

Poster: Genetics and Biotechnology

Use of highly resolving molecular tools to assess the seasonal population dynamics of *Ceratitits capitata*

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Background: The Mediterranean fruit fly, *Ceratitits capitata* (Diptera: Tephritidae), is an important pest species of African origin and has been introduced at various locations outside the species' natural range. It has made its way into Europe in the 19th century and became well established throughout the Mediterranean Basin. It is rapidly expanding its range and has the ability to colonize a wide variety of environments. Incursions of *C. capitata* beyond the northern margin of its range are increasing while established populations are pushing the boundaries of the species' current distribution further north. However, knowledge on annual and seasonal population dynamics of *C. capitata* is lacking. For this reason, we assessed whether populations within the core of European *C. capitata* distribution and populations at the edge of the distribution (marginal areas and satellite occurrences) show different genetic signatures in terms of genetic structuring and genetic diversity on a temporal scale.

Methods: To address our objectives, flies were repeatedly collected at locations in core, marginal and satellite regions within the *C. capitata* distribution. DNA samples were acquired and submitted for Whole-Genome Resequencing, followed by SNP-calling. Genetic differentiation (F_{ST}) was calculated and spatio-temporal structuring was assessed using admixture, principal component and cluster analysis together with kinship estimation. In order to test for significant differences between seasons, a series of permutation tests were performed.

Results: *C. capitata* in Europe exhibits a low level of spatial genetic structuring and could be a typical example of range expansion with a rapid invasion of suitable habitat. Additionally, we bring forward evidence of significant annual variation in genetic composition in populations of *C. capitata* at multiple locations. The case study of satellite occurrences (Vienna, Austria) suggested that isolated allotments where fruits and vegetables are grown on a small scale, likely serves as a habitat of transient nature with independent year-to-year genetic variation.

Conclusion: Here, we provide evidence for annual variation in genetic composition at both the core and margin of the distribution of *C. capitata*. The occurrence of *C. capitata* in Vienna is likely associated with annual fruit import and populations there are assumed to be transient. Geographical structuring of *C. capitata* in Europe is weak which is likely the result of intense gene flow and a shared ancestry.

Keywords: temporal genetic variation, Mediterranean fruit fly, population genetics, WGS