2 Germplasm Resources and Variety Selection

2.1 Overview of global fig germplasm diversity

Fig germplasm resources are very rich and widely distributed in the Mediterranean Basin, West Asia, and newly developed cultivation regions. A large pool composed of local varieties, wild types, and introduced cultivars has been characterized using morphological, pomological, biochemical, and molecular tools. The results consistently show high phenotypic and genetic diversity (Sclavounos et al., 2023).

Studies from Tunisia, Morocco, Algeria, Azerbaijan, Greece, and Iran indicate wide variation in tree structure, leaf traits, and especially in fruit size, shape, color, and ripening time. Although most germplasm can be grouped into a few basic fruit shape and skin color categories, the variation within these groups is still significant (Abdelsalam et al., 2019).

Analyses based on molecular markers such as SSR and ISSR show that fig germplasm has abundant alleles, high polymorphism, and relatively weak genetic structure. Most of the variation exists within populations rather than among populations or regions (Ali-Shtayeh et al., 2014; Ahmad and Noori, 2023).

2.2 Selection criteria for candidate varieties

In dual-purpose evaluation, the selection of candidate varieties aims to cover different fruit traits, quality characteristics, and genetic backgrounds. Key focus is placed on fruit-related traits, such as single fruit weight, fruit size, shape, skin color, flesh thickness, and dried fruit weight. These traits show wide variation ranges and high coefficients of variation, and they are important discriminant indicators in multivariate analysis (Khadivi and Mirheidari, 2022).

Morphological and agronomic traits (such as tree vigor, yield, and maturity time) are combined with physicochemical and biochemical indicators (such as soluble solids, acidity, phenolic compounds, flavonoids, and antioxidant capacity). These indicators are closely related to consumer preference and processing suitability (Almeida et al., 2022).

2.3 Description of selected fig varieties

Local varieties from traditional fig-growing regions perform well in fruit size, dried fruit weight, and sensory quality, and they are important genetic resources for breeding. Among North African germplasm, some local varieties have large, nearly spherical fruits, attractive skin color, and high sugar content, making them suitable for both fresh consumption and drying (Hssaini et al., 2019). Germplasm from the Eastern Mediterranean region includes types with relatively large fruits, diverse skin colors, and good overall quality, showing a wide range of phenotypic variation.

Introduced varieties such as “Brown Turkey” have been more systematically studied in terms of growth characteristics, yield, fruit traits, and nutritional quality. Some of these varieties show strong performance in combined morphological and biochemical evaluations (Almeida et al., 2022). The combination of local and introduced varieties reflects both the long-term diversification of figs and their current commercial value.

3 Fresh Consumption Evaluation Indicators

3.1 Fruit appearance traits (size, shape, peel color)

In the fresh market, figs must first meet consumers’ visual expectations. Fruit size and weight are key commercial evaluation criteria because they directly affect grading and market attractiveness. There are large differences in average fruit weight among varieties; for example, genotypes such as ‘Banane’, ‘Brown Turkey’, and ‘San Martino’ usually produce significantly larger fruits (Mahmoudi et al., 2018) (Figure 1). Fruit shape (length-to-width ratio) and ostiole characteristics are also included in standardized description systems, as they influence visual appeal, handling convenience, and safety (e.g., susceptibility to insect or pathogen entry) (Tikent et al., 2025).

Peel color is the most direct indicator reflecting varietal characteristics and maturity. Light- and dark-colored varieties can be clearly distinguished, and their color parameters (L*, C*, h°) show strong varietal dependence.