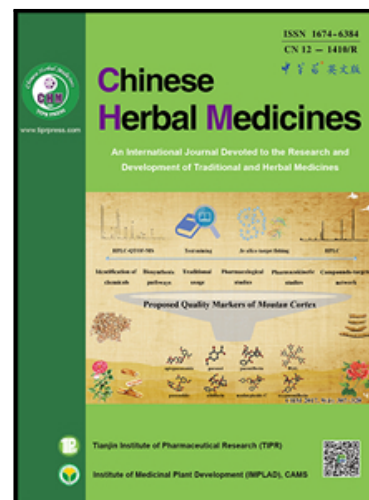


## Accepted Manuscript

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## Original article

# Effect of Light Quality on Total Gypenosides Accumulation and Related Key Enzyme Gene Expression in *Gynostemma pentaphyllum*

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## ABSTRACT

**Objective** Light quality has effect on the accumulation of gypenosides in the medicinal plant *Gynostemma pentaphyllum* in the family Cucurbitaceae, while the squalene synthase (SS) and squalene epoxidase (SE) are the key enzymes for gypenoside biosynthesis. The objective of this study was to elucidate the relationship between light quality and biosynthesis key enzyme involving the regulation of gypenoside accumulation. **Methods** The content of total gypenosides was measured by colorimetric method and the expression of SS and SE gene was determined by quantitative Real-time PCR in the seedlings of *G. pentaphyllum* which were grown with different light quality. **Results** Light quality showed remarkable impacts on the accumulation of total gypenosides. The highest content of total gypenosides was determined in the plant under red light condition, followed by blue light and white light, while the lowest content was recorded under dark condition. qRT-PCR analysis proved that the expression levels of SS and SE genes were also affected by light quality. The high-level gene expressions of SS and SE were found in the plant under red light condition, followed by blue light, with the least content in darkness. The statistical analysis revealed that the total gypenosides were significantly different in different light treatment and the content of total gypenosides was positively related to the expression of SS and SE genes. **Conclusions** Light quality regulates gypenoside accumulation via altering the expression of SS and SE in *G. pentaphyllum*.

*Key words*

gene expression; *Gynostemma pentaphyllum*; gypenosides; light quality; squalene epoxidase; squalene synthase

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## 1. Introduction

*Gynostemma pentaphyllum* (Thunb.) Makino (Jiaogulan in Chinese) is a perennial creeping medicinal herb in family Cucurbitaceae and mainly distributed in East Asia, including

China, India, Nepal, Bangladesh, Sri Lanka, Laos, Myanmar, Vietnam, Korea, Japan, Thailand, and Malaysia (Blumert and Liu, 1999; Wilde and Duyfjes, 2007). China is known to be the largest distribution area for this species. *G. pentaphyllum* has the capability of synthesizing and accumulating

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gypenosides with the same dammarane type structure as ginsenosides. As the key pharmacologically active ingredients in this plant, gypenosides have been used for their antidiabetic and antitumor effects (Huyen et al, 2012; Yan et al, 2014), anti-inflammatory properties (Lüthje et al, 2015) and immune-modulatory functions (Im et al, 2012), in addition to

its traditional use in treatments of hypertension, hyperlipemia, obesity, and neurological disorders. Currently, *G. pentaphyllum* was cultivated in some areas in South China to provide beneficial supplements for different purposes, such as healthy tea, tablet, granule, vegetarian capsule, and food additives. Even in Europe and North America, the Jiaogulan

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