Essentials to improve crop genetics

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Abstract

Climatic changes along with growing population, climate resilient, high yielding and nutritious varieties are must needed to meet the future demand. Five different breeding approaches are suggested as Genome assembly, Germplasm characterization, Gene function identification, Genomic breeding (GB), and Gene editing (GE). For the identification of desirable and superior genotypes, it is necessary to carry genome assembly for every crop and germplasm characterization at agronomic and genomic levels. Plant breeding coupled with genetic diversity is key component in tackling climate changes and integration of these strategies is best way for sustainable food production.

Key words: Climate resilient, Genetic diversity, Sustainable food

INTRODUCTION

Agriculture is vulnerable towards the changing climatic conditions. Quick climate change causes adverse weather which includes floods, droughts, rise in temperature and many other disasters. Around 80% of the world's rural poor population lives in risk prone, resource poor and highly heterogeneous area typically depending on local agriculture for their life (FAO, 2019). Zhao *et al.*, (2017) predicted that yield of main crops on average will be decreased by 7.4 % in maize, 6% in wheat, 3.1% in soybean and 3.2% in rice for world mean temperature rise in each degree Celsius. The CGIAR started a "Two Degree Initiative for Food and Agriculture" which focused on giving assistance to 200 million small food producