Proceedings of the 56th Italian Society of Agricultural Genetics Annual Congress
Perugia, Italy – 17/20 September, 2012
ISBN **978-88-904570-1-2**

Oral Communication Abstract – 1.05

ARF AND Aux/IAA PROTEINS IN THE DEVELOPMENTAL TRANSITION LEADING TO FRUIT SET IN THE TOMATO

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tomato, fruit set, parthenocarpy, auxin signaling, transcriptional regulation, Solanum lycopersicum

The onset of ovary development into fruit, the so-called fruit set is naturally triggered by successful pollination of the flower. Yet, the the signals that drive fruit growth after fertilization are not clearly understood, even though the involvement of some plant hormones, such auxin and GA, in the fruit set is becoming well documented. However, the molecular mechanisms underlying the auxin control of fruit initiation remain largely unknown. We previously showed that down-regulation of *SlIAA9*, a tomato member of the *Aux/IAA* gene family, leads to fruit development prior to flower fertilization giving rise to parthenocarpy. Subsequently, the search for putative IAA9 interacting partners identified SlARF8 as a solid candidate. Expression analysis revealed that *SlARF8* transcript levels remain low in unpollinated flowers but increase dramatically after flower pollination. Interestingly, the over-expression of *SlARF8* in transgenic tomato results in the production of seedless fruit indicating that the altered expression of either of the two genes leads to pollination-independent fruit set and parthebnocarpy, fully supporting their direct role in the fruit initiation process. Further investigation revealed that the tomato microRNA, miR167, causes degradation *SlARF8* transcripts and that under-expressing this microRNA in transgenic tomato lines yields parthenocarpic fruit. All together, the data define a new regulome controlling the flower-to-fruit transition involving SlARF8 as a key actor. The expression of SlARF8 is under double control, by SlIAA9 at the post-translational level and by microRNA at the post-transcriptional level. Moreover, genome-wide transcriptomic profiling of the fruit set process suggested an active hormonal interplay involving, mainly auxin, GA and ethylene, that is likely to be the essential features underlying this developmental transioning. The present study uncovers a control mechanism of the fruit set process in which the down-regulation of the central player Sl-IAA9 represents the initial event that triggers the cascade of changes in gene expression associated with the flower-to-fruit transition. Overall,the work indentifies new targets for breeding programs aiming at improving fruit yield and at producing parthenocarpic fruit.