Molecular mechanisms of chromoplastogenesis

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Abstract

Carotenoids are powerful antioxidants and the main source of vitamin A that we can obtain through diet. The first enzyme in the carotenoid biosynthesis pathway is phytoene synthase (PSY), which catalyzes the production of phytoene from geranylgeranyl diphosphate (1). PSY activity is crucial, not only for carotenoid production, but also for the differentiation of chromoplasts, which are plastids specialized in accumulating carotenoids and other plastidic isoprenoids such as tocopherols (2, 3). In fact, chloroplasts from leaves can be transformed into artificial chromoplasts by transient expression of the crtB gene, which encodes a bacterial PSY. However, overexpression of plant PSY genes is unable to trigger this process because they do not reach sufficient phytoene production. Our hypothesis is that endogenous regulatory mechanisms limit the activity of plant PSY enzymes in chloroplasts, but not that of bacterial enzymes (2, 3).

Since a very important part of the regulation of PSY activity in plants occurs at the post-translational level and is mediated by binding to other proteins (1), our goal is to find proteins that interact with PSY (PIPs) that can improve its enzymatic activity and/or the production, transport and storage of phytoene, in order to increase carotenoid production and even trigger the artificial chromoplastogenesis phenotype for the generation of biofortified crops. One of the identified PIPs is FIBRILLIN6, a fibrillin able to interact with PSY and to improve phytoene production directly promoting the enzyme's activity (4). These and other results with other PIPs will be presented at the meeting.

Referencias

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