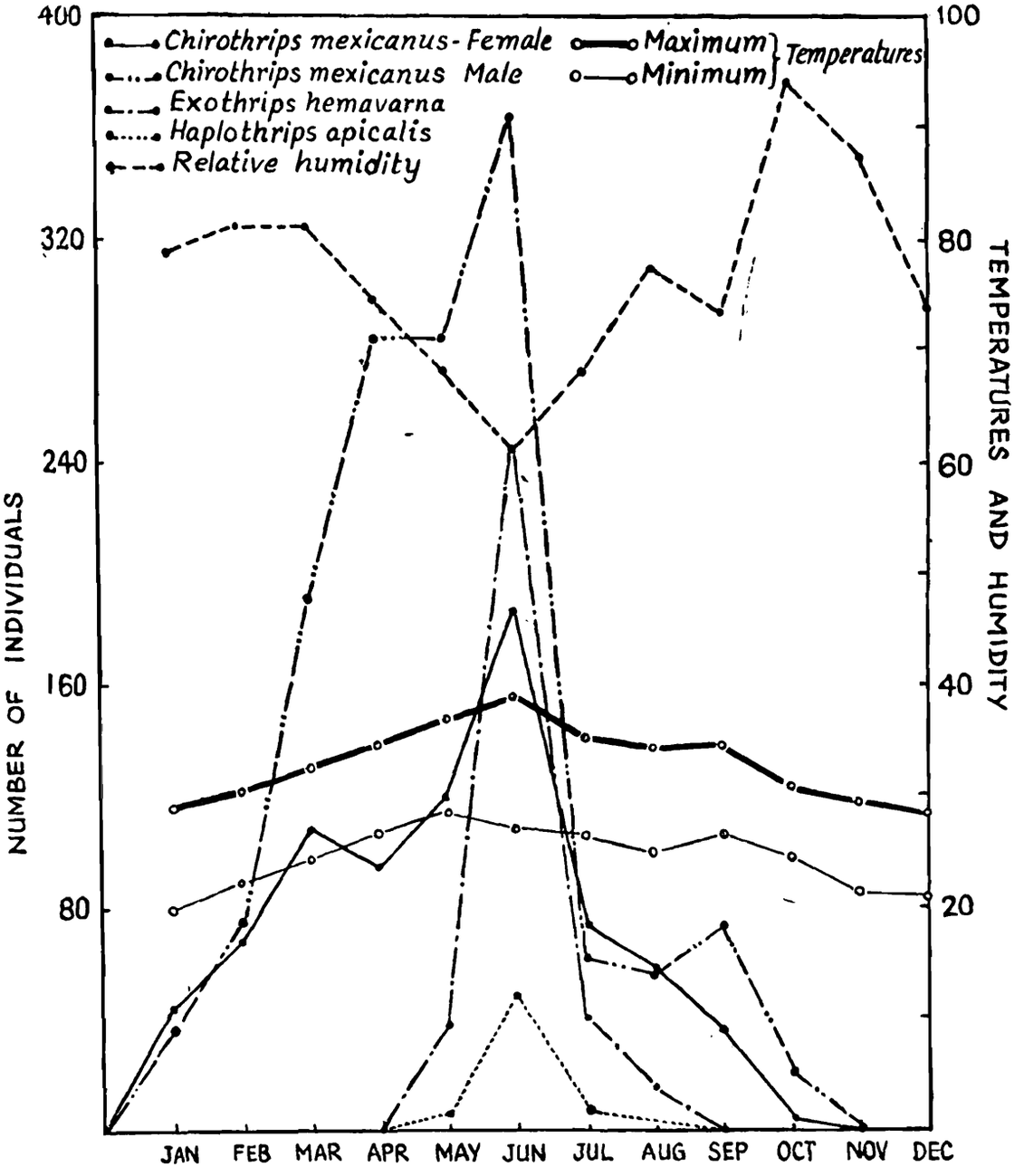

Fig. 1. Graph showing the effect of temperature humidity on the population of *Chirothrips mexicanus*, *Exothrips hemavarna* and *Haplothrips apicalis*.

all the three species during June (1977) suggest their preference to high temperature, low humidity and optimum rainfall.

BIOLOGY

In *Chirothrips mexicanus* both sexual and parthenogenetic modes of reproduction occur (Ananthakrishnan and Thirumalai, 1977). The thrips are active throughout the year except November and December. Oviposition starts 4-5 days after adult emergence, the eggs being laid at the tip of the developing ovules (Pl. VIC) partly embedded in the ovular tissue of *Chloris barbata*, the oviposition rate being 3-4 eggs per day. The total number of eggs laid by a single sexually reproducing female is 29 to 41 and 2 to 3 eggs/day/female under laboratory conditions. The ovary of parthenogenetically reproducing individuals shows four to six mature eggs at a time. The total duration of life cycle from egg to adult is of the range of 14-19 days.

