

15. FLATTENED SHOOT MERISTEM is required for shoot meristem maintenance in rice

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Shoot apical meristem (SAM) is the most important plant tissue, because it is a source of all lateral organs and acts as an organizer of plant form. For guaranteeing the repeated production of leaves during vegetative phase, the indeterminate cells in the SAM should be maintained stably. To understand how SAM maintenance is regulated genetically, several mutants affecting SAM maintenance have been characterized in *Arabidopsis* (Fletcher, 2002). In rice, however, only a few mutants involved in the maintenance of vegetative SAM have been reported (Sato et al. 2003). For better understanding of rice development, more genes should be analyzed. In this report, we describe a novel recessive mutant of rice, *flattened shoot meristem (fsm)*, which has defect in the SAM maintenance.

The *fsm* was identified as a recessive mutant showing abnormal seedling in a M₂ population of cv. Taichung 65 chemically mutagenized with N-methyl-N-nitrosourea. After germination, *fsm* plants were dwarf with shortened leaves (Fig. 1A). The roots were shortened, and the number of crown roots was reduced (Fig. 1A). Subsequent growth of *fsm* plants was retarded, new leaf emergence was gradually inhibited, and the plants became dead in succession. Finally, almost all the *fsm* plants died before two months after germination. To elucidate the cause of the lethality of *fsm* plants, we examined the shoot apices. At two weeks after germination, wild-type SAM is dome-like and forms leaf primordia regularly (Fig. 1B). In contrast, the SAM of *fsm* was flattened and seemed unable to produce new leaf primordia (Fig. 1C~E). The size of the SAM was remarkably reduced in most cases (Fig. 1C, E). These observations indicate that the SAM is not maintained properly and finally disappears in *fsm*. Thus, *FSM* is indispensable to the maintenance of shoot apical meristem in rice.

To determine the position of *FSM* locus, we crossed *FSM/fsm* heterozygote with indica cv. Kasalath. We selected mutant plants from the F₂ population and used them for the mapping. The *FSM* locus was confined within 12.2 cM on the long arm of chromosome 1 between two markers R1764 and S10526 (Fig. 2).

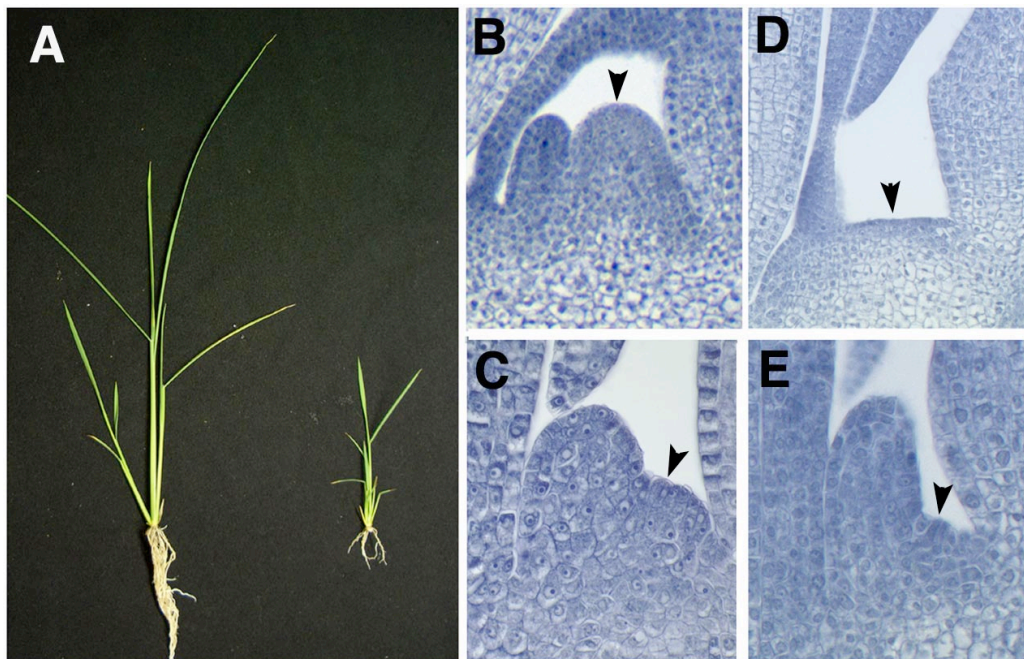


Fig. 1. Phenotype of *fsm* mutant. (A) Seedling of wild type (left) and *fsm* (right) two weeks after germination. (B) Shoot apex of two-week-old wild-type plant. (C~E) Shoot apices of *fsm* plants at one week, two weeks and one month after germination, respectively. Arrowheads indicate SAM.

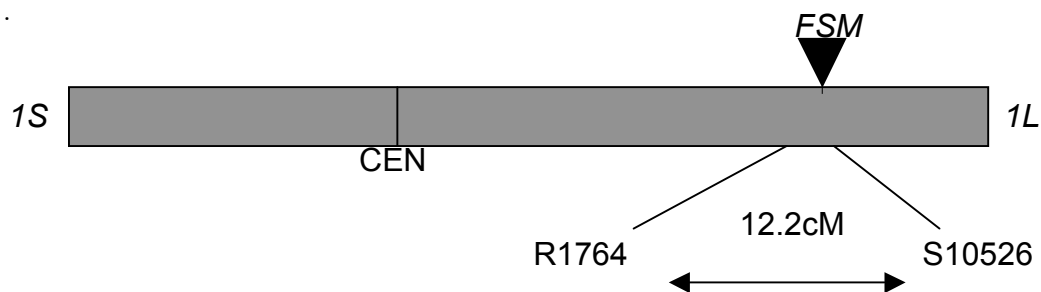


Fig. 2 Map position of *FSM* locus

References

- Fletcher, J.C. 2002. Shoot and floral meristem maintenance in *Arabidopsis*. *Annu Rev Plant Biol* 53: 45–66.
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