OsATM safeguards accurate repair of meiotic double-strand breaks in rice

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Abstract

ATAXIA TELANGIECTASIA-MUTATED (ATM) protein has been well studied for its roles in the DNA damage response. However, its role in meiosis has not been fully explored. Here, we characterized the functions of the rice (*Oryza sativa*) ATM homolog during meiosis. Aberrant chromosome associations and DNA fragmentations were observed after the completion of homologous pairing and synapsis in *Osatm* pollen mother cells (PMCs). Aberrant chromosome associations disappeared in *Osspo11-1 Osatm-1* double mutants and more severe defects were observed in *Osdmc1 Osatm*, suggesting that OsATM functions downstream of OsSPO11-1-catalyzed double-strand break (DSB) formation and in parallel with OsDMC1-mediated homologous recombination. We further demonstrated that phosphorylation of H2AX in PMCs did not depend on OsATM, in contrast to the situation in somatic cells. Moreover, the removal of OsDMC1 from chromosomes in *Osatm* PMCs was delayed and the number of HEI10 foci (markers of interference-sensitive CO intermediates) decreased. Together, these findings suggest that OsATM plays important roles in the accurate repair of meiotic DSBs in rice.

Key Words: DSB repair; γ-H2AX; Homologous recombination; Meiosis; OsATM

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