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South Korea researchers explore genetic traits for Haploid induction in rice

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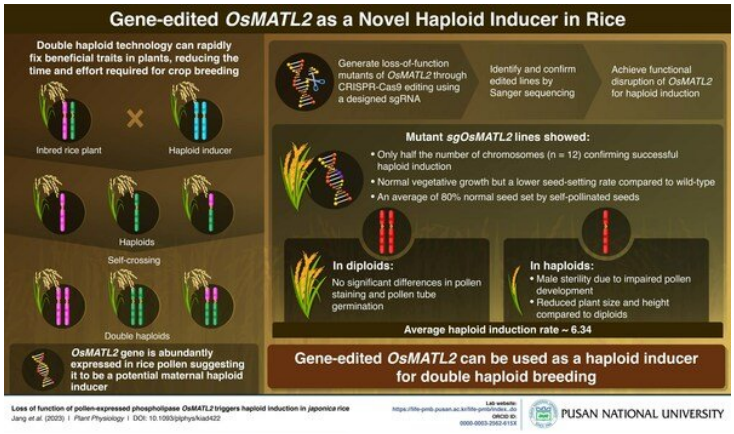

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Conventional crop breeding is not time-efficient for creating inbred lines with desired genetic traits owing to the diploid nature of plants, wherein they have two sets of chromosomes, one from each parent. In contrast, double haploid technology utilizes gene-edited haploid inducer plants to create double haploid crops that have two sets of chromosomes from a single parent.

This revolutionary agricultural method can create inbred crop lines in a single generation thereby accelerating the breeding process. Using a combination of GUS reporter genes, green fluorescent protein-tagged antibodies, and reverse transcriptase quantitative polymerase chain reaction, the team observed that OsMATL2 protein, a phospholipase enzyme, is highly expressed in pollen, primarily in the plasma membrane of cells of theÂ *japonicaÂ* rice plant. Researchers from Korea led by Dr.Â Yu-Jin KimÂ from PusanÂ National UniversityÂ identifiedÂ *OsMATL2*, a potential haploid-inducing gene in JaponicaÂ rice (*Oryza sativa japonica*).

Studies have unveiled the potential of specific genes in triggering haploid induction, a key step in double haploid technology. In particular, the geneÂ *ZmMATL*Â was identified as a pollen-specific phospholipase in maize that plays a role in haploid induction within the plant's reproductive processes. Building on this discovery, researchers demonstrated the conservation of pollen-specific phospholipase A-mediatedÂ *in vivo*Â haploid induction across various monocot species includingÂ *indica*Â rice by mutating theÂ *OsMATL*Â gene. However, the haploid induction rate (HIR) was found to be only 6% at best, which is far below the industry standard, suggesting a need to increase this rate.

This study showed the existence of a new haploid-inducing gene in rice. WhileÂ *OsMATL*Â andÂ *OsMATL2*Â genes have an individual HIR of ~6%, with their functional redundancy, it may be possible to mutate both genes to obtain a higher HIR. The applications of this research can revolutionize rice cultivation.Â *"Rapid crop breeding is required to combat climate change, abiotic stress, and threats from viruses. Identification of more haploid-inducing genes and understanding their mechanisms*

*during double fertilization in plants can reduce the time and effort needed for effective crop breeding,'*Â concludes Dr. Kim