Entomon, 1976, *Vol.* 1, *No.* 1, *pp.* 71 *to* 77

ASPECTS OF HOST PREFERENCE AND SUCCESSION IN THRIPS INFESTING *RUELLIA TUBEROSA*

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(*Received 30 April 1976*)

Polyphagous and restricted oligophagous species when they inhabit a host plant with a restricted flowering season, tend to show ecological succession and interspecific competition. The periodicity of occurrence and abundance of six species of thrips inhabiting the flowers of *Ruellia* as evaluated from their population dynamics for a period of two years, indicated that, while the polyphagous species were always primary or secondary colonizers, the restricted oligophagous species were always tertiary inhabitants. The frequency distribution or the number of thrips per flower per day for two years is discussed along with the nature of the host range of the primary and secondary species.

INTRODUCTION

Information relating to fluctuations in natural populations of anthophilous Thysanoptera is given by DAVIDSON & ANDREWARTHA (1948 a, b), ANDREWARTHA & BIRCH (1954) and SMITH (1953) on *Thrips imaginis* BAGNALL infesting roses in Australia, RAIZADA (1963) on *Microcephalothrips abdominalis* CRAWFORD on Marigold in India, WARD (1966) on *Thrips validus* UZEL on varied hosts in England and LAUGHLIN (1970) on *Isoneurothrips australis* BAGNALL in Australia. KUDO (1971) provides interesting data on the population fluctuations of a number of species inhabiting nine different species of flowers, laying particular stress on the phenology, frequency distribution and diurnal variations of different species. Results presented herein relate to a detailed analysis of not only the population fluctuations of different species of thrips infesting the solitary flowers of *Ruellia tuberosa* but also to aspects of ecological succession and interspecific competition.

Six species of thrips inhabiting the flowers are *Haplothrips gowdeyi* (FRANKLIN), *Frankliniella schultzei* PRIESNER, *Megalurothrips distalis* KARNY, *Thrips hawaiiensis* MORGAN, *Tusothrips aureus* (MOULTON) and *Micothrips fasciatus* ANANTHAKRISHNAN. Of these the first four species are typically polyphagous being recorded on a variety of hosts, while the last two have been reported only from *Ruellia tuberosa* in India. The periodicity of occurrence and abundance of all the six species present considerable variations.

MATERIALS AND METHODS

In an attempt to study the fluctuations of different species at Madras data was collected for the years 1972 and 1973 from June to October, with collections being made every fourth day from among 30 flowers obtained at each collection. Care was taken to choose flowers of same age and from same area.

RESULTS AND DISCUSSION

The thrips populations within *R. tuberosa* showed a remarkable succession resulting in the displacement of one species by another, a feature primarily dependent upon not only the seasonal periodicity, but also

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the host range and colonizing ability of the respective species of thrips. On the basis of their relative duration within the flowers the thrips species may be designated as *primary*, *secondry* and *tertiary*. *H. gowdeyi* and *F. schultzei* being the first to appear within the flowers and occurring as they do throughout the flowering season, are the primary species *M. distalis* and *T. hawaiiensis* representing the secondary species occur comparatively in fewer numbers than the primary species. These secondary species also occur throughout the period of study but display considerable irregularity in their population trends. Equally characteristic of the secondary species is their belated appearance within the flowers after a severe environmental stress. The tertiary species represented by *T. aureus* and *M. fasciatus* occurring in fewer numbers than the primary or secondary are present only for a short period and appear highly host specific. All the species never occur together in a single collection in view of their graded periodicities and of the tertiary species only one is found to occur at a time.

The rise and fall in numbers of different species appear independent of each other often following the conditions of the environment. In both 1972 and 1973 the highest temperature recorded for the period of study was noted in the month of June (27.4°C - 37.0°C) in 1972 and July (27.9 - 36.7°C) in 1973. The two primary species had their peaks of abundance in June-July and their minimum numbers were noted in September-October when the mean temperature was only 24.4°C - 30.6°C and 24.8°C-32.0°C respectively. Relative humidity in June-July was lowest being 67% in 1972 and 61% in 1973 and highest in September-October viz. 86% in 1972 and 84% in 1973. Among the secondary species *T. hawaiiensis* had a numerical abundance over *M. distalis* in 1972. These two species had their own respective periods of abundance or sparseness irrespective of those of primary species. However, *M. distalis* overnumbered the primary species in 1973. The increase in numbers was so high that it practically replaced *H. gowdeyi*, the primary species during one phase of collection. In spite of this attribute they are treated only as secondary species because of their restricted ability for colonization after an environmental stress. An aspect of interest relates to *M. fasciatus* which occur during early weeks of collection while *T. aureus* appeared at the last phase of collection. To be more specific *M. fasciatus* reached its peak during May-June indicating a preference to low humidity and high temperature, while *T. aureus* reached its maximum numbers in August-September during conditions of higher humidity and lower temperature. The number of secondary species had also a regulating effect on the abundance or sparseness of primary species. This was particularly true with regard to one secondary species viz. *M. distalis*.

