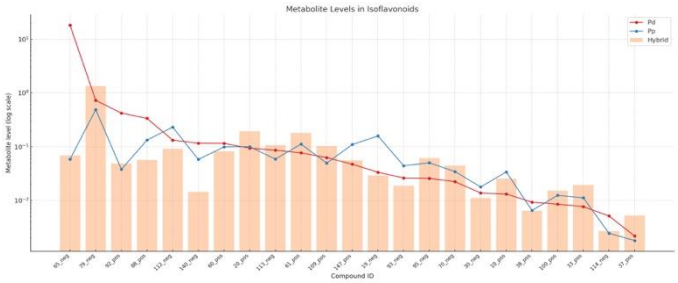
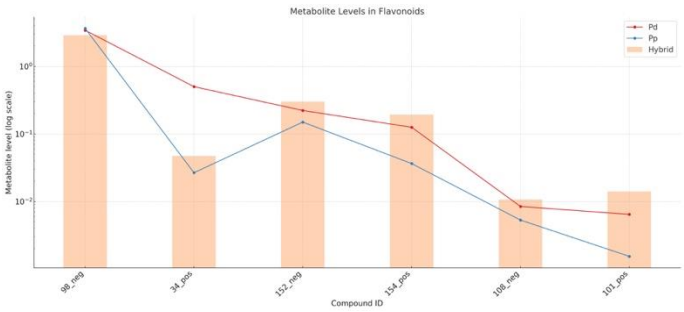
A



B



C

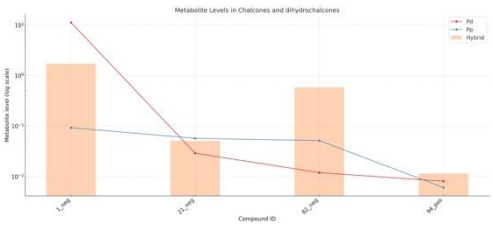


Fig. S1 Relative quantitative values of flavonoid metabolites in three flowers of *Paphiopedilum*. The figure shows only the relative quantification values of three flavonoid subclasses， Isoflavonoids (A), Flavonoids (B) , Chalcones and dihydrochalcones (C). Pp: *P. primulinum,* Pd: *P. delenatii,* Hybrid: The hybrid progeny of *P. delenatii* and *P. primulinum*.

