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Sorghum TCP transcription factor *MULTISEED1* affects grain yield regulating at pedicellate spikelet fertility

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Abstract

Inflorescence architecture mainly contributes to final grain yield in crops. Sorghum inflorescence is basically composed of one fertile sessile spikelet (SS) and two infertile pedicellate spikelets (PS). To identify regulatory factors involved in the inflorescence architecture, we screened an EMS mutagenesis population from the pedigreed sorghum mutant library. We found inflorescent architecture mutants, named as multi-seed mutants, *msd*, with gained fertile ability in PS and also an increased number of floral branches. In natural sorghum populations, it is not common that are fertile. A detailed dissection of developmental stages of wild type and *msd1* mutant described that the PS in wild type do not have floral organs, including ovary, stigma, filament and anther, while the *msd1* mutants generate intact floral organ in the sessile spikelet. We found *MSD1* encoded a TCP transcription factor using bulk segregant analysis (BSA) of F2 population, and was a strongly enriched expression during inflorescence developmental stages. We proposed that *MSD1* functions to suppress floral organ maintenance at PS during inflorescence development in Sorghum. To explore the regulatory network associated with PS fertility, whole genome expression profiling was performed at 4 different developmental stages in 6 various tissue types between wild type and *msd1*. Taken together, we demonstrated that *MSD1* was involved in the plant hormone and maybe influenced program cell death in PS via the activation of plant hormonal pathway.

Keywords: Sorghum, TCP transcription factor, inflorescence, floral organ, plant hormone

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