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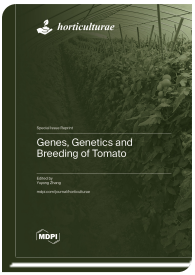
Special Issue Reprint

Genes, Genetics and Breeding of Tomato



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Tomato (*Solanum lycopersicum*) is a globally significant vegetable crop with substantial economic importance. Over the past twenty years, its production has doubled, primarily driven by genetic enhancements targeting yield optimization and environmental adaptation. Contemporary breeding objectives now prioritize balancing productivity with pest/disease resistance, responding to dual demands: consumers favoring improved nutritional profiles and flavor, alongside producers requiring cultivation efficiency and stress resilience. As a model organism for fruit biology and plant genetics, the tomato offers extensive genetic resources that have enabled breakthroughs in deciphering the genetic foundations of critical agronomic traits. Tomato research reveals genomic tools' role in combatting biotic stresses, identifying resistance genes and pathways. Studies on abiotic stresses uncover regulatory genes and hormone-signaling mechanisms influencing tolerance. Fruit development and ripening mechanisms, governed by hormonal control, enable the optimization of quality and shelf life. Against rising global demand, research work synergizes with breeding to restore stress-resistant and quality traits lost during domestication, supporting sustainable agriculture. Advances in genetics and genomics have accelerated molecular breeding techniques, collectively advancing the shared goal of enhancing yield, quality, and stress tolerance for breeders, producers, and consumers. The Special Issue synthesizes these innovations, spanning from gene discovery to molecular breeding strategies.

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