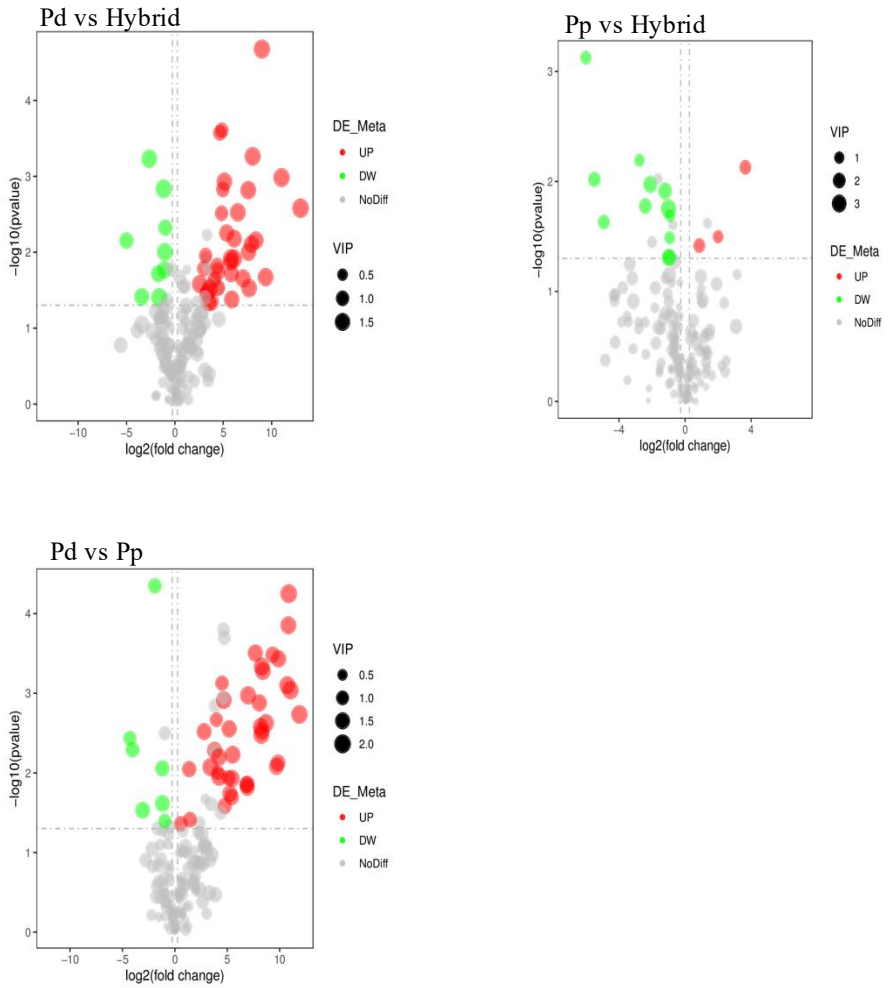


Fig. S2 Volcano plot of differential flavonoid metabolites. The x-axis represents the log2-transformed fold change (log2FC) of metabolites between comparative groups, and the y-axis represents the negative base-10 logarithm of the P-value (-log10(P-value)). Each point in the volcano plot corresponds to an individual metabolite. Metabolites with significant upregulation are depicted in red, while those with significant downregulation are colored green. The size of each point is proportional to the Variable Importance in Projection (VIP) value. Pp: *P. primulinum,* Pd: *P. delenatii,* Hybrid: The hybrid progeny of *P. delenatii* and *P. primulinum*.

