Journal of Plant Physiology & Pathology

Editorial

A SCITECHNOL JOURNAL

Gene Editing in Fruit Crops: Transforming Quality, Yield and Sustainability

Dr. Isabelle Dupont*

Department of Horticulture, University of Lyon, France

***Corresponding author:** Dr. Isabelle Dupont, Department of Horticulture, University of Lyon, France, Email: idupont@univ-lyon.fr

Citation: Isabelle D (2025) Gene Editing in Fruit Crops: Transforming Quality, Yield and Sustainability. J Plant Physiol Pathol 13: 409

Received: 01-Nov-2025, Manuscript No. jppp-26-183750; **Editor assigned:** 4-Nov-2025, Pre-QC No. jppp-26-183750 (PQ); **Reviewed:** 17-Nov-2025, QC No. jppp-26-183750; **Revised:** 24-Nov-2025, Manuscript No. jppp-26-183750 (R); **Published:** 29-Nov-2025, DOI: 10.4172/2329-955X.1000409

Introduction

Fruit crops are vital for human nutrition, providing essential vitamins, minerals, and antioxidants. However, their improvement through conventional breeding is often slow due to long juvenile phases, complex genetics, and high heterozygosity. In recent years, **gene editing technologies**, particularly CRISPR-Cas systems, have emerged as powerful tools for precise and efficient genetic improvement of fruit crops. These technologies enable targeted modification of specific genes, offering new opportunities to enhance fruit quality, yield, stress tolerance, and disease resistance while supporting sustainable horticulture [1,2].

Discussion

Gene editing allows scientists to introduce precise changes in the plant genome without altering the overall genetic background of elite cultivars. In fruit crops, CRISPR-Cas9 has been widely explored for improving **disease resistance**, especially against fungal, bacterial, and viral pathogens. By knocking out susceptibility genes or modifying immune-related pathways, edited fruit plants can exhibit enhanced resistance, reducing the need for chemical pesticides. For example, gene editing has shown promise in improving resistance to powdery mildew in grapevine and bacterial diseases in citrus [3,4].

Another major application of gene editing is the improvement of **fruit quality traits**. Genes controlling fruit ripening, texture, color, flavor, and shelf life can be precisely modified. Editing ethylene-related genes has enabled delayed ripening and extended shelf life in fruits such as tomato and banana, reducing post-harvest losses. Nutritional quality can also be enhanced by targeting pathways involved in vitamin, sugar, or antioxidant biosynthesis [5].

Gene editing is also being used to improve **abiotic stress tolerance** in fruit crops. Traits such as drought, salinity, and temperature tolerance are increasingly important under climate change. Editing stress-responsive genes can improve water-use efficiency, maintain fruit yield under stress, and ensure stable production in challenging environments. Additionally, gene editing can modify plant architecture and flowering time, making fruit crops more adaptable to different cultivation systems.

Despite its potential, gene editing in fruit crops faces challenges. Efficient delivery of gene-editing components, regeneration of edited plants, and long generation times remain technical hurdles. Regulatory frameworks and public acceptance also vary across regions, influencing commercialization. However, advances in tissue culture, transient expression systems, and DNA-free editing approaches are helping to address these concerns.

Conclusion

Gene editing is revolutionizing fruit crop improvement by enabling precise, rapid, and targeted genetic modifications. Through enhanced disease resistance, improved fruit quality, and greater stress tolerance, gene editing supports sustainable fruit production and reduced chemical inputs. Continued technological innovation, clear regulatory policies, and transparent communication will be key to realizing the full potential of gene editing in shaping resilient, high-quality fruit crops for the future.

References

1. Bellgrove MA, Chambers CD, Vance A, Hall N, Karamitsios M, et al. (2006) Lateralized deficit of response inhibition in early-onset schizophrenia. Psychol Med 36: 495-505.
2. Benes FM, Vincent SL, Alsterberg G, Bird ED, SanGiovanni JP (1992) Increased GABAA receptor binding in superficial layers of cingulate cortex in schizophrenics. J Neurosci 12: 924-929.
3. Bestelmeyer PE, Phillips LH, Crombiz C, Benson P, Clair DS (2009) The P300 as a possible endophenotype for schizophrenia and bipolar disorder: Evidence from twin and patient studies. Psychiatry res 169: 212-219.
4. Blasi G, Goldberg TE, Weickert T, Das S, Kohn P, et al. (2006) Brain regions underlying response inhibition and interference monitoring and suppression. Eur J Neurosci 23: 1658-1664.
5. Bleuler E (1958) Dementia praecox or the group of schizophrenias, New York (International Universities Press) 1958.