An active nonautonomous DNA transposon, nDart1-0, belonging to the hAT superfamily, was identified. The transpositions of nDart1-0 were promoted by an active autonomous element, aDart1-27, on chromosome 6. By using the endogenous nDart1/aDart1-27 system in rice, a large-scale nDart-inserted mutant population could be easily generated under normal field conditions, and the resulting tagging lines were free of somaclonal variation. The nDart1 transposons tend to insert into the promoter, 5' UTR region, or exon of a gene, which suggests that the nDart1/aDart1-27 system is a powerful tool for rice functional genomics. Furthermore, we are developing several indica lines bearing the active nDart1/aDart1-27 system. These lines would effectively contribute to gene functional analysis and breeding for the indica rice varieties.

A rice mutant displaying a heterochronically elongated internode carries a 100 kb deletion

We have isolated a recessive rice mutant, designated as indeterminate growth (ing), which displays creeping and apparent heterochronic phenotypes in the vegetative period with lanky and winding culms (Figure 1). Rough mapping and subsequent molecular characterization revealed that the ing mutant carries a large deletion, which corresponds to a 103 kb region in the Nipponbare genome, containing nine annotated genes on chromosome 3.

Of these annotated genes, the SLR1 gene encoding a DELLla protein is the only one that is well characterized in its function, and its null mutation, which is caused by a single base deletion in the middle of the intronless SLR1 gene, confers a slender phenotype that bears close resemblance to the ing mutant phenotype. The primary cause of the ing mutant phenotype is the deletion of the SLR1 gene, and the ing mutant appears to be the first characterized mutant having the entire SLR1 sequence deleted. Our results also suggest that the deleted region of 103 kb does not contain an indispensable gene, whose dysfunction must result in a lethal phenotype (Figure 2).

Examination of transpositional activity of nDart1 at different stages of rice development

As a useful tool to elucidate gene functions, a rice transposon tagging line has been developed using an active endogenous DNA transposon, nDart1. It was highly desirable to evaluate the transposition timing and frequency of the nDart1 elements during rice development to facilitate the generation of an efficient mutant isolation system. Comparison of the detected new insertions at different stages of rice development by transposon display analysis demonstrated that the last heading tiller carry a higher number of nDart1 elements than the main culm. Moreover, it was revealed that the last heading tiller could produce progeny that carried more new insertions of nDart1 elements, mainly as a result of the accumulation of somatic insertions in the parental plant. This report demonstrates that late tillers increase the probability of producing independent mutant lines.

Publication List

〔Original papers〕


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