Sex Ratio

In 1972 and 1973 there was an overabundance of females in thrips population (Table 1 a, b). The individual species also showed the same trend, although in 1973 the sex ratio of secondary species was slightly different from that of 1972. *H. gowdeyi* had the maximum male/female ratio (0.29 and 0.28) in both years. Among the secondary species *M. distalis* recorded the highest male/female ratio (0.26 and 0.28) for 1972 and 1973 respectively. The males of secondary species were rare in the collections of 1972 and 1973 but *T. aureus* showed a male/female ratio of 0.71 which is negligible compared to that of other species, thereby showing a preponderance of females in the population of tertiary species.

Observations on the frequency distribution (number of thrips per flower per day) showed

Table 1a. Relative abundance of adult thrips in *Ruellia tuberosa* for the year 1972
Number of individuals collected

Species	Females	Males	Females plus Males	% to total number	Ratio of male/ female
Haplothrips gowdeyi	249	73	322	39.22	0.29
Frankliniella schultzei	235	8	243	29.59	0.340
Megalurothrips distalis	34	9	43	5.22	0.26
Thrips hawaiiensis	85	1	86	10.47	.011
Tusothrips pseudosetiprivus	102	0	102	12.42	0/102
Micothrips fasciatus	25	0	25	3.04	0/25
Total	730	91	821		

Table 1b. Relative abundance of adult thrips in *Ruellia tuberosa* for the year 1973
Number of individuals collected

Species	Females	Males	Females plus Males	% to total number	Ratio of Males/ Females
Haplothrips gowdeyi	210	59	269	24.003	0.2809
Frankliniella schultzei	379	16	295	38.46	0.42
Megalurothrips distalis	375	78	453	41.98	0.208
Thrips hawaiiensis	42	2	44	4.07	0.47
Tusothrips pseudosetiprivus	14	1	15	1.39	.071
Micothrips fasciatus	3	0	3	.278	0/3
Total	923	156	1079		

that it presented variations for each of the species during different months and for the same species in the same month (Figs. 1 & 2). *H. gowdeyi* presented the highest frequency distribution in 1972 being more conspicuous in June. *F. schultzei* was the next populous species with others following at different levels. In 1973 the frequency of the primary species varied greatly due to the sudden spurt in the population of *M. distalis*. The number of *M. distalis* per flower per day was highest during the period 13.8.1973 to 22.8.1973. This abudance was not only due to the absence of other species but also to

