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Loss of function of SPFF, a novel receptor-like kinase, induces parthenocarpy in tomato

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We are facing to the global warming. Fruit yield is decreased under high temperature because of a failure in pollination. To improve fruit yield under harsh environmental conditions, it is needed to understand the mechanism of fruit set. However, its genetic and molecular factors remain poorly understood. Analyzing the mechanism of parthenocarpy, fruit set without pollination, will help to identify the key regulators that control fruit set. A mutant named small parthenocarpic fruit and flower (SPFF) was obtained by γ -ray irradiation of Micro-Tom seeds. In this study, we aimed to identify and characterize the responsible gene for parthenocarpy in SPFF mutant. First, we characterized the visible phenotypes, size of cells and ploidy levels. The characterization of SPFF mutant was male sterility, floral organs dwarfism and parthenocarpic fruits with high ploidy levels. Second, in order to identify the responsible gene for these phenotypes, positional cloning by fine mapping and RNAi strategy were performed. They allowed us to identify that a loss of function of a gene coding a receptor like kinase (SPFF) triggers parthenocarpy. Third, to analyze the function and characterization of SPFF gene, RNA sequence and in situ hybridization were performed. SPFF expressed higher at receptacle than the other organs including reproductive organs in developing buds. The expression level of cell cycle genes (CDKB) and the gene maintaining stem cell (WUSCHEL) were affected at developing ovule. According to these results, our research brought a new point of view of the mechanism of fruit set, that they are supposed to be regulated by a receptor like kinase named SPFF. Furthermore, we also brought an idea that a responsible gene for parthenocarpy was expressed in receptacle and supposed to be in vascular bundle although the function of receptacle and vascular bundle during fruit set in tomato had not been noticed so far.

Biography

Hitomi Takei has received Bachelor's degree of Bio-resource Science from the University of Tsukuba in 2016. Currently she is pursuing International Double degree Master's Program co-organized by the University of Tsukuba in Japan and University of Bordeaux in France. She has her passion in working toward a solution of food security problems in African countries and other developing regions of the world by improving yields of vegetables and crops.

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