Title:
3040- Evolution of the Y-chromosome and the two sex determinants in the genus Actinidia

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Abstract body text:
Separated sexuality (or dioecy) is a main strategy to maintain genetic diversity within a species. Although theoretical models for the evolution of dioecy are well established, little is known about the evolutions of the specific genes responsible to sex and the sex chromosomes. Actinidia, including various kiwifruits, is a dioecious genus. We have identified the male-specific region of the Y-chromosome (MSY) and the Y-encoded two sex-determinants, named Shy Girl and Friendly Boy, from the A. chinensis genomes (Akagi et al. 2018, 2019, Varkonyi-Gasic et al. 2021). Despite the long history of their Y-chromosomes (> 20 millions years ago), of which the establishment predated the origin of the genus Actinidia, the MSY is substantially smaller (up to 1-Mb) than suggested in the conventional models for plant sex chromosomes. Here, we assessed the conservation and genetic diversities of the genes located on the MSY, among the Actinidia species. We also drafted the whole genome sequences of diploid A. arguta var. hypoleuca, which is one of the most distant relatives to A. chinensis in the genus Actinidia, and compared the genomic structures of the MSYs. The results suggested that the two sex determinants could solely play main roles in both the sex determination and expression of the sexual dimorphisms, while the surrounding regions might not be co-evolved with the sex determinants.

Transformation and gene-editing of Shy Girl / Friendly Boy in model plants and kiwifruits, respectively, supported this possibility. These all would propose a new aspect of homomorphic sex chromosome evolution in plants.