

Review and Progress

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Evaluation of the Effects of Harvest Period and Drying Methods on the Quality of Hangbaiju

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Abstract Hangbaiju, an important medicinal and edible plant in Zhejiang Province, has value in tea, food, and medicinal product development, and its quality is jointly affected by harvest period and post-harvest drying methods. This study explored the effects of harvest period and drying methods on the formation and preservation of Hangbaiju quality, with a focus on analyzing the effects of different flowering stages on flavonoids, phenolic acids, volatile compounds, antioxidant activity, and commercial appearance quality. It also compared the differences among sun drying, shade drying, hot-air drying, microwave-assisted drying, pulsed vacuum drying, and vacuum freeze-drying in terms of active component retention, color preservation, aroma maintenance, and processing efficiency. The results showed that the period from the bud stage to the Taiju stage is generally favorable for the accumulation of functional components such as chlorogenic acid, total flavonoids, luteolin-7-O-glucoside, and 3,5-O-dicaffeoylquinic acid, whereas the full flowering stage has certain advantages in flower integrity, yield, and commercial maturity. In terms of drying methods, moderate or staged thermal treatment, microwave-hot air combined drying, infrared-assisted drying, and pulsed vacuum drying help improve quality stability, while shade drying also shows advantages in preserving some active components and maintaining appearance quality. Overall, the quality improvement of Hangbaiju should be based on suitable harvest windows, matched drying processes, and a multi-indicator comprehensive evaluation system, thereby promoting the transformation of Hangbaiju harvest and processing from experience-based management toward standardization, precision, and quality-oriented development.

Keywords Hangbaiju; Harvest period; Drying method; Quality evaluation; Active components

1 Introduction

Hangbaiju, a cultivar of *Chrysanthemum morifolium* widely produced in Zhejiang, China, is an important traditional medicinal and edible plant that has long been used in tea, food, and health-related products. Chrysanthemum has been cultivated in China for tea and food use for more than two thousand years, and the dried capitulum is commonly consumed both as a traditional Chinese medicine and as a functional food material (Yuan et al., 2015; Ouyang et al., 2022). In Hangbaiju specifically, the capitulum is rich in flavones and caffeoylquinic acids, which are regarded as the principal active substances and are associated with anti-inflammatory, antibacterial, antioxidant, and antidiabetic activities (Lu et al., 2024). Hangbaiju is also favored by consumers because of its disease-preventing and health-improving functions, and both its flowers and leaves show notable antioxidant, antibacterial, antiviral, anti-inflammatory, antitumor, and immunomodulatory activities (Liu et al., 2025). Beyond medicinal use, chrysanthemum products are valued for flavor, aroma, and sensory quality, which supports their role in health teas and other edible applications (Xu et al., 2022a). Because Hangbaiju quality directly determines its medicinal efficacy, edible value, and market competitiveness, establishing scientific quality evaluation criteria is essential. Current studies show that relying only on geographical origin or traditional experience can lead to biased quality judgment, whereas comprehensive evaluation based on chromatographic fingerprints, bioactive compounds, and bioactivity provides a more reliable basis for quality control (Lu et al., 2022). Consistent with this, flavones and caffeoylquinic acids are not only major active ingredients but also important indicators for evaluating Hangbaiju quality, while compounds such as chlorogenic acid, 3,5-O-dicaffeoylquinic acid, luteolin, and related flavonoids repeatedly emerge as key discriminatory or quality-marker substances across chrysanthemum cultivars.