The Production of Gardenia Reds- The Kinetically Controlled Gardenia Red-1 and the Thermodynamically Controlled Gardenia Red-2

Chiu-Lan Hsieh¹, Wang-Chi Hsieh², Yu-Wen Chen², Charng-Cherng Chyau³ and Robert Y Peng²,4*  
¹Graduate Institute of Biotechnology, Changhua University of Education, Taiwan  
²Day Spring Biotech Co., Ltd., Taiwan  
³Research Institute of Biotechnology, Hungkuang University, Taiwan  
⁴Research Institute of Medical Sciences, Taipei Medical University, Taiwan  
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*Corresponding author: Robert Y Peng, Research Institute of Biotechnology, Hungkuang University, Research Institute of Medical Sciences, Taipei Medical University, Taiwan, Tel: +886426318652; Email: ypeng@seed.net.tw

Introduction

Gardenia colors are widely used as food colorants. Gardenia blue (GB) is mainly synthesized via the conjugation reaction of genipin with alpha-amino acids [1] (Figure 1). Previously, we have demonstrated the chemical kinetics of the transformation of geniposide to geniposidic acid [2].

Figure 1: Interconversion of iridoids compounds. A) -glucosidase hydrolyzes geniposide to produce genipin. Through alkaline hydrolysis geniposide is demethylated to produce geniposidic acid, which in turn produces genipin after hydrolyzed by -glucosidase.

Moritome et al. [5] prepared purified extract from Gardenia fructus which was directly used for synthesis of GR. From our experience, the production of GR is handicapped by a variety factors, like the high content of genipin, the interfering amino acids and proteins.

Materials and Methods

Chemicals

Geniposide was purchased from Sigma Aldrich (purity>98%, St Louis, MO, USA). Other chemicals were provided by Wako Pure Chemicals (Osaka, Japan).

Preparation of GR: The modified method of [5] was followed to prepare GR. The final dextrin addition was omitted. The GR solution was purified by the adsorption macroporous adsorption resin (MinshengTMD101, China) and the desorption of color was eluted by ammonia solution (pH 10.0). The concentrated GR solution was lyophilized.

The powder GR (GR1) was re-dissolved in deionized water to a concentration 0.0001mg/mL and the opticall density of which was scanned with Elisa Reader within the range from 480 nm to 560nm. The product GR1 was then autoclaved at 121°C for 10 min to obtain GR2, which was similarly scanned using the same range of wavelength.

Results and Discussion

Effect of heating and autoclaving

GR is thermal stable. The formation of GR1 was facilitated at 90 °C for 2h [5] (Figure 2). GR1 exhibited a maximum absorption at 531 nm (λmax=531 nm) with a color value of 2.12. When GR1 was subjected to autoclaving at 121 °C for 10 min, the λmax...
shifted to 521 nm (Figure 3), and the same time the color value increased to 3.90 (Figure 2).

**Explanation in view of the physico-chemical aspects**

Thus it is likely that GR1 is a product produced by kinetically controlled mechanism, while GR2 is the one called “thermally controlled” product. GR1 showed common red color, while GR2 looked more like a shining rose color (Figure 2 & 3). To our belief, this is the first time GR has been found to exhibit such an interesting phenomenon involving two different kinetic isomers.

**References**