THE GENOMIC BASIS OF ECOLOGICAL ADAPTATION IN A DROSOPHILA AGRICULTURAL PEST

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Drosophila suzukii is one of the few fruit flies capable of laying eggs and feed on fresh fruit. Its recent outbreak in western countries from Asia, and its peculiar ecological behaviour makes it an emerging model in pest management and evolutionary biology. To understand the molecular basis behind the switch from fermenting to fresh fruit reproductive habit, we mined *D. suzukii* genome(s) and performed thorough comparative studies of its repertoire of chemosensory genes against genomes of 21 other *Drosophila*.

Although odorant and gustatory receptors in *D. suzukii* follows a typical birth-and-death model of evolution, there are local significant expansion and contractions in receptors associated with fruit detection and oviposition choice. Odorant receptors that are responsible for fresh fruit detection and oviposition site choice in *D. melanogaster* experience duplication in *D. suzukii*, and even show significant signals of adaptation. On the other hand genes involved in detecting fermentation in *D. melanogaster* are either pseudogenes or experienced neofucntionalisation. Notably, these genes are extremely different in the genomes of European and American populations, suggesting that ancient adaptive losses of function have been followed by separation of population in Asia. These results are being validated by targeted PCR in different populations, and are finding pleasing reciprocal confirmations with chemical ecological and neurobiological experiments.

Our comparative analyses reveal key genomic adaptations responsible for the building of a new ecological behavior, and unveil key genes which may become target of field chemical control strategies.