Males (Pl. VIA) comprise the major portion of the population in *Chirothrips mexicanus* throughout the year excepting January and July. The sex ratio is 1 : 1 to 5 : 1 (Males : Females) (Ananthakrishnan and Thirumalai, 1977). The abundance of male population (Fig. 2) throughout the life cycle is due to the arrehenotokous mode of reproduction, which appears to be the principal mode almost throughout its life span, besides normal sexual reproduction. Like *Thrips linarius* Uzel, *Caliothrips fasciatus* Pergande, *Haplothrips verbasci* (Osborne), *Scirtothrips citri* Moulton, the virgin females of *C. mexicanus*

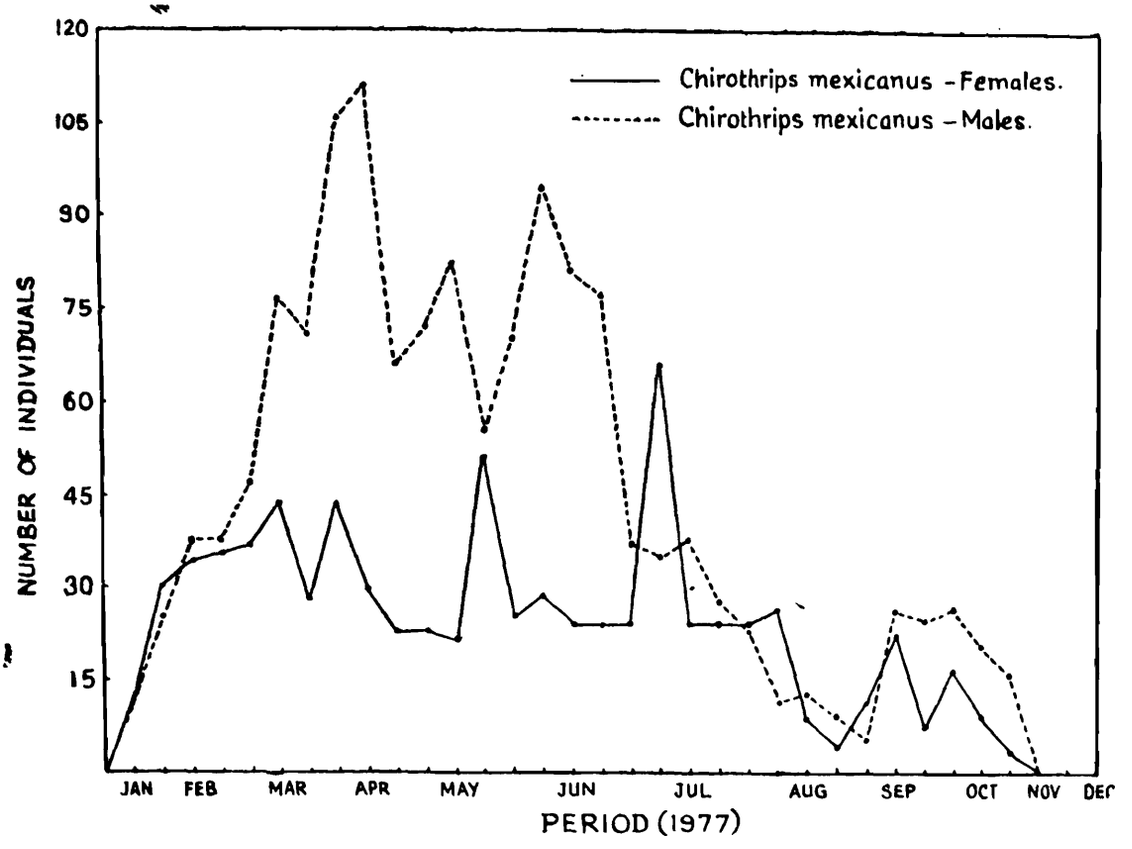

Fig. 2. Graph showing population fluctuation of males and females of *Chirothrips mexicanus* for the period 1977.

produce only male offspring, whereas fertilized females produce mostly females.

Discussion

The peak population of C. *mexicanus*, *E. hemavarna* and *H. apicalis* during June 1977 in particular, indicates their preference to low humidity and high temperature, as indicated by Viswanathan and Ananthakrishnan, (1976) in relation to *Micothrips fasciatus* Ananthakrishnan, an anthophilous species. The presence of *C. mexicanus* throughout the year excepting the period November and December characterised by high humidity and low temperature, and the abundance of *C. mexicanus* even in the situations with extreme climatic factors mark it as the most successful inhabitant. The absence of a predator throughout the period appears significant in that the principal environmental factors controlling the population of these Thysanop-

