Open-field evidence points in the same direction, although the optimum interval depends on climate and soil. Sensoy and colleagues found that a 6-day schedule with higher pan-based replacement produced the highest melon yield and strongly affected fruit traits, indicating that lower frequency combined with lower replacement was too restrictive. Similarly, greenhouse studies in southeast China have shown that low-water treatments can increase some quality attributes, but they also lower biomass accumulation and tend to suppress maximal yield. The main message is that adequate growth depends on keeping vegetative stress within a narrow range (Sensoy et al., 2007; Yue et al., 2023).

3.2 Effects on root development and water uptake

Root responses to irrigation frequency are more complex than shoot responses. In field-grown crops, less frequent irrigation can sometimes encourage deeper rooting, but in high-value melon systems, especially greenhouses and substrates, large drying cycles often reduce effective water uptake before any benefit from "hardening" appears. A recent cantaloupe study found that severe deficit weakened plant water status enough to trigger water-conservative behavior, while also suggesting reduced root hydraulic conductivity under stronger soil drying. By contrast, moderate deficit maintained functional performance much better (di Santo and Barrios-Masias, 2026).

Protected-environment studies show that root-zone physical conditions matter alongside watering rhythm. In a BMC Plant Biology study on greenhouse muskmelon, supplemental soil aeration under subsurface drip increased yield, leaf area index, dry matter, and irrigation use efficiency, showing that water-frequency effects cannot be separated from oxygen supply in the root zone. In other words, a frequent irrigation schedule is beneficial only if it avoids hypoxia and keeps the wetting pattern accessible to roots (Li et al., 2020).

Northwestern China adds another layer because high-EC irrigation water and protected production often require pulsed delivery rather than a few large applications. Sun and colleagues found that, in high-EC irrigation regions, irrigation frequency had a curvilinear effect, with integrated growth, water use efficiency, fertilizer use efficiency, and fruit quality improving and then declining as frequency increased; across their tested conditions, seven pulses per day emerged as the best compromise. This result is especially revealing because it shows that "more frequent" is not always better. There is an optimum beyond which additional pulsing adds management complexity without physiological gain (Sun et al., 2024).

3.3 Effects on leaf growth and photosynthetic performance

Leaf area is central to melon productivity because the fruit depends on a continuous supply of current photoassimilates rather than large stored reserves. Studies under deficit irrigation repeatedly show that reduced water availability lowers relative water content, stomatal conductance, and net photosynthesis, which then limits leaf expansion and canopy persistence. In inoculated and uninoculated melon plants, Miceli and colleagues observed that stronger deficits reduced stomatal conductance and fruit yield, while moderate deficit combined with mycorrhiza improved water use efficiency and preserved some quality traits (Miceli et al., 2023).

The same physiological pattern appears outside Mediterranean systems. Panda and colleagues reported that increasing water stress in a Mediterranean climate reduced yield and fruit traits and that the best outcomes for relative water content, stomatal conductance, and yield were associated with full irrigation and the milder reduction level. In Murcia, sensor-based precision irrigation improved water productivity without depressing stem water potential, photosynthesis, or stomatal conductance, suggesting that irrigation frequency can be reduced or adjusted only when plant status is monitored carefully enough to avoid a hidden physiological penalty. (Zapata-García et al., 2023; Panda et al., 2025).

3.4 Comparative responses under different irrigation frequencies

Taken together, the comparative literature suggests that the "best" irrigation frequency depends on production environment. In greenhouse and nethouse systems with localized drip or substrate culture, relatively frequent or pulsed irrigation often performs better because the effective root volume is smaller and the system dries quickly. That is why three irrigations per day improved growth under net-house conditions, and why seven pulses per day performed well in the high-EC greenhouse study from northwestern China (Nut et al., 2019; Sun et al., 2024).