

## Abstract

Studies on the bioecology of thrips on French beans were carried out at Machakos, Kaguru and JKUAT. The general objectives of this study were twofold, namely to study the biology and population dynamics of thrips on French beans and to identify and evaluate indigenous natural enemies of the thrips. Two thrips species, *M. sjostedti* and *F. occidentalis* were found throughout the year on French bean crops in all localities of the study. Their population peaks occurred at different times in the course of the year. Populations of *M. sjostedti* peaked after the rains while those of *F. occidentalis* occurred during the hot and dry months of the year at all the localities. Studies on the movements of thrips, into and out of the French bean crops showed that colonization by both species begins soon after germination and that both species preferred the flowers to other plant parts. *F. occidentalis* was found to thrive equally well on the leaves, unlike *M. sjostedti* which only inhabited flower buds and flowers. During the pre-flowering phase of the crop, *M. sjostedti* were found on the terminal buds from where they moved to the flowers immediately after the onset of flowering. Most first instar larvae emerged from the pods and flowers. Petioles, leaves, flower buds, flowers and pods were used as oviposition substrates by the thrips to varying extents. Analysis of the spatial distribution showed both species to be significantly aggregated in the respective plant parts. Laboratory studies indicated that developmental period decreased with an increase in temperature for all the stages of *M. sjostedti* and *F. occidentalis*. Developmental threshold temperatures were calculated as 9.6 and 9.0 for *M. sjostedti* and *F. occidentalis* respectively. Development from egg to adult required 212.0 and 256.8 Degree Days for *M. sjostedti* and *F. occidentalis* respectively. However, at 15°C and 30°C, mortality rates for all the developmental stages were higher for *M. sjostedti* than *F. occidentalis*. The highest mortalities were recorded for the first instar larvae for both species, ranging from 15% to 42% and 11% to 30% for *M. sjostedti* and *F. occidentalis* respectively. Pre-pupae and pupae had the lowest mortality rates. An indigenous anthorid bug, *Orius albidipennis* was found throughout the year in all the three field sites. Studies on the functional responses of *O. albidipennis* to *M. sjostedti* showed that more second instar larvae than adult *M. sjostedti* were killed at all the temperature profiles and densities. With increase in temperature, more second instar larvae and adult *M. sjostedti* were killed. High  $f_2$  values show that both Types I and IT functional responses provided good fit for the data at 15°C, 25°C and 28°C. Attack rates also increased with an increase in temperature. Mortality rates of the *O. albidipennis* nymphal instars decreased from the first to the 5th instar at all the temperatures. The mortality rates at 25°C were lower than at 20°C and 30°C for all the nymphal instars except the first instar. Temperatures had a significant effect on the pre-oviposition period, which decreased with an increase in temperature. The eggs took long to hatch at 20°C. Developmental periods of each of the nymphal instars decreased with an increase in temperature. An indigenous larval endoparasitoid of thrips, *Ceranisus menes*, was found throughout the year in the three localities and its population peaks occurred in the late and early months of the year, from October to April. A closer correlation was found between *C. menes* and *F. occidentalis* than with *M. sjostedti*. At JKUAT, percentage parasitism, over the entire crop cycle, ranged from 3.5% to 19.5% and peaked in the months of March and April. The lowest percentage parasitism coincided with the period of the highest *M. sjostedti* infestation on French beans. Linear regression analysis showed a density dependence relationship between parasitism and larval

density. Laboratory experiments showed that *C. menes* successfully parasitized and completed development in both *M. sjostedti* and *F. occidentalis*. Developmental times of *C. menes* in *M. sjostedti* and *F. occidentalis* were not significantly different.