Effects of light on production of endogenous and exogenous lignans by *Forsythia koreana* wildtype and transgenic cells

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In a previous study, we reported the production of the exogenous lignan, sesamin, using the *Forsythia koreana* transgenic cells (CPi-Fk cells), in which an exogenous sesamin-synthase CYP81Q is stably expressed while an endogenous pinoresinol-lariciresinol reductase is suppressed by RNA interference. Here, we present the effects of light on the production of sesamin and an endogenous lignan pinoresinol which is a precursor of sesamin, in CPi-Fk cells. CPi-Fk cells produced a 2.3-fold, 2.7-fold, or 1.6-fold greater level of sesamin under two-week irradiation with white fluorescent light, blue LED, or red LED light, respectively, compared with the level obtained under the dark condition. Likewise, CPi-Fk cells produced approximately 1.5 to 3.0-fold pinoresinol (aglycone and glucosides), respectively. Furthermore, the expression of the pinoresinol-glucosylating enzyme UGT71A18 was suppressed in CPi-Fk cells under blue or red light. Considering that white fluorescent light contains the blue wavelength and that CYP81Q fails to convert pinoresinol glucosides to sesamin, it is concluded that blue light plays a major role in the up-regulation of the production of sesamin by CPi-Fk via an enhancement of the production of pinoresinol aglycone and a reduction of UGT71A18. This is the first report on the elevation of lignan biosynthesis by light.

**Fig. 1:** Comparison of the lignan content in CPi-Fk cells under the dark condition, white, blue, and red. (A) pinoresinol aglycone. (B) total pinoresinol (aglycone and glucosides). (C) Sesamin. Lignans were determined separately for each sample and then presented as the average values of three independent experiments after a culture period of 2 weeks in the same medium. Each point represents the mean ± S.E.M. of three preparations.