

Agriculture plays an important role to determine the economy of Kerala. Being primarily an agricultural state, contribution of Kerala to the vegetable crop industry is a crucial one. However, despite the rich diversity of pests on these crops, knowledge on their faunal composition particularly of mites as pests and other related details remains very much limited. In this context, the present study, though throws light only on the tetranychid fauna of selected few can be considered as a basic framework for further research along this line.

In the present investigation, association of 5 most common and dominant species of spider mites of local importance with a few economically important vegetable crops was studied in detail. Further, the study shed light on the feeding habits of the selected species and helped assess the damage potential qualitatively and quantitatively, unravelling the relative abundance, host range, seasonal distribution and the population distribution pattern of the selected species of spider mites on the leaves of the host plant.

Aerial parts of the plants, especially the leaves and leaflets that showed mite infestation were collected with the help of a scissors and transferred to polythene bags, labelled and transported to the laboratory. The collected samples were examined individually under a stereo zoom microscope. Live mites were either transferred to 70% alcohol for further processing or to fresh leaves for biological studies. Rearing of species of interest for in-depth studies on feeding was made by culturing them on artificially set up experimental and control plots. Studies on the life history parameters were initiated by raising laboratory cultures of the mites by rearing them on leaves of their respective host plant as food. Daily observations

were made on the mode of feeding and damage induced by the mites. The damage potential was evaluated by adopting different approaches like estimation of loss of chlorophyll content, estimation of phenol content and so on. The various aspects of the study have been presented in appropriate chapters with special emphasis on the survey of acarine fauna associated with 40 species of vegetable crops cultivated in different localities covering 6 districts of Kerala and feeding biology of 5 species of spider mites belonging to 3 different genera showing potentiality as major pests.

Survey of the acarine fauna revealed the occurrence of members belonging to 3 orders, Prostigmata, Mesostigmata and Oribatida. Prostigmata confirmed maximum acarine inquilines figured by 3 super families, Tetranychoida, Tarsonemoidea and Eriophyoidea, detected in all of the 25 collection sites, thereby claiming maximum diversity, closely followed by members of Mesostigmata and Oribatida. Of the various species of Prostigmatids recovered, 5 species of mites representing family Tetranychidae belonging to 3 genera viz., *Tetranychus*, *Eutetranychus* and *Oligonychus* were considered for detailed biological studies. The above 5 species were *T. neocaledonicus* Andre, *T. ludeni* Zacher, *T. cinnabarinus* (Boisduval), *E. orientalis* (Klein) and *O. biharensis* (Hirst).

The survey of host plants associated with the tetranychid fauna revealed 40 species of economically important plants, especially vegetable crops belonging to 36 genera and 22 families cultivated in agricultural fields, home yards and kitchen gardens in 25 different sites covering 6 districts of Kerala viz., Malappuram, Kozhikode, Kannur, Wayanad, Palakkad and Thrissur. However, detailed studies

were initiated on 7 species of host plants duly considering their availability, supreme status and severity of mite infestation on them.

Studies on the seasonal distribution of the selected species of mites during the study period revealed their presence throughout the year at peak, moderate or scanty levels. *T. neocaledonicus*, *T. cinnabarinus*, *E. orientalis* and *O. biharensis* occurred at peak levels mainly during summer from February to April or May while *T. ludeni* showed its presence at peak levels from May to July. Study of relative abundance of the spider mite species revealed variations at interspecific and intraspecific levels. Of the 5 species, *T. ludeni* was found to be the most abundant species in terms of population density, followed by *T. cinnabarinus*, *T. neocaledonicus* and *O. biharensis* and *E. orientalis*, which happened to occur only at low to scarce levels. Data on differential distribution pattern of the spider mites evidenced the occurrence of *E. orientalis* and *T. ludeni* on the upper leaf surface, *T. neocaledonicus* and *T. cinnabarinus* on the underside while *O. biharensis* on the other hand showed equal distribution on both sides of the leaf blade.

Results of the feeding experiments conducted in the laboratory on *T. neocaledonicus* infesting *V. unguiculata* and *A. tricolor*; *T. ludeni* on *M. deeringiana*; *T. cinnabarinus* on *C. papaya* and *D. lablab*; *E. orientalis* on *M. oleifera* and *O. biharensis* on *M. esculenta* leaves reflected on active feeding by the different life stages by piercing the leaves and sucking the cell contents. Combined and extensive feeding by the mites resulted in acute chlorosis of the leaves. Estimation of the damage potential of the above species through analysis of chlorophyll content of the leaves, in terms of percentage loss of chlorophyll 'a' and

'b', respectively yielded  $47.58 \pm 2.1$  % and  $48.30 \pm 2.2$  % for *T. neocaledonicus*,  $34.57 \pm 2.2$  % and  $43.32 \pm 3.3$  % for *T. ludeni*,  $41.07 \pm 2.1$  % and  $50.81 \pm 1.6$  % for *T. cinnabarinus*,  $36.26 \pm 0.99$  % and  $35.40 \pm 2.0$  % for *E. orientalis* and  $29.40 \pm 1.6$  % and  $46.03 \pm 1.0$  % for *O. biharensis*. Interestingly enough, this loss was found to reach 80% levels in cases of severe infestations. Analysis of total phenolics revealed an increase of about 2 - 2.5 mg phenol/100 gm plant material following *T. neocaledonicus* infestation and 10 – 12 mg phenol/100 gm plant material following infestation by *O. biharensis*. The overall impact of spider mite feeding had resulted in the total destruction of the photosynthetic machinery of the plant leading to its final collapse. These results thus clearly established the potentiality of the leaf sucking forms in damaging the host plants.

A worth mentioning aspect of the study was the incidence of *E. orientalis* on *M. oleifera* and *T. ludeni* on *M. deeringiana*, both of which were new records of host plants, so far unreported from India. Further investigations should aim at providing undisputable evidence of new host plants yet to be explored, thereby necessitating further attention to be focussed on this aspect.

The shorter developmental period averaging 6 – 12 days for the above 5 species helped them in successfully completing 2-5 generations per month during favourable conditions corresponding to the temperature-humidities as reflected from the present investigation. These conditions could be identified as the ideal conditions for the population build-up of the mite in field conditions also. This seems to explain why these spider mites could multiply and attain pest status especially during the drier and hotter months of the year in Kerala.