

Chrysanthemum showed a slight chlorophyll increase under light drought but a decline under moderate and heavy drought, indicating a threshold response rather than a simple monotonic loss, whereas broader pigment research shows that chlorophyll content and the chlorophyll a/b ratio directly influence antenna size, light distribution, and the balance between efficient capture and photodamage avoidance (Figure 1) (Simkin et al., 2022).

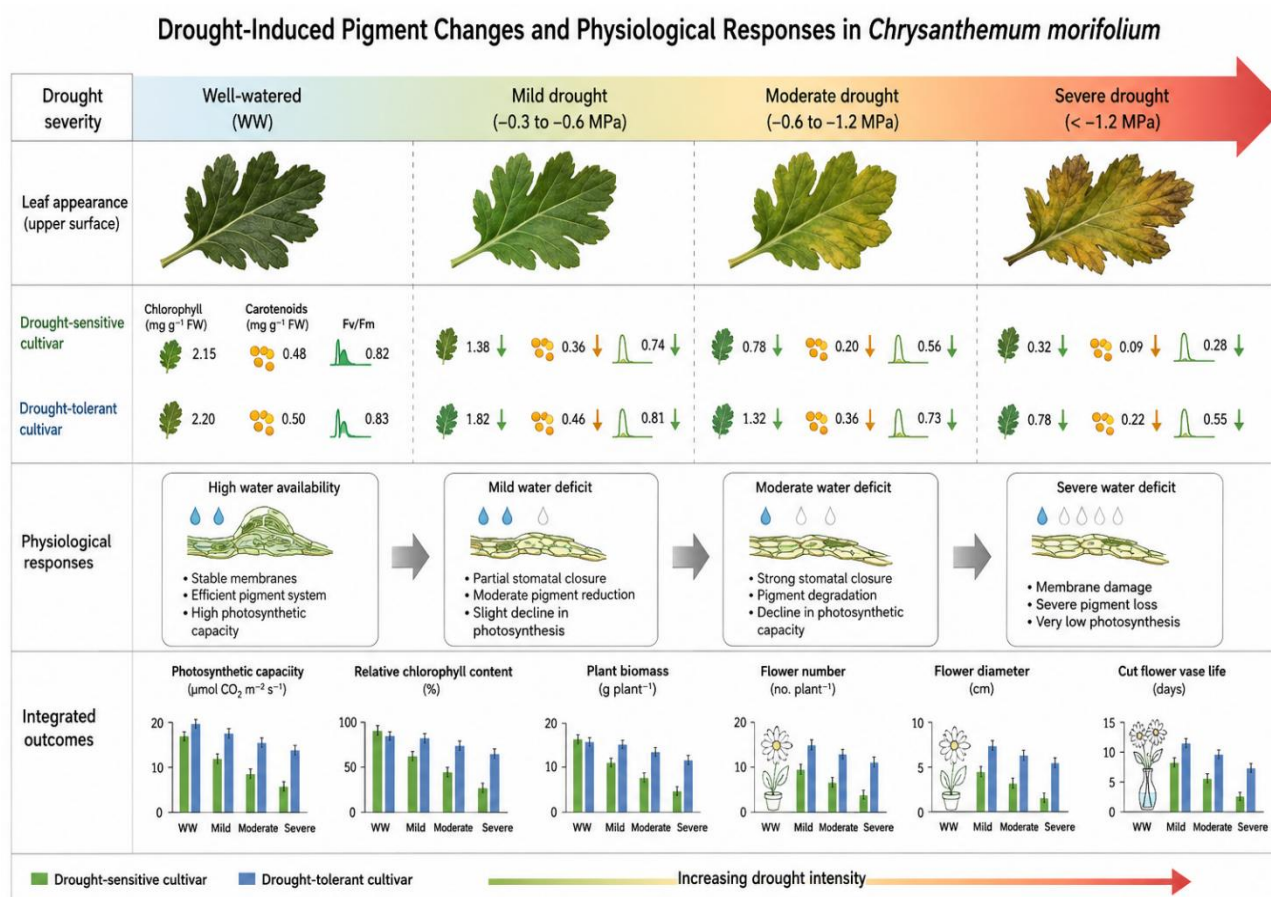


Figure 1 Phenotypic and physiological responses of *Chrysanthemum morifolium* leaves under progressive drought stress

3.2 Effects of drought stress on gas exchange parameters

Drought stress consistently suppresses the major gas-exchange parameters of *Chrysanthemum* leaves, especially net photosynthetic rate, stomatal conductance, and transpiration rate. In *Chrysanthemum* seedlings exposed to PEG-induced drought, net photosynthetic rate, stomatal conductance, and transpiration rate all decreased significantly while intercellular CO₂ concentration increased, and similar patterns were observed in ground-cover *Chrysanthemum*, where light drought reduced intercellular CO₂ but heavy drought increased it by 30.6% (Luo et al., 2023).

These patterns indicate a transition from stomatal limitation under milder drought to stronger non-stomatal limitation as stress intensifies. General drought physiology supports this interpretation: when leaf water status remains relatively higher, declines in photosynthesis track parallel declines in stomatal conductance and intercellular CO₂, but under more severe water deficit photosynthesis continues to fall even as intercellular CO₂ rises, implying biochemical impairment beyond stomatal closure; *Chrysanthemum*-focused analysis likewise notes that stomatal closure is typically the main determinant under mild to moderate drought, although metabolic damage becomes increasingly important as stress deepens (Gogoláková and Paganová, 2020).

3.3 Regulation of photosynthetic electron transport and carbon fixation

Beyond gas exchange, drought stress disrupts the photochemical machinery that supports electron transport and carbon assimilation in *Chrysanthemum* leaves. Comparative work in *Chrysanthemum* shows declines in PSII yield