PATTERNS OF SPECIES CO-OCCURRENCE OF FRUIT FLIES IN ORCHARDS OF GUAVA (*Psidium guajava* L.), LOQUAT (*Eriobotrya japonica* LINDL.), AND PEACH (*Prunus persica* BATSCH)

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INTRODUTION

Species of fruit flies of economic importance in Brazil belong to four genera: *Anastrepha*, *Bactrocera*, *Ceratitis*, and *Rhagoletis* (Zucchi, 2000a). Among them, the species of *Anastrepha* Schiner, 1868 and *Cetatitis capitata* (Wiedemann, 1824) are of greatest economic importance. *Anastrepha* is represented by 115 valid species in Brazil, occurs in all regions of the country, and infects a wide variety of native and cultivated fruits (Zucchi, 2000b, 2008). The Mediterranean fruit fly, *Ceratitis capitata*, was introduced in the early twentieth century (Zucchi, 2000a). It is also widely distributed in Brazil and it is associated with 84 plant species (Zucchi 2012). In spite of the economic importance of these insect pests, little is known about their seasonal patterns of abundance and the potential for positive and negative associations among different fruit fly species.

OBJECTIVES

The main objective of this research is evaluate patterns of co-occurring species of fruit-flies through analysis of a binary presence-absence matrix in which each row represents a fruit fly species, each column represents a different trapping date, and the entries are the presence or absence of a fruit fly species in an orchard.

MATERIAL AND METHODS

Study area: This study was conducted at the experimental station of the Polo Regional de Desenvolvimento Tecnológico dos Agronegócios do Leste Paulista/Agência Paulista de Tecnologia dos Agronegócios (PRDTALP/APTA), in Monte Alegre do Sul, SP, Brazil, from January 2002 to January 2004, in orchards of guava (*Psidium guajava*); loquat (*Eriobotrya japonica*) and peach (*Prunus persica* Batsch) trees. Data collection: Fruit flies were collected in McPhail traps containing protein-rich torula as an attractant. Three traps were installed in each orchard (guava, loquat and peach), and traps were censused and emptied weekly from January 2002 to January 2004. The screening of captured insects was performed in the laboratory of PRDTALP/APTA. Adults of *Anastrepha* and *C. capitata* were sexed, quantified, labeled, and stored in 70% ethanol. The identification of *Anastrepha* was based exclusively on specimens of females. Data Analysis: The data from each orchard collected in a year were organized into matrices in which each row represents a species, each column represents a sample, and entries indicate the presence (1) or absence (0) of a species at a sampling period (McCoy, Heck 1987). Data were analyzed separately for each orchard and year of collection. For each matrix, the co-occurrence pattern for each unique species pair was summarized as the C score (Stone; Roberts 1990), which measures the degree of aggregation or segregation among trapping times. The statistical significance for each species pair was calculated with the software package PAIRS (Ulrich 2008). With n species in the matrix, there are (n)(n-1)/2 possible pairs of species, and many of these pairs may not be biologically or statistically independent from each other (Gotelli and Ulrich, 2010). Using the PAIRS software, we identified the extreme pairs that were beyond the 95% confidence interval.

RESULTS

In each orchard, the number of species recorded varied between the two years: 11 and 12 species in guava; 18 and 13 species in loquat, and 7 and 6 species in peach. In the guava orchard in the first year, there were three non-random pairs of species, of which two were segregated (*C. capitata* x *A. obliqua* and *C. capitata* x *A. grandis*) and one was aggregated (*A. obliqua* x *A. distincta*). In the second year, the pattern was very similar, with two pairs of segregated species (*C. capitata* x *A. obliqua* and *C. capitata* x *A. sororcula*) and one pair of aggregated species (*A. obliqua* x *A. sororcula*). In the loquat orchard in the first year, there were three significantly segregated species pairs (*C. capitata* x *A. obliqua*, *C. capitata* x *A. grandis* and *A. bistrigata* x *A. pseudoparallela*) and five aggregated species pairs (*A. sororcula* x *A. bahiensis*, *A. sororcula* x *A. bistrigata*, *A. obliqua* x *A. grandis*, *A. zenildae* x *A. barbiellinii* and *A. punctata* x *A. consobrina*). In the second year, there were two segregated pairs (*C. capitata* x *A. obliqua* and *A. obliqua* x *A. pseudoparallela*) and one aggregated pair (*A. obliqua* x *A. sororcula*). In the peach orchard in the first year, there were two segregated species pairs (*C. capitata* x *A. bistrigata*) and one aggregated pair (*C. capitata* x *A. sororcula*). In the second year, there was only one aggregated pair (*C. capitata* x *A. sororcula*).

DISCUSSION

In most cases in the guava and loquat orchards, the Mediterranean fruit fly, *C. capitata*, was segregated from other *Anastrepha* species. In other words, when *C. capitata* was present, species of *Anastrepha* were usually not found. This pattern of occurrence is interesting because *C. capitata* is an exotic species and it appears to be locally excluding native species of *Anastrepha*. According to DeBach and Sundby (1963), based on competitive displacement principle, different species with identical ecological niche cannot coexist for long in the same habitat. This reinforce that the occurrence pattern of fruit flies here presented may be deeply relationship of the phenology and availability of host of fruit trees around the orchards.

CONCLUSION

The Mediterranean fruit fly *C. capitata* occurs infrequently with native *Anastrepha* species in guava and loquat orchards at the experimental station in Monte Alegre do Sul, SP, Brazil. However, in a peach orchard, *C. capitata* occurs in significant aggregations with some species of *Anastrepha*.

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