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GENETIC CHARACTERIZATION OF A NOVEL POLLEN-PART SELF-COMPATIBLE MUTANT OF JAPANESE PEAR IN PROGENY OF A CROSS USING POLLEN FROM A CHRONICALLY GAMMA-IRRADIATED TREE

Most of the important fruit crops in the subtribe Pyrinae of the Rosaceae, such as apple and pear, exhibit S-RNase–based self-incompatibility. In 2013, we selected a pollen-part self-compatible mutant of Japanese pear (*Pyrus pyrifolia*), designated 415-1, from the progeny of a cross using pollen from a 'Kosui'tree chronically exposed to low-dose-rate gamma-irradiation in the gamma field at the Radiation Breeding Division, Institute of Crop Science, NARO. We developed a new self-compatible mutant selection (designated 391-1) of Japanese pear, which was identified from among male-derived progeny of a gamma-irradiated 'Nijisseiki'tree. CAPS analysis of the S-RNase genes indicated that the S haplotype of 391-1 was S2S4. Crosses between 391-1 and self-incompatible cultivars with S2 and/or S4 haplotypes revealed that the styles of 391-1 accepted S4 pollen but rejected S2 pollen. Furthermore, the pollen of 391-1 was not rejected by self-incompatible cultivars containing the same S haplotypes. Thus, this selection was determined to have mutations in both pollen and stylar functions of self-incompatibility. Segregation analyses of S haplotypes of the progeny of 'Niitaka'× 391-1 revealed a duplication of the S2 haplotype; thus, the accurate S haplotype of 391-1 is S2S2S4. Furthermore, segregation analyses of SSRs in the same linkage group as the S haplotype revealed a segmental duplication encompassing an S2 haplotype. Similarly, 415-1 (S4S5S5) has a segmental duplication encompassing an S5 haplotype.
These results indicate that pollen-part self-compatibility in *Pyrus* does not require mutation of a pollen S factor, but can be caused by duplication of an S haplotype. Further, they demonstrate the effectiveness of using pollen from irradiated plants to obtain self-compatible mutants of fruit crops in the Pyrinae.

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