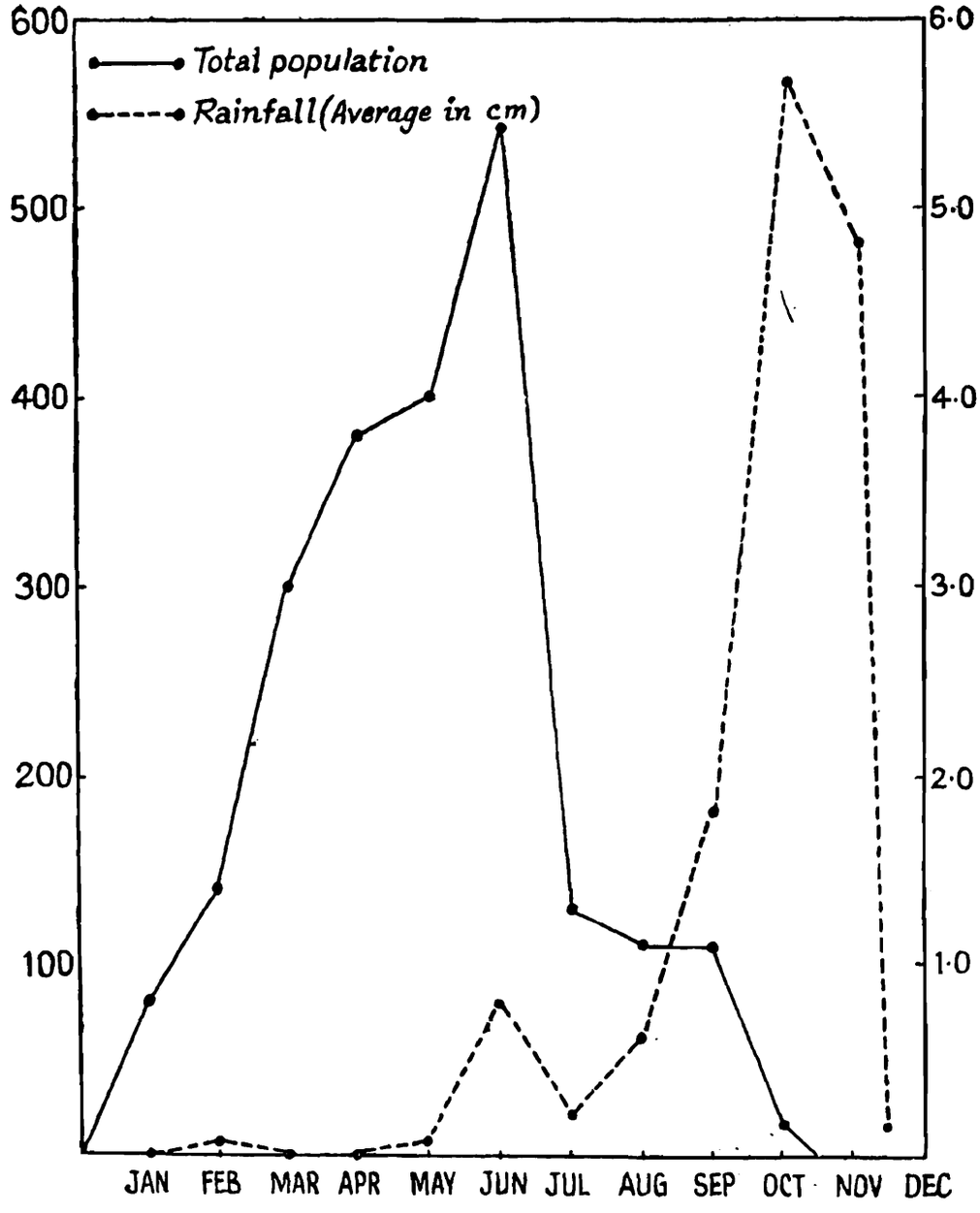

Fig. 3. Graph showing the trend of total population of thrips and average rainfall in the year 1977.

tera are the density independent ones – especially temperature and humidity. Davidson and Andrewartha (1948 a, b) and Andrewartha and Birch (1954) considered rainfall and temperature could together control thrips populations only when density dependent factors are totally absent. The present study in addition indicates that besides temperature and humidity controlling the population, an optimum rainfall also appears necessary (Fig. 3).

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REFERENCES

ANANTHAKRISHNAN, T. N. and VISWANATHAN, T. R. 1976. *General Animal Ecology*. Macmillan, New Delhi, 324 pp.

ANANTHAKRISHNAN, T. N. and JAGADISH, A. 1965. On the seasonal fluctuations and biology of *Anaphothrips flavicinctus* (Karny) on *Panicum maximum* in Madras. *J. Bombay nat. Hist. Soc.*, 65 : 243-248.

ANANTHAKRISHNAN, T. N. and THIRUMALAI G. 1977. The grass seed infesting thrips *Chirothrips mexicanus* Crawford on *Pennisetum typhoides* and its principal alternate host *Chloris barbata*. *Curr. Sci.*, 46 : 193-194.

