

## **Evaluation of nanocomposite structure for the effective cosmetic utilization of quercetin**

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We investigated the formulation design of nanocomposite structure for the effective cosmetic utilization of quercetin. Especially, we focused on the improvement of water solubility of quercetin (QUE) by preparing amorphous solid dispersion of ternary dispersed system with transglycosylated rutin (Rutin-G) and isoquercitrin (IQC). The solubility enhancement effect of IQC addition on QUE solubility was investigated. Evaporated particles (EVPs) were prepared by rotary evaporator with QUE, Rutin-G, and IQC. Differential scanning calorimetry and powder X-ray diffraction analysis indicated the amorphization of QUE and IQC by evaporation with Rutin-G. No characteristic diffraction peaks were observed in EVPs even after storage in sealing condition for 8 weeks at 40°C. The amount of dissolved QUE from the physical mixture was enhanced according to the increase of Rutin-G ratio because QUE was solubilized in the aggregated structure of Rutin-G, an associated nanocluster of Rutin-G, formed in proportion to Rutin-G concentration. The concentration of dissolved QUE from the EVP samples increased when IQC was added in QUE/Rutin-G binary formulation. The concentration of dissolved QUE from EVPs of QUE/Rutin-G/IQC (1/7/3, w/w/w) and QUE/Rutin-G/IQC (1/5/5, w/w/w) was much higher than that with QUE/Rutin-G/IQC (1/10/0, w/w/w). These results suggested that IQC inhibit the re-crystallization from an amorphous QUE in dissolution medium, resulted in the enhancement in stability of an amorphous QUE in the supersaturated state. In conclusion, the addition of IQC into QUE/Rutin-G binary system could obviously improve the water solubility of QUE by forming nanocomposite structure.