Strigolactone biosynthesis and action in rice and Arabidopsis

Shinjiro Yamaguchi[1]
[1]*Tohoku University*

Until recently, little was known about the strigolactone (SL) biosynthetic pathway. Recently, biochemical analysis of genetically identified components revealed that carlactone, which has an SL-like carbon skeleton, is produced from all-*trans*-β-carotene by sequential reactions of DWARF27 (D27), D17 (carotenoid cleavage dioxygenase7 [CCD7]) and D10 (CCD8) *in vitro*. Using ^{13}C-carlactone, we showed that ^{13}C-labeled carlactone is converted to ^{13}C-*ent*-2'-*epi*-5-deoxystrigol (4-deoxyorobanchol; 4DO), an endogenous SL in rice, *in planta*. Quantitative analysis of endogenous carlactone in Arabidopsis showed that it accumulates to an extremely high level in the *max*1 mutant, which is defective in a cytochrome P450 monooxygenase. This result suggests that carlactone is a direct substrate for MAX1. In fact, we found that carlactone is converted to a carboxylated metabolite, named carlactonoic acid (CLA), in a MAX1-dependent manner in Arabidopsis. Moreover, ^{13}C-CLA was converted to ^{13}C-4DO in rice. In Arabidopsis, CLA was converted to its methyl ester (MeCLA). We found that MeCLA, but not CLA, was able to interact with Arabidopsis D14 (AtD14) protein, an SL receptor, *in vitro*. These results suggest that MeCLA is biologically active in inhibiting shoot branching in Arabidopsis.