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Editorial

A Method to Improve the Quality of Horticultural Crops

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DESCRIPTION

The consumption and nutritional value of horticulture crops are affected by quality attributes such as the accumulation of nutrients and taste compounds, shape, and texture. Efforts have been conducted for many years to increase the quality of horticulture crops. The recent development of gene editing technology, which has potential uses in horticulture crops, will enables a technique for reaching this goal quickly and efficiently. We present a summary for research programs targeted at increasing quality of horticulture crops by genome editing. We go over the various genome editing technologies that have been used, as well as the traits that have been targeted. Moreover, we highlight the limitations of genome editing technology and its future prospects to increase horticulture quality of crops in both research and plant breeding. In conclusion, genome editing technology is proving to be a potent tool for increasing horticulture crop productivity quickly and efficiently, we believe that testing the genome editing in horticultural crops will provide new germ plasms to better quality in future.

Fruits, vegetables, and ornamental plants are important components of modern agriculture. The nutritional and economic worth of horticulture crops is determined by their quality. Fruits and vegetables are high in nutrients like carbohydrates, vitamins, minerals, and antioxidants, all of which are crucial for human growth, development, and well-being.

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Flowers from ornamental plants are admired for their vibrant colour, perfume, and shape. The ultimate purpose of horticulture research and development is to improve the quality of horticultural crops.

Traditional breeding methods like sexual crosses, mutagenesis, and transgenesis are being used to improve the quality of horticulture crops in earlier days. While these technologies improve the quality of horticulture products to some extent, they are time-consuming, labor-intensive, and inefficient, and they may be sensitive due to safety concerns about eating genetically modified organisms. The fast evolution of molecular biology and genome editing techniques, particularly the CRISPR (Clustered Regularly Interspaced Short Palindromic Repeat) tools, sometimes known as 'molecular scissors,' has opens the possibility of altering plant genomes and producing attractive qualities without introducing foreign genes.

The ideas to develop genome editing technology, and how CRISPR technology has been utilized now-a-days, to improve horticultural crop quality, and explore CRISPR technology's for future possibilities in boosting up horticultural crop features.

Principles and development of gene editing technology

Early gene editing techniques like as Zinc Finger Nucleases (ZFNs) and Transcription Activator-Like Effector Nucleases (TALENs) had limited value

because in their complexity, time-consuming, expensive, and inefficient nature. On the other hand, CRISPR technology is simple in utilizing, and more effective, and inexpensive. CRISPR/Cas9 is an adaptive immune system identified in bacteria and archaea that protects them from viruses and plasmids. The CRISPR/Cas9 system has two components: a single guide RNA that targets a specific DNA sequence with its 5′ end and the DNA endonuclease Cas protein that cleaves the target region between the third and fourth nucleotides upstream of the targeted sequence Protospacer Adjacent Motif (PAM). When the Cas protein cleaves genomic DNA, a double-strand break occurs, initiating Non-Homologous End Joining (NHEJ) and Homology-Directed Repair pathways (HDR) in the cell. The NHEJ pathway is activated quickly and inaccurately without a homologous repair template, resulting in small insertions/deletions (InDel) or substitutions, leads in knocking out the functional gene, whereas the HDR pathway is precisely activated with homologous sequences, results in the insertion of a new sequence or the replacement of a DNA sequence.