



Figure 2 Mechanistic model illustrating how fruit bag color and material regulate anthocyanin accumulation in red table grapes through modification of cluster light environments

7.2 Bagging management for improving table grape quality under rainy conditions

Under rainy conditions, bagging works best as part of a moisture-exclusion strategy aimed at reducing fruit wetness, surface contamination, and disease pressure. In open-field rain-shelter systems, fruit bagging was reported to prevent fruit surface contamination, reduce pesticide residues, and protect clusters from bird damage, while broader grape studies identify fruit bagging as a physical barrier against microbial pathogens, insects, and mechanical injury (Wang et al., 2022; Luca et al., 2023). This makes bagging especially relevant where frequent rain increases disease incidence and repeated spraying raises residue concerns. Direct disease-control evidence in grapes is strong for paper-bag systems. Brown paper bagging reduced grape berry moth infestation to 1.8%–2.3%, black mold to 0.6%–2.0%, gray mold to 1.1%–2.2%, and powdery mildew to 0.0–5.4%, compared with severe damage in non-bagged controls, and these benefits were achieved even without additional pesticide benefit from spraying. In rainy regions, whole-vine rain shelters further reduced canopy leaf wetness and relative humidity and lowered the severity of ripe rot, white rot, downy mildew, gray mold, and brown spot, showing that cluster bagging and rainfall exclusion address complementary parts of the same moisture-driven disease problem.