ABSTRACT

In plants, α1,3-fucosyltransferase (FucT) catalyzes the transfer of fucose from GDP-fucose to asparagine-linked GlcNAc of the N-glycan core in the medial Golgi. To explore the physiological significance of this processing, we isolated two Oryza sativa (rice) mutants (fuct-1 and fuct-2) with loss of FucT function. Biochemical analyses of the N-glycan structure confirmed that α1,3-fucose is missing from the N-glycans of allelic fuct-1 and fuct-2. Compared with the wild-type cv Kitaake, fuct-1 displayed a larger tiller angle, shorter internode and panicle lengths, and decreased grain filling as well as an increase in chalky grains with abnormal shape. The mutant allele fuct-2 gave rise to similar developmental abnormalities, although they were milder than those of fuct-1. Restoration of a normal tiller angle in fuct-1 by complementation demonstrated that the phenotype is caused by the loss of FucT function. Both fuct-1 and fuct-2 plants exhibited reduced gravitropic responses. Expression of the genes involved in tiller and leaf angle control was also affected in the mutants. We demonstrate that reduced basipetal auxin transport and low auxin accumulation at the base of the shoot in fuct-1 account for both the reduced gravitropic response and the increased tiller angle.