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To study the biochemical and physiological role of plastidic transporters and key enzymes in source metabolism of higher plants, we characterized transgenic plants with mutations in single mutants of three plastidic transporters, such as triose phosphate/phosphate translocater (TPT), glucose transporter (GT), and maltose transporter (MEX1), and the first step key enzyme, cytosolic fructose 1,6-bisphosphatase (cFBPase) which converts from triose-phosphates to hexose-phosphates in cytosol. We also generate double knock-out mutants of transporters and cFBPase. Phenotype and biochemical analysis indicate that GT functions to transport glucose from chloroplast to cytosol during night periods as well as daytime. The well known TPT which mainly functions during daytime seems not to be the key functioning transporter in Arabidopsis during daytime. In contrast with Arabidopsis, rice FBPase and TPT knock-out mutants show almost the same phenotypes of severe growth retardation, implying that TPT route is the main valve to transport photosynthetic carbohydrates to cytosol. In addition, the overexpression mutant of pyrophosphate dependent phosphofructokinase (PFK) grows much faster than wild type in Arabidopsis as well as tobacco plants, suggesting that this gene could be used for practical application to improve economic value of various vegetables and horticultural plants.