Emerging function of G protein in shoot apical meristem development and yield formation in tomato

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Program theme: Metabolite and Hormone Signalling

Oral

Abstract

Plant shoot apical meristem (SAM) development is closely related to crops yield formation. G protein plays an essential role in the regulation of plant SAM development and yield formation, but the underlying mechanisms are still unclear. Here, we show that tomato genome has one Gβ subunit and four Gγ subunits. Tomato Gγ subunit *ggc1* mutants had significantly increased SAM sizes and yields. CO_2 transport, photosynthesis, and carbon metabolism of the primary metabolism-related genes were significantly upregulated in *ggc1* mutants. The SAMs of tomato G protein β subunit *slgb1* mutants and other G γ subunits *gga1ggb1ggb2* triple mutants were lethal. The secondary metabolites phenolamides, particularly N-p-trans-coumaroyltyramine and N-trans-feruloyltyramine were massively accumulated in the apices of *slgb1* and *gga1ggb1ggb2* mutants. We further found that GGC1 protein inhibited the interaction between other three Gγ subunits and Gβ subunit by yeast three-hybrid and luciferase complementation assays. These results together indicate that G protein β and γ subunits influence either primary or secondary metabolism to precisely regulate SAM development, which will supply theoretical basis for the generation of novel tomato germplasms with high yield.