

Despite this high value, the industrial development and standardized cultivation of *R. chingii* still lag behind its resource potential (He et al., 2023). Existing studies emphasize that the species has great development value in Zhejiang and other East China production areas, and it has been recognized as one of the representative “Zhe Bawei” medicinal materials, but current drug development remains relatively limited and the mechanistic understanding linking phytochemistry, pharmacology, and production practices is still not deep enough (Xiong et al., 2024). At the same time, fruit quality studies have identified large differences among genotypes in developmental period, soluble solids, acidity, vitamin C, anthocyanins, terpenoids, ellagic acid, and fruit firmness, and quality-marker studies across production origins have shown further differences in antioxidant activity, acidity, carbohydrates, volatiles, and candidate Q-markers. These findings show that improving the consistency of yield and quality in *R. chingii* requires not only germplasm selection and harvest-stage optimization, but also field management strategies capable of regulating vegetative growth, reproductive performance, and bioactive compound formation under production conditions (Li et al., 2025).

In medicinal and horticultural crops more broadly, water and fertilizer management is one of the main agronomic determinants of plant growth, yield formation, nutrient uptake, photosynthetic performance, and the synthesis of quality-related metabolites (Li et al., 2024; Chatzistathis et al., 2025; Sharma et al., 2025). Multiple studies show that irrigation and fertilization often act through a coupling effect rather than as isolated factors. In *Panax notoginseng*, combined water and soluble organic fertilizer treatments increased yield and improved saponin accumulation, with intermediate irrigation and fertilizer levels producing the best comprehensive performance (Mu et al., 2023). In wolfberry, irrigation, nitrogen, and their interaction significantly affected growth, chlorophyll, yield, and quality, and the optimized water-nitrogen regime improved both productivity and quality indices. In melon, irrigation, fertilization, and their interaction significantly affected fruit yield and quality, while structural equation analysis indicated that photosynthesis influenced quality and yield mainly through dry matter accumulation and plant growth. Similar patterns have been reported in capsicum, pear, kiwifruit, eggplant, bitter melon, aonla, and *Ophiopogon japonicus*, where moderate or optimized nutrient-water regimes improved biomass, fruit weight, soluble solids, phenolics, antioxidant activity, medicinal components, or water and fertilizer use efficiency, whereas excessive or poorly coordinated inputs reduced quality or created sustainability risks (Cai et al., 2025; Dolatmand-Shahri et al., 2025; Liu et al., 2025). These results also highlight an important constraint: excessive irrigation and chemical fertilizer use can degrade soil conditions, increase production costs, and undermine sustainable cultivation, making precise water-fertilizer management especially important for high-value medicinal crops (Yang et al., 2023).

This review investigates the regulatory effects and potential mechanisms of water and fertilizer management on fruit yield and quality formation in *Rubus chingii*. Although current studies on *R. chingii* have clarified its major bioactive compounds, developmental patterns, and potential quality markers, research on how cultivation practices regulate the coordinated formation of yield and quality traits under field conditions remains relatively limited. Since the medicinal value of *R. chingii* mainly depends on the accumulation of bioactive compounds such as ellagic acid, kaempferol derivatives, flavonoids, and terpenoids, and since the accumulation of these compounds is jointly influenced by growth stage, fruit tissue characteristics, and environmental conditions, optimizing water and nutrient supply to match plant growth, development, and fruit formation processes is essential for achieving high-yield, high-quality, and stable production of *R. chingii*. This review systematically summarizes the effects of different water and fertilizer management regimes on plant growth, fruit yield, external quality, nutritional quality, and accumulation of medicinal active compounds in *R. chingii*. Furthermore, the physiological mechanisms underlying water-fertilizer regulation of yield and quality formation will be analyzed, and optimized management strategies integrating production efficiency, stable medicinal quality, and sustainable industrial development will be proposed. This review provides a theoretical basis for establishing precision water-fertilizer management systems, implementing standardized cultivation practices, optimizing input management, and improving quality-oriented harvesting and processing, thereby promoting the efficient utilization of *R. chingii* medicinal resources and the high-quality development of its industry.