Dammarene-type ginsenoside metabolic engineering –Characterization of genes involved in dammarenediol saponin biosynthesis–

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Ginseng (*Panax ginseng* C.A. Meyer) is one of the most popular medicinal herbs and contains pharmacologically active components, ginsenosides, in their roots. Ginsenosides, a class of tetracyclic triterpene saponins, are synthesized from dammarenediol-II after hydroxylation by the cytochrome P450 (CYP) enzymes and then glycosylation by glycosyltransferases. The first step in biosynthesis of dammarane-type ginsenosides is cycling of 2, 3-oxidosqualene to dammarenediol-II, a reaction that is catalyzed by an enzyme from dammarenediol synthase. We functionally characterized the dammarenediol synthases (*PgDDS*) from *P. ginseng*. Dammarenediol-II is thought to be converted to two ginsenoside aglycones (protopanaxadiol and protopanaxatriol) after hydroxylation by cytochrome P450 (CYP) enzymes. Two CYP genes are thought to be involved in dammarene-type ginsenoside biosynthesis. One of these genes is involved in protopanaxadiol production by hydroxylation of dammarenediol at the C-12 position. Another gene is protopanaxatriol synthase which involved in protopanaxadiol hydroxylation at the C-6 position conferring protopanaxatriol production. We reported that *CYP716A47* is involved in the hydroxylation of dammarenediol-II at the C-12 position to yield protopanaxadiol (Han et al. 2011). The next step of protopanaxatriol production (protopanaxdiol 6-hydroxylase) is also characterized by our group recently. We will discuss the possible metabolic engineering using those genes involved in dammarene-type ginsenoside saponin biosynthesis in *Panax ginseng*.

[Keywords] *Panax ginseng*, Tetracyclic triterpene, Saponin biosynthesis, Dammarane-type ginsenoside