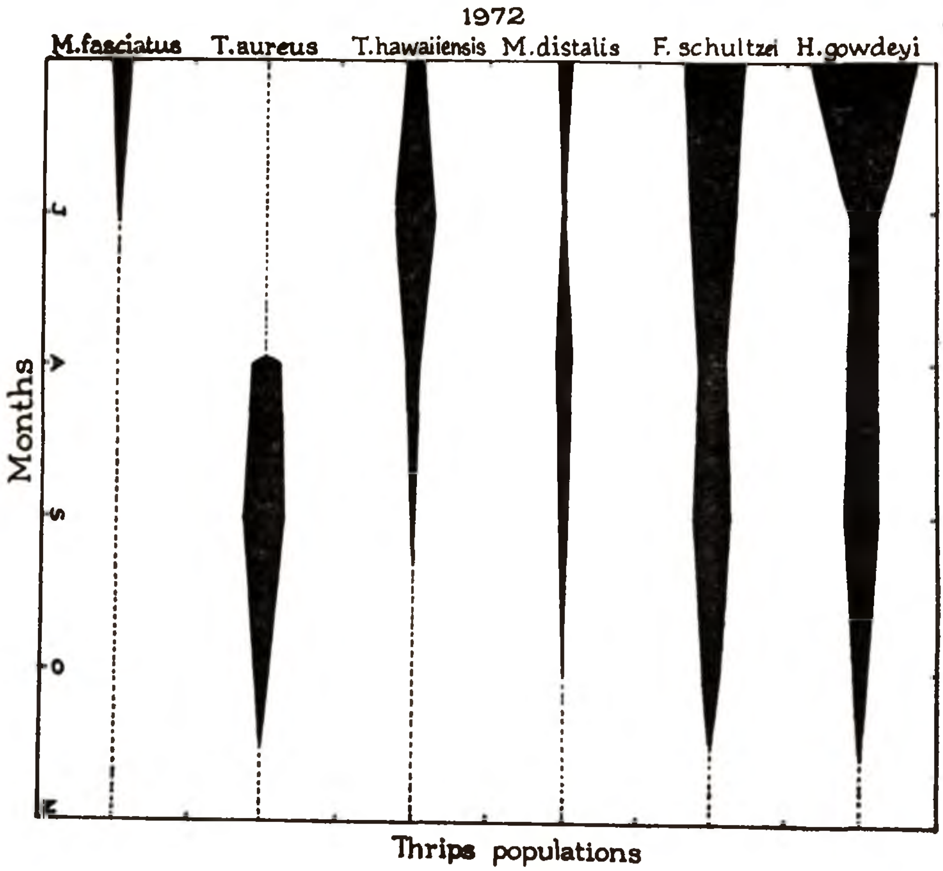
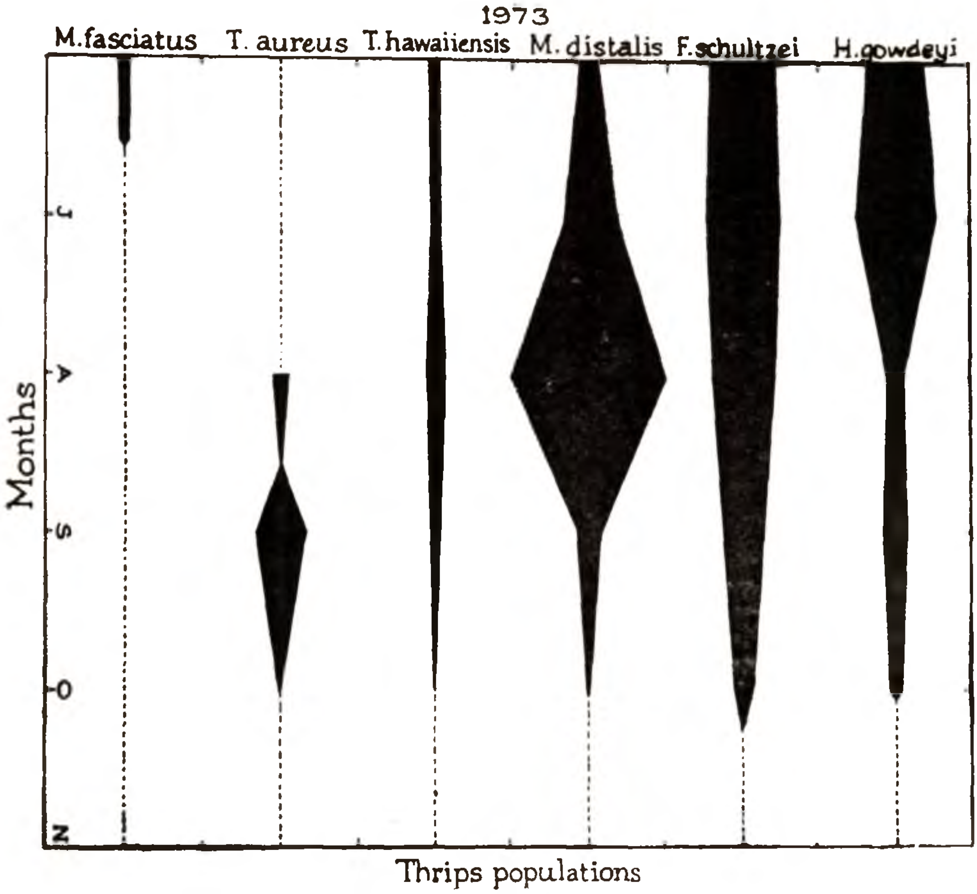


Fig. 1 (above) and Fig. 2 (on Page 75) showing the distribution and succession of the species during different months.

the exclusion of the primary species, an ideal example where other species are overshadowed by mere numerical abundance — an instance of interspecific competition. Irrespective of whether they are primary species or tertiary species, all of them appear to be at the mercy of density independent factors especially temperature and humidity. This is further confirmed by the fact that at no time of collection throughout the two year period was there a predator or prey observed and the flowers have only a short duration about 2–3 days. That the control is primarily density independent is illustrated by the differential periods of abundance or sparseness. For example, in June-July there was an abundance of the primary species and a sparseness of secondary species. The intermediate conditions afforded by August–September saw a richness of primary species. But in 1973 *H. gowdeyi* was relatively sparse. Among the secondary species *T. hawaiiensis* was conspicuously sparce in 1972 and 1973 but *M. distalis* which was found only in fewer numbers in 1972 was very abundant in 1973. With regard to the tertiary species *T. aureus* had its sparseness, richness and decline in August–September and *M. fasciatus* was totally absent in these two months. But the month of June had seen a reverse situation



with *M. fasciatus* being abundant and *T. aureus* totally absent. That the drier conditions of the atmosphere encourage abundance of thrips on the flowring plants are discussed by Lamb (1965) and Lewis (1973). Von Oettingen (1942) similarly points out that wet conditions had a scarcity of thrips. Comparison of data of 1972 and 1973 (Fig. 3) would indicate that this abundance is especially conspicuous with regard to primary and secondary species.

