CRISPR/Cas-Mediated Genome Editing in Legumes

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Abstract

Legumes are considered one of the important family of angiosperms, which provides significant source of dietary proteins, dietary fibers and minerals, and carbohydrates to the world. They are mainly grown for human consumption, forage, green manure. Legumes also play key role in crop rotation as most of them have symbiotic nitrogen-fixing bacteria in their root nodules. However, legumes are hugely affected by different biotic and abiotic stresses, which limits their growth and productivity. Some of the common legume diseases include downy mildew, Fusarium root rot, Southern blight, common leaf spot etc. On the other hand, drought, and salinity are the major abiotic stresses which limits legume food crops productivity. Thus, considering the nutritional and economic benefits of the legume crops, it is important to equip them with a system that can contribute to multi-stress tolerance and sustainable agricultural productivity. Over the years, sustainable approach against these stresses has been carried out via breeding tolerant cultivars. Despite nature-friendly, long screening and cross breeding protocols confined its usage to control stress and accomplish the objective of global food security. To this end, genomic editing approaches has enabled to master the constraints of conventional breeding methods in identifying the factors and unzipping the barrier which leads to loss of crop yield. Therefore, editing in legume plants in highly accurate and precise manner to perform genome manipulation for improving the desired traits or inducing novel traits towards climate-resilient crop varieties is the targeted goal to fulfill the demand of increasing population. The present study summarizes genome editing in legume crops to manipulate or to perform site specific modification with special emphasis on advancement in CRISPR (clustered regularly interspaced short palindromic repeat) /Cas-mediated (CRISPR-associated) editing of legumes towards attributing resilience against different stressors and increasing the yield.

Key words: CRISPR/Cas, Genome Editing, Legumes, stress tolerance