ANDREWARTHA G. G. and BIRCH, L. C. 1954. *The distribution and abundance of animals*. University of Chicago Press, 782 pp.

DAVIDSON, J. and ANDREWARTHA, G. G. 1948*a*. Annual trends in the natural populations of *Thrips imaginis* Bagnall (Thysanoptera). *J. Animal Ecol.*, 17 : 193-199.

DAVIDSON, J. and ANDREWARTHA, G. G. 1948*b*. The influence of rainfall, evaporation and atmospheric temperature on fluctuations in size of a natural population of *Thrips imaginis* Bagnall (Thysanoptera). *J. Animal Ecol.*, 17 : 200-222.

EVANS, J. W. 1935. Further observation on the seasonal fluctuations in number of *Thrips imaginis* by associated blossom thrips. *J. Coun. Sci. Ind. Res. (Aust.)*, 46 : 86-92.

LEWIS, T. 1978. *Thrips. their biology and economic importance*. Academic Press, London, 349 pp.

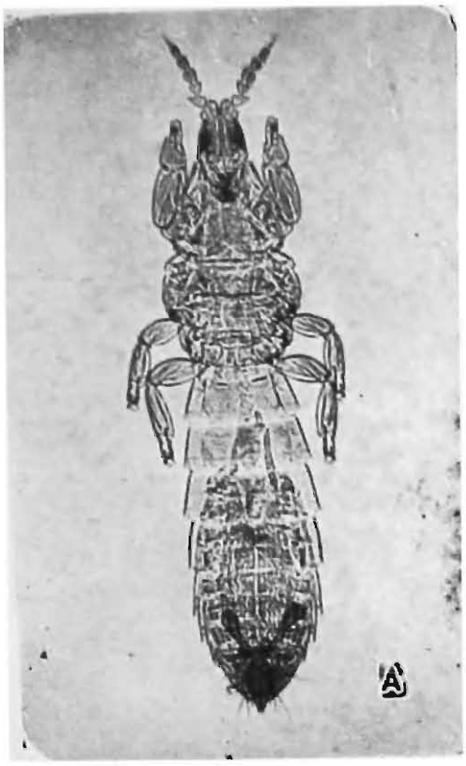
OTTINGEN, V. 1942. Die Thysanopteren dea Norddentschen grassland. *Ent. Beih. Berl. Dahlem*, 9 : 79-141.

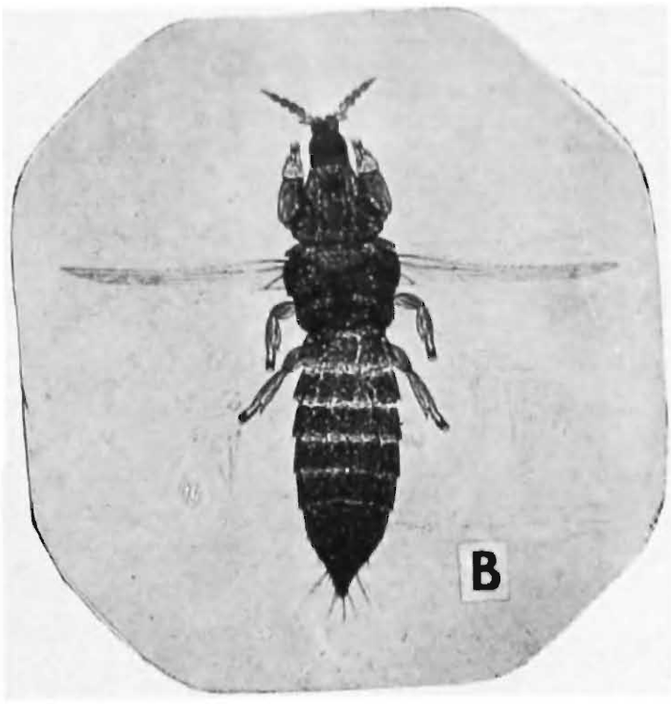
RAIZADA, U. K, 1961. The life history of *Microcephalothrips abdominalis* Crawford. *Bull. Ent. Loyola Coll.* 2 : 12-20.

SMITH, F. E. 1953. Density dependence in Australian thrips. *Ecology*, 42 : 403-407.

VISWANATHAN, T. R. and ANANTHAKRISHNAN, 1976. Aspects of host preference and succession in thrips infesting *Ruellia tuberosa*. *Entomon.*, 1 : 71-77.

WARD, L. K. 1966. *The biology of Thysanoptera*. Ph. D. Thesis, London University (Quoted by Lewis, 1973).





Chirothrips mexicanus Crawford
A, Male ; B. Female ; C. Egg inserted at the tip of the ovule of *Chloris barbata*.