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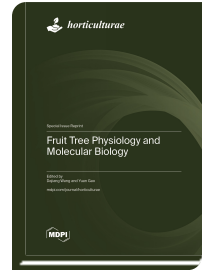
## **Fruit Tree Physiology and Molecular Biology**

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Fruit tree physiology and molecular biology, a key branch of agricultural science, is key to maintaining the sustainability of the global fruit industry amid worsening conditions due to climate change and the growing demand for high-quality, diverse fruits. Critical physiological changes in fruit trees—flower bud differentiation, fruit/seed development, sugar-acid/color formation, rootstock impacts on tree/fruit quality, and stress responses—guide production, and analyzing their molecular mechanisms remains a focus of research, as this drives practical guidance. This Reprint “Fruit Tree Physiology and Molecular Biology” presents the latest work by global researchers in this field, focusing on four core areas: extreme environment adaptation, efficient resource use, precise quality improvement, and variety innovation. It covers apples, pears, grapes, etc., integrating multi-omics, CRISPR/Cas9, and cultivation techniques to explore stress resistance, nutrient regulation, and germplasm innovation mechanisms, solving industry issues (low efficiency, poor resilience, etc.). Our motivation for compiling this Reprint lies in addressing challenges (nutrient imbalance, pear ring rot, lab–field gaps, etc.) and consolidating progress (key genes, YOLOv10 models, etc.), and gaps (molecular–physiological links) are bridged via theory–practice research. The targets of this Special Issue Reprint include researchers (new mechanisms), agronomists (field optimization), and students (trends). It aims to inspire collaboration, accelerate technological translation, and advance a climate-resilient, high-quality industry for food security.



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