PTraD Initiative
形質転換植物デザイン研究拠点

University of Tsukuba
Plant Transgenic Design Initiative
44th PTraD Research Seminar
T-PIRC Research Seminar

Date and Time: 2018/10/22 (Mon) 14:00 –16:00
Place: Gene Research Center, Seminar Room (211)

Engineering tomato fruit for increased quality/added value traits

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In this seminar I will present a number of engineering cases aiming to increase tomato fruit quality which were all designed taking advantage of our Goldenbraid gene assembly technology.

Plastids are the cellular organelles where many of the visual, health and flavor-related metabolites are produced and stored in the fruit, and therefore are valuable components for consumers and breeders. During the last few years transcription factors implicated in fruit plastid biogenesis have been identified. GLKs described as co-regulators of photosynthesis-related genes, and APRR2 demonstrated to influence in fruit plastid development by over expression early in fruit development. Moreover, constitutive overexpression of each of those TFs was associated to increase organoleptic and nutritional quality in ripe fruits.

Our strategy consisted in introducing in a MM background (SlGLK2 deficient) SlGLKs and SlAPPR2 genes, separately and combined, controlled under a tomato spatiotemporal promoter which drives expression early in development. Engineered plants show a range of fruit chloroplast enhancement phenotypes where a novel additive effect resulted when both TF are coexpressed. Fruits are affected also in the ripening quality accumulating more sugars, carotenoids and specific volatiles than MM.

Paradoxically, over decades fruits with a high content in chloroplasts have been avoided by the breeders because it usually suffers of oxidative stress disorders; such yellow shoulder impairment and fruit cracking when the light intensity increases. Therefore, we also aim to improve tolerance to oxidative stress in traditional varieties (SlGLK2 functional). A cloning strategy to express tomato genes for MYB-BHL-WD40 anthocyanin regulatory complex under the control of the tomato light inducible promoter (PLI) is developed. Those plants resulted to accumulate high levels of anthocyanins in the fruit peel.

Finally a CRISPR Cas9 strategy directed to produce green flesh mutants will be presented to enhance fruit quality in tomato.

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