

bud and leaf traits and thus relatively lower appearance consistency in the finished tea (Yu et al., 2023; Yan et al., 2025). In addition, technologies such as hyperspectral imaging can quantitatively identify differences in fresh leaf morphology and texture among cultivars, further indicating that appearance quality has a clear genetic basis (Figure 4) (Zhao et al., 2024).

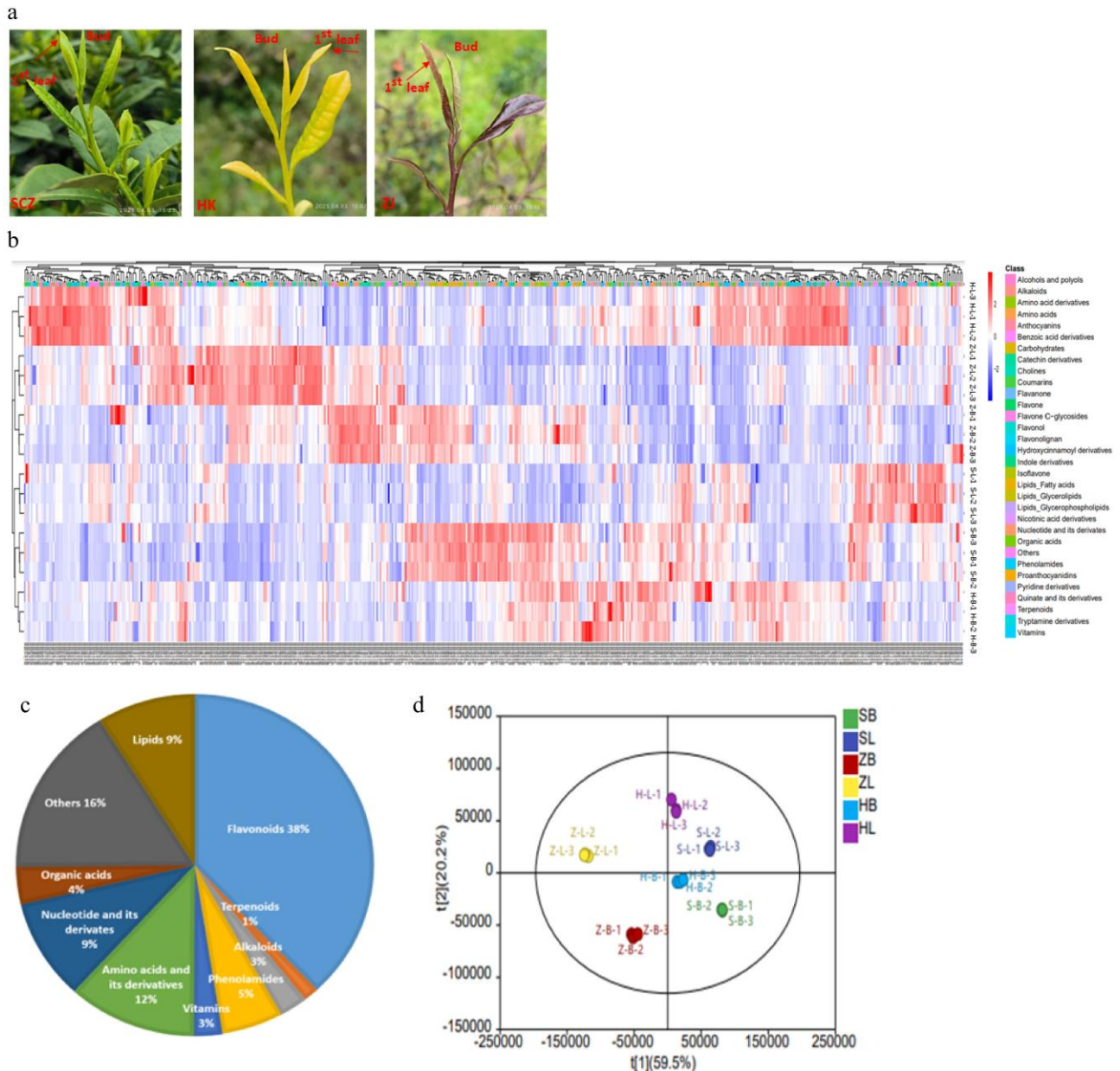


Figure 4 Detection and identification of specialized metabolites (Adopted from Zhao et al., 2024)

Image caption: (a) The phenotypes of two tissues of the three cultivars. 'Shuchazao' (SCZ), 'Huangkui' (HK) and 'Zijuan' (ZJ). (b) Clustering heatmap tree of total metabolites of two tissues of the three cultivars. Z-scores normalize the value. Red indicates a high abundance, and blue indicates a low relative abundance of metabolites. (c) Composition and proportion of different metabolites in different tea cultivars. (d) PCA of the metabolites in different tissues of tea plants. SB: SCZ-bud; ZB: ZJ-bud; HB: HK-bud; SL: SCZ-leaf; ZL: ZJ-leaf; HL: HK-leaf (Adopted from Zhao et al., 2024)

Color is another key indicator of the appearance quality of Longjing tea. Differences among cultivars in chlorophyll, carotenoids, and anthocyanin contents lead to variations in the overall color of dry tea, liquor, and infused leaves. High-quality Longjing tea usually appears tender green or bright green with luster, while different cultivars may show light green, yellow-green, or composite hues. Studies have shown that the relatively high chlorophyll b content in Longjing 43 contributes to the formation of a typical overall color (Teng et al., 2024). In