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CRISPR/Cas9- A Promising Genome Editing Tool to Mitigate Environmental Issues: Future Prospects

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Abstract—*Unsustainable exploitation of natural resources, rapid industrialization, and unflinching anthropogenic activities has generated serious environmental issues- Pollution of air, water and soil, global warming, and energy/fuel crisis. Environmental pollution and energy crisis are two most serious risks to human beings, now and in the future. Sustainable exploitation of natural resources coupled with biological processes is one of the most promising approaches to mitigate these issues. One such approach is bioremediation wherein mitigation of pollutants is achieved by utilizing microbes and plants (phytoremediation). Several microbes and plants have inbuilt decontamination and/or biofuel producing features but with lower efficiency. Genome editing provides a brighter solution to improve the bioremediation/biofuel producing ability of organisms whereby organisms are genetically modified in order to equip them with desired traits. In past years many synthetic microbial consortia and genetically modified organisms with high bioremediation and biofuel producing potential were developed using advanced molecular tools. Genome editing is achieved by using artificially engineered nucleases. So far four different families of engineered endonucleases: meganucleases, transcription activator-like effector nucleases (TALENs), zinc finger nucleases (ZFNs) and clustered regularly interspaced short palindromic repeats (CRISPR)-associated (Cas) systems have been reported to be used successfully for genome editing from bacteria to animals.*

The present article provides a short review on application of newly deciphered CRISPR/Cas9 system in genome editing of various plants and microbes. Although CRISPR/Cas approach of genome editing is in its infant stage but there is significant number of studies showing it as an efficient, cheapest, robust, easy to implement and extremely versatile genome editing tool compared to others. In the light of till date reported scientific evidences on CRISPR/Cas9 mediated successful genome editing, the system is proposed as a promising genome editing tool to mitigate environmental issues.

Keywords*: CRISPR/Cas9, genome editing, Environmental issues, bioremediation, phytoremediation, biofuel.*