The collections of 2 years indicated that the larvae of primary and secondary species were frequent in occurrence and those of tertiary species were relatively sparce. *H. gowdeyi* larvae appeared in maximum numbers among the primary species. During the phase of collection, when *M. distalis* temporarily excluded the primary species from the environment, it was interesting to observe that not even one larva of *M. distalis* was observed.

H. gowdeyi, an exclusively anthophilous thrips was present throughout the period of study. Similarly, *F. schultzei* was observed in all collections although in fewer numbers. Their abundance even in situations when climatic factors were extreme, mark them out as the most successful inhabitants and euroecious species. The failure of *M. distalis* and *T. hawaiiensis* to do so and their tendency to increase in mumbers only when

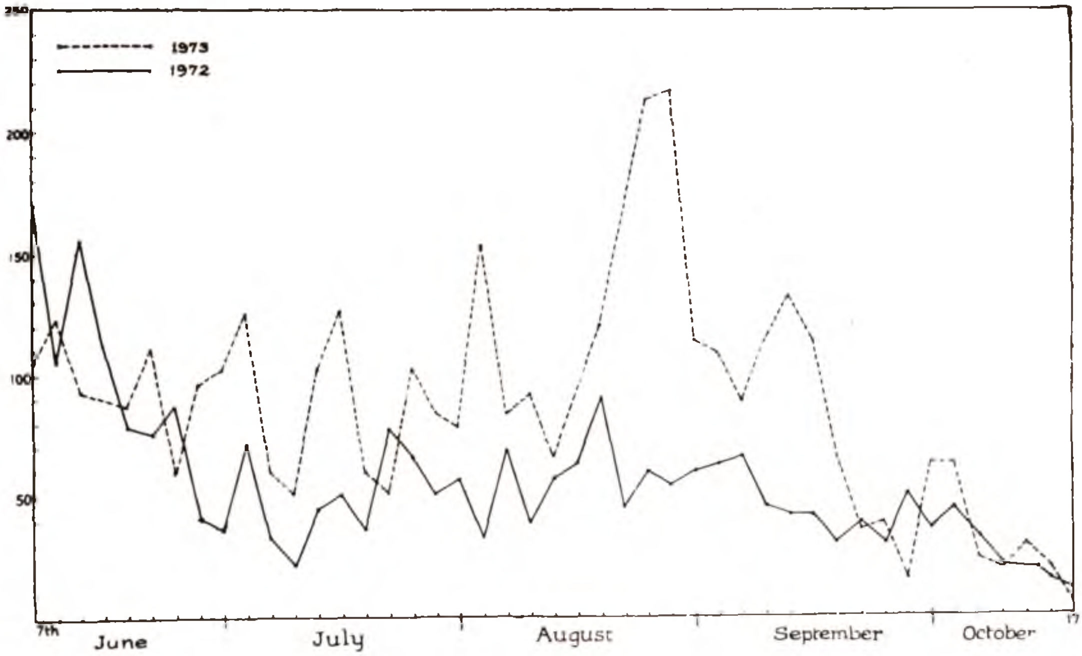


Fig. 3. Total population counts in fortyfive flowers made every third day from 7th June to 17th October.

proper environmental conditions arise mark them out as the secondary species.

Taking into consideration that no notable predator was observed the only density dependent factor evident is the interspecific competition between different species. As MILNE (1957) points out it is a very important density dependent factor since the rise and fall of populations is controlled by it. The principal environmental factors controlling thysanopteran populations seem to be density independent ones–especially temperature and humidity, Since rainfall is sparse during these months it is never an important factor. DAVIDSON & ANDREWARTHA (1948 a, b) and ANDREWARTHA & BIRCH (1954) considered from their srudies on *Thrips imaginis* on roses that rainfall and temperature can together control thrips populations when density dependent factors are totally absent. But a situation devoid of density dependent factors is remote and hence one has to agree with MILNE (1957) who states that fluctuations are the result of density independent factors and oscillations due to density dependent ones, and it is the interaction of the two factors that regulates a population.

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