Planting density is a central experimental factor because it simultaneously affects resource competition, canopy structure, and marketable fruit size. Trials commonly compare several inter- and intra-row spacings (for example, 3.0 × 0.8 m vs. 2.0 × 0.6 m, or 120 × 60 cm vs. denser arrangements) to quantify responses of fruit number, average fruit weight, commercial fruit proportion, and total yield per hectare (Silva et al., 2021). In some studies, plant density is integrated with training system (horizontal vs. vertical), stem number, or fruit-thinning treatments to manipulate source-sink balance and define optimal load per plant for targeted fruit-size categories (Kim et al., 2023). Such multifactor designs allow identification of densities that maximize total yield without excessively shifting the population toward undersized or mini fruits, while preserving desirable quality traits such as soluble solids content (Figure 2) (Tegen et al., 2021).

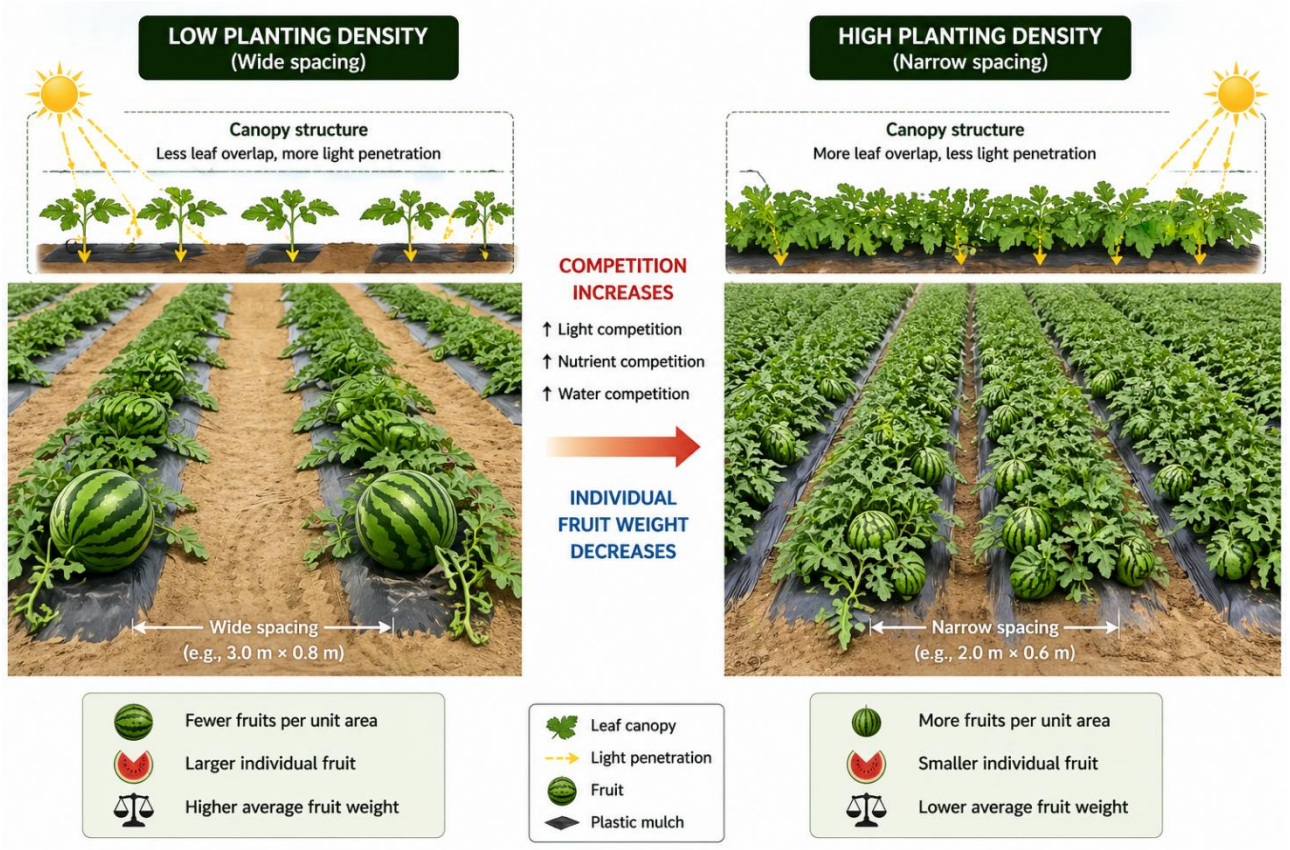

Figure 2 Effect of planting density on the trade-off between fruit number and individual fruit weight in watermelon production systems

4.2 Collection of data on watermelon fruit weight and related growth indicators

Fruit weight is usually recorded at harvest as single-fruit weight and/or average fruit weight per plant or per plot, along with fruit number to derive total and marketable yields. Detailed datasets often include fruit length, fruit diameter, average fruit weight, and total fruit yield, and distinguish between marketable and unmarketable fruits to assess economic performance (Yismaw et al., 2024). Additional yield-related variables such as fruit set, fruit retention, and yield per plant or per hectare are measured to characterize treatment effects on both productivity and fruit-size distribution (Bora et al., 2024). When treatments involve fruit thinning or fruit load per stem, measurements of fruit weight and number at different node positions or fruit counts per plant help quantify how source-sink manipulation alters final fruit mass and commercial yield.

Quality-related indicators, especially soluble solids content (Brix), are commonly assessed to link fruit weight responses with eating quality. Studies generally sample representative fruits from each plot, measure Brix with a refractometer, and record traits such as rind firmness, pulp firmness, juice content, and sugar fractions (reducing, non-reducing, and total sugars). Some trials analyze Brix alongside fruit length, diameter, and average weight to identify trade-offs between density or fruit load and sweetness, while others focus on cultivar × mulch or growth