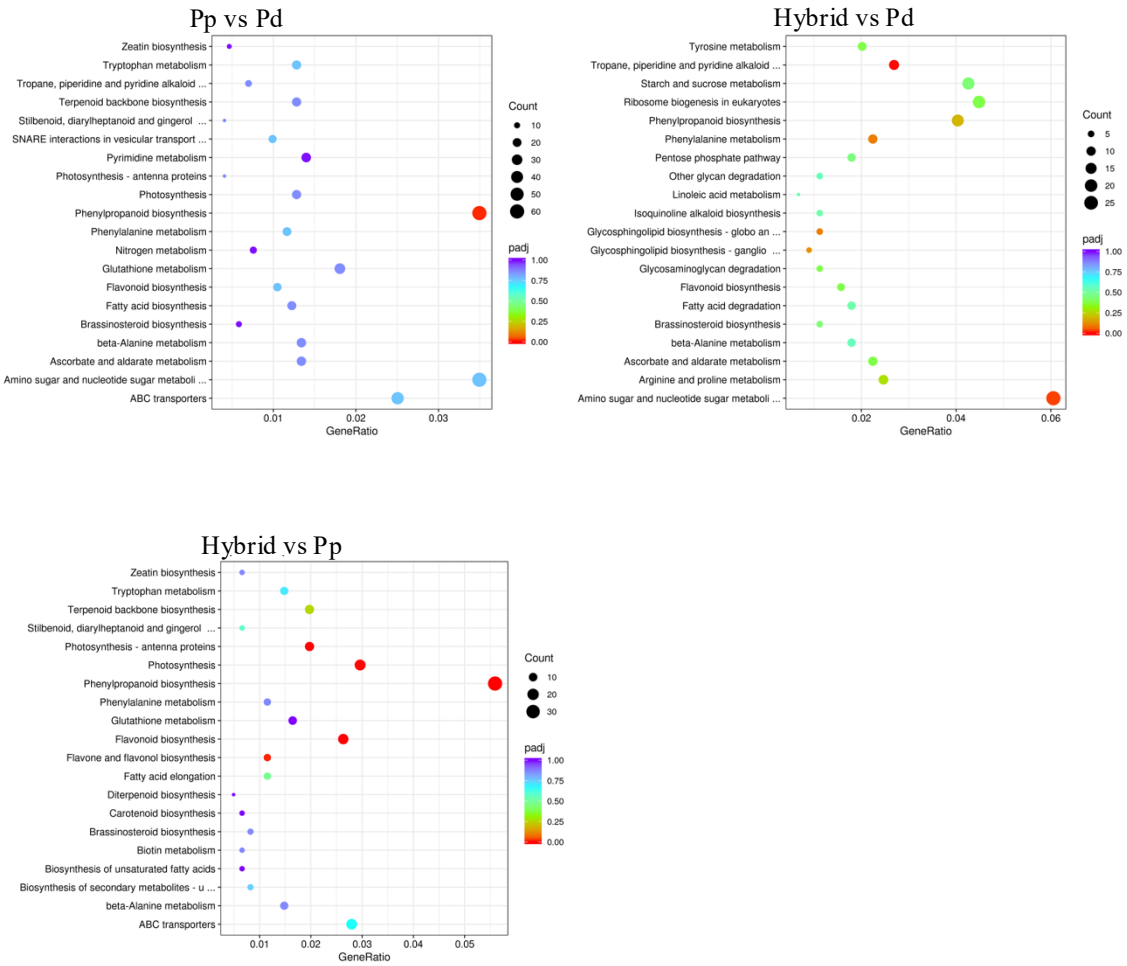
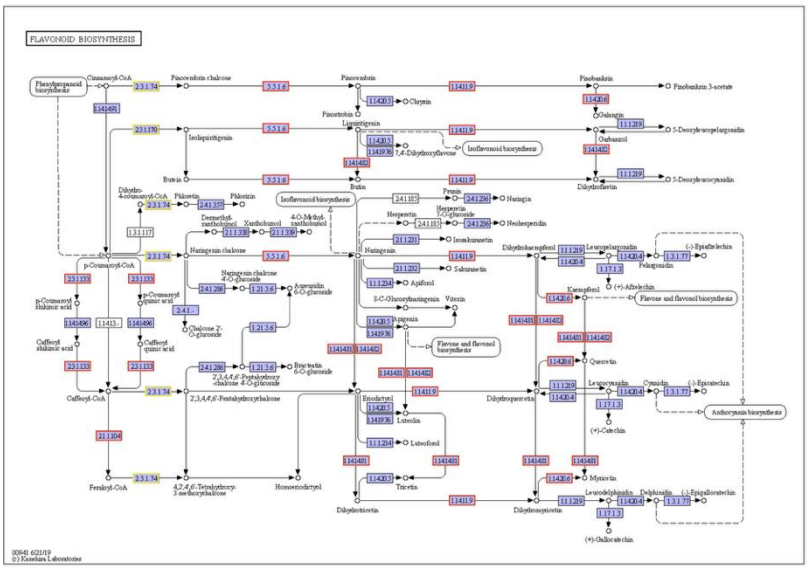


Fig. S3 Scatter plot of KEGG enrichment analysis for differentially expressed genes (DEGs). The vertical axis displays pathway names, while the horizontal axis represents the Gene Ratio corresponding to each pathway. The color intensity of the points negatively correlates with the padj value, where deeper red indicates smaller padj. The point size is proportional to the count of differentially expressed genes contained within each pathway. Pp: *P. primulinum,* Pd: *P. delenatii,* Hybrid: The hybrid progeny of *P. delenatii* and *P. primulinum.*

A. Kegg Pathway Enrichment Map of ko00941 in Hybrid vs Pp



B. Kegg Pathway Enrichment Map of ko00941 in Hybrid vs Pd

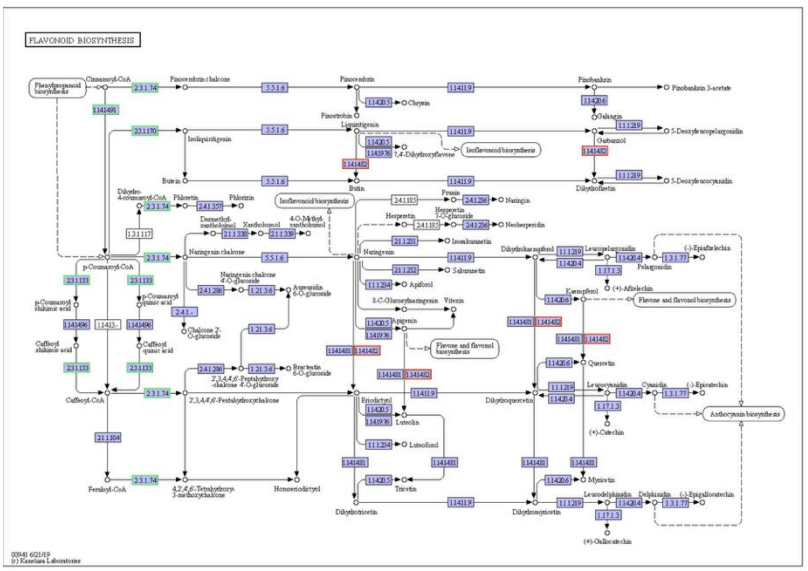


Fig. S4

C. Kegg Pathway Enrichment Map of ko00941 in Pp vs Pd

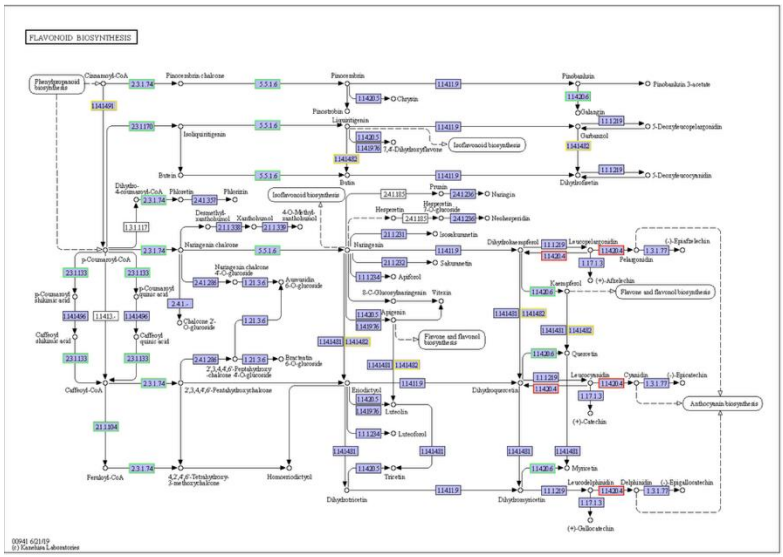


Fig. S4 KEGG Pathway Enrichment Map of ko00941 (Flavonoid Biosynthesis Pathway). KO nodes containing upregulated genes are outlined in red, KO nodes containing downregulated genes are outlined in green, and KO nodes containing both upregulated and downregulated genes are outlined in yellow. Pp: *P. primulinum,* Pd: *P. delenatii,* Hybrid: The hybrid progeny of *P. delenatii* and *P. primulinum*.

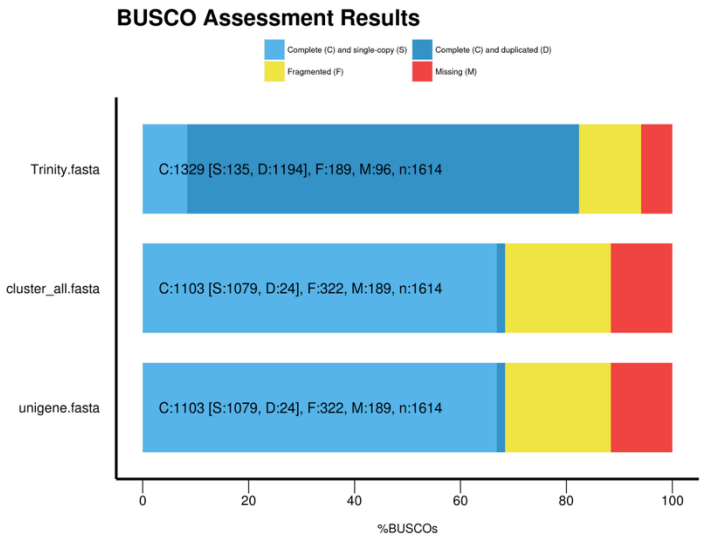


Fig. S5 BUSCO assessment results. The x-axis represents the percentage of BUSCOs, while the y-axis indicates the assembly quality assessment of Trinity.fasta, unigene.fasta, and cluster.fasta generated through BUSCO assembly.