related root diseases can accumulate rapidly (Akanksha et al., 2025). In practical terms, grafting is now used not only to reduce infection in a single crop cycle but also to limit disease development and suppress inoculum build-up in the soil, which improves the health of subsequent crops (Thies, 2021). Experimental evidence in eggplant shows that this protection can be large. In greenhouse production, grafting onto 'Huimei Zhenba' reduced bacterial wilt incidence to 3.33% compared with 55.56% in non-grafted controls, while also increasing yield substantially. Under artificial pathogen pressure, grafted plants also showed strong resistance to Verticillium and Fusarium wilts: Hawk and KingKong F_1 were completely resistant to Verticillium, and several rootstocks showed complete resistance to Fusarium, with Hawk increasing marketable yield by 68.28% over the non-grafted control under Fusarium stress. Rootstock screening further supports the durability of this approach, with *S. torvum* showing the strongest multi-pathogen resistance among tested germplasm for bacterial wilt, southern blight, and Fusarium wilt (Akanksha et al., 2025).

Disease suppression by grafting is not explained by host resistance alone, because the rootstock also reshapes the rhizosphere environment in ways that favor plant health. Grafted eggplants had higher microbial biomass carbon, nitrogen, and phosphorus, together with higher phosphatase and β-glucosidase activity, indicating a more active and nutrient-cycling rhizosphere than self-rooted plants. These shifts likely matter biologically because soil microbial communities, biomass, and enzyme activity are recognized determinants of nutrient cycling, soil fertility, and the severity of soil-borne disease expression around the root zone (Du et al., 2024). Even with these clear benefits, resistance remains rootstock-dependent rather than universal. Reviews emphasize that disease-resistant rootstocks are a sustainable replacement for heavily chemical disease management, but they also note the need to expand the rootstock pool because pathogen populations evolve and currently favored resistance sources may not remain sufficient indefinitely (Thies, 2021). Accordingly, future improvement in pathogen resistance will depend on broader rootstock breeding, especially for combinations that retain high compatibility while combining resistance to bacterial wilt, Fusarium, Verticillium, nematodes, and other persistent soil pests (Akanksha et al., 2025).

5.2 Tolerance to abiotic stress conditions

Grafting also improves eggplant tolerance to abiotic stress, particularly drought and salinity, by allowing sensitive commercial scions to exploit the root systems of more tolerant wild or interspecific rootstocks. This is agronomically important because eggplant is drought-sensitive, and water restriction reduces both yield and fruit quality, while salinity creates ionic and osmotic stress that constrains growth and productivity. Across vegetable systems, grafting is therefore treated as a rapid, non-chemical alternative to breeding for resistance to drought, salinity, temperature stress, and related environmental constraints. Under drought, grafted eggplants consistently retain higher productivity than non-grafted plants. In a two-year field study, grafting onto wild rootstocks improved fruit yield by 12.7%-24.5%, reduced yield losses by 12%-44%, and increased water productivity under deficit irrigation through stronger canopy vigor, root proliferation, water uptake, and photosynthesis (Wakchaure et al., 2025). A second semi-arid field study found that SUR/SIS and SUR/TOR outperformed non-grafted Suraj under both full and deficit irrigation, and at 60% ETc the yield reduction was only 14% for SUR/SIS versus 25% for the non-grafted control (Khapte et al., 2025). These responses are consistent with the broader mechanism proposed for grafted vegetables: drought-tolerant rootstocks improve soil exploration, osmotic adjustment, and stress buffering through deeper and more vigorous roots (Nadoda et al., 2024).

Salinity tolerance shows a similarly clear pattern. In eggplant, SH and ST rootstocks protected the scion under 80 mM NaCl by maintaining higher photosynthetic pigment concentration and chlorophyll fluorescence and by lowering Na^+ accumulation in the shoot relative to non-grafted plants (Mozafarian et al., 2023). Mechanistically, salinity tolerance depends strongly on ion partitioning, because tolerant rootstocks can retain more Na+ in roots while helping preserve higher K^+/Na^+ balance and water status in active tissues under saline. The abiotic benefits of grafting extend beyond drought and salinity. Reviews indicate that tolerant rootstocks can also reduce damage from high and low temperatures, flooding, heavy metals, and other adverse soil conditions, although the strength