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Development of high-value traits transgenic soybean lines through metabolic engineering

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Metabolic engineering for production of secondary metabolites including isoflavones in soybean has been conducted to obtain rather diversified soybean lines in respectto synthesis of secondary metabolites and to have soybean lines what are less sensitive to environmental factors in term of secondary metabolites synthesis. We have cloned genes coded for isoflavone synthase (IFS) and chalcone isomerse (CHI); and have developed recombinant gene expression cassettes using soybean seed specific promoters. To investigate expression patterns of isoflavone synthase 1 and 2 gene, we isolated promoter regions and linked to GUS reporter gene. To have higher level isoflavone concentration in soybean seed, we have tried to synchronize IFS and CHI gene expressions in soybean seed. We used seed specific promoters showing similar expression. Additionally, we developed model systems to study soybean defense system against various stress and to identify transcription factors involved in phenylpropanoid pathway. We applied salicylic acid and acetyl salicylic acid to soybean sprout and soybean somatic embryo and observed that *de novo*synthesis of IFS was affected by external supply of both chemicals; however methyl jasmonic acid induced cell death. Isoflavone production was increased in both cotyledon and hypocotyls by salicylic and acetyl salicylic acid treatment. Interestingly, both salicylic and acetyl salicylic acid treatment effectively blocked chlorophyll synthesis. Using these model systems with developing soybean seed, we amplified about 40 soybean Myb genes and currently we study the expression patterns of individual Myb genes.

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