

development and post-pollen production processes, with sharp losses already evident from 25°C to 26°C and from 28°C to 29°C (Fortunato et al., 2023) (Figure 1).

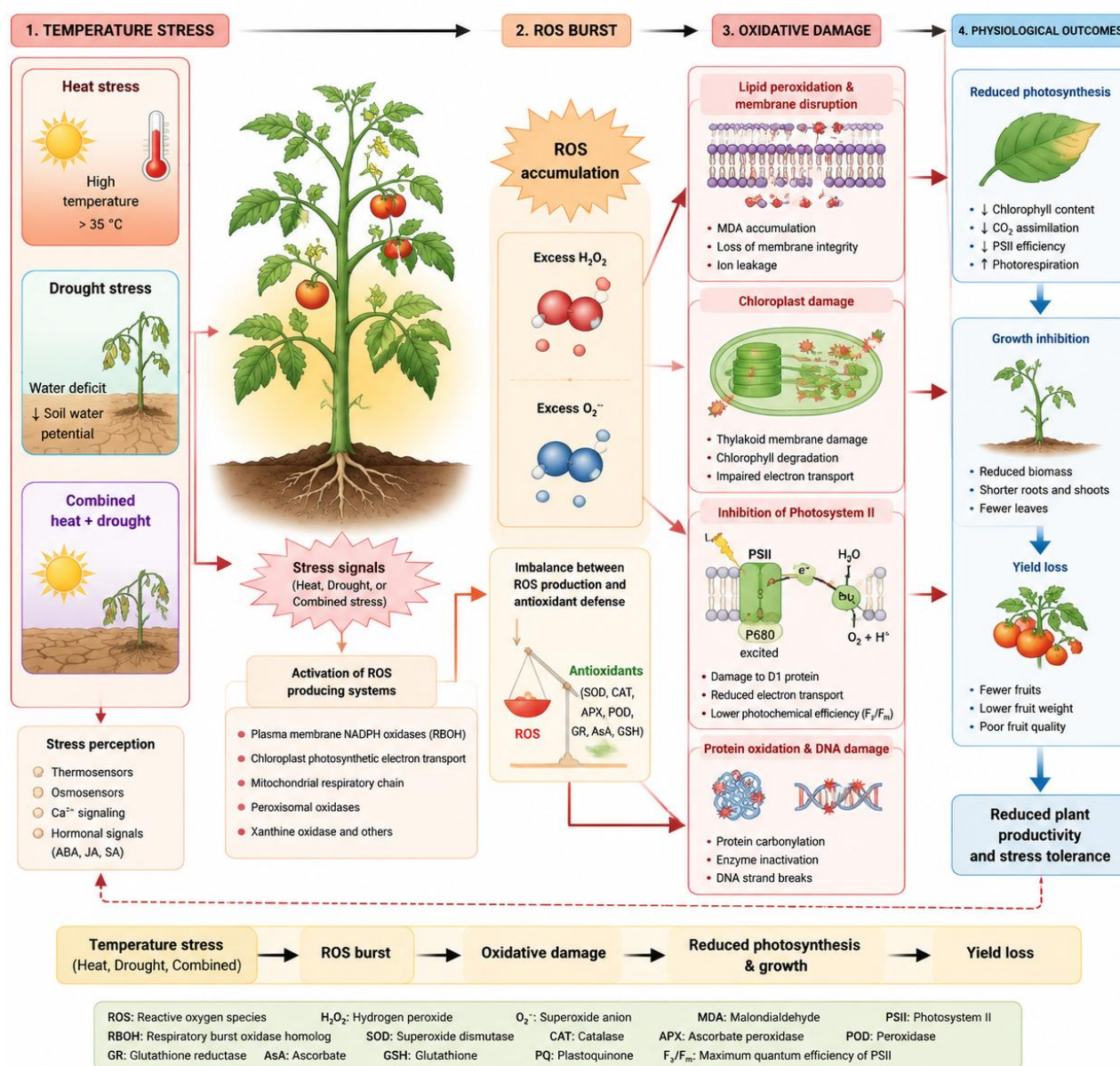


Figure 1 Mechanistic overview of temperature stress-induced reactive oxygen species (ROS) accumulation and antioxidant defense activation in tomato plants

5.2 Effects on fruit development and yield components

Temperature regulation strongly influences yield formation by altering fruit set, fruit number, seed formation, fruit growth rate, and fruit mass. In male-fertile tomatoes, a daily mean temperature of 29°C reduced fruit number, fruit weight per plant, and seed number per fruit to 10%, 6.4%, and 16.4% of the values observed at 25°C, showing how rapidly yield can collapse when reproductive heat stress persists. Genotype comparisons under elevated temperature likewise found that fruit number per plant, fruit set percentage, average fruit weight, and yield per plant all declined with rising temperature, although the extent of reduction differed among cultivars, indicating substantial genetic variation in reproductive heat tolerance (Vijayakumar et al., 2021).

Fruit development after set is also temperature-sensitive, and the direction of the response depends on both developmental stage and the thermal regime. Controlled-environment studies showed that fruits ripened much faster as temperature rose from 14°C to 26°C, but both low and high regimes tended to produce small