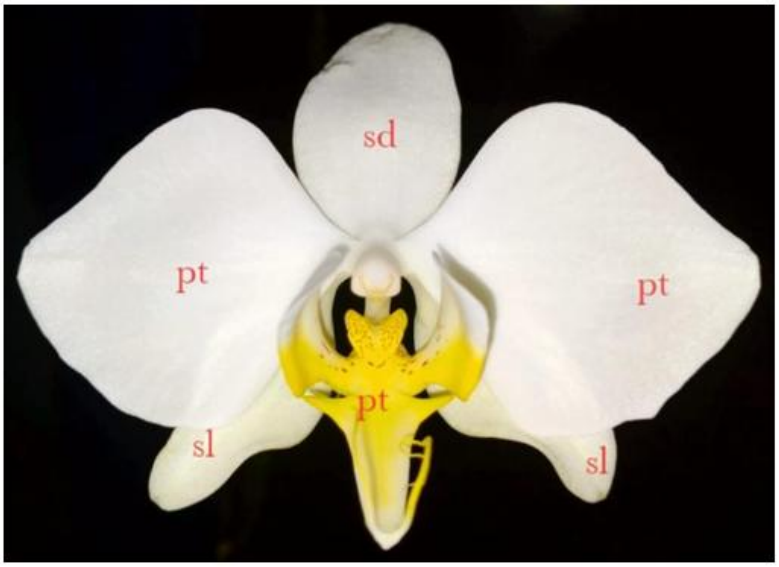

Figure 2 Floral morphology of *Phalaenopsis sp* (Adopted from Indraloka and Rahayu, 2022)
Image caption: sd=sepal dorsal, pt=petal, sl=sepal lateral (Adopted from Indraloka and Rahayu, 2022)

Petal texture represents an important microstructural feature influencing ornamental perception. *Phalaenopsis* petals can generally be categorized into waxy and velvety types: waxy petals have tightly arranged epidermal cells and a thicker cuticle, resulting in a glossy appearance, whereas velvety petals possess conical cells and a thinner cuticle, producing a softer visual effect. This indicates that floral aesthetics are not solely determined by macroscopic shape but are also influenced by microscopic structure, affecting both visual and tactile perception. The labellum is the most variable and diagnostic floral structure, exhibiting substantial variation in size, lobe differentiation, curvature, and color contrast. In some cultivars, a well-developed and vividly colored labellum forms a strong visual focal point, whereas in others, it contributes to overall harmony. Molecular studies have shown that *MADS-box* genes such as *SEPALLATA-like* and *AGL6-like* play key roles in labellum formation, and alterations in their expression can result in petal-to-labellum transformations, producing novel floral forms. Thus, the labellum serves not only as a descriptive trait but also as a key structure for understanding genetic regulation of floral morphology (Indraloka and Rahayu, 2022).

Flower size (flower diameter) is another critical factor influencing market positioning. Large-flowered cultivars are typically used for high-end displays, medium-sized cultivars offer balanced adaptability, and small-flowered types are more suitable for home gardening. Studies have shown that flower diameter is associated with coordinated variation in petal size and labellum proportion, resulting from both cell division and expansion processes, which are regulated by plant hormones such as auxins, cytokinins, and gibberellins (Guan et al., 2025). Therefore, variation in floral form reflects an integrated outcome of developmental regulation and market-oriented selection.

2.3 Inflorescence and whole-plant architecture

Inflorescence structure and overall plant architecture are key traits linking individual flower aesthetics to whole-plant commercial performance. *Phalaenopsis* typically produces racemose inflorescences, but significant variation exists among cultivars in peduncle length, inflorescence orientation, and flower arrangement (Pramanik et al., 2022). Inflorescences may be erect, arching, or pendulous, largely depending on the degree of lignification of the floral axis. Highly lignified inflorescences provide better mechanical support and are suitable for standardized potted plant production, whereas more flexible inflorescences create a dynamic and artistic visual effect, suitable for decorative applications.

Branching ability and spike number directly determine flower quantity and spatial complexity. Highly branched cultivars produce more flowers and achieve a fuller visual effect, while single-spike large-flowered types emphasize individual flower quality. These differences reflect distinct resource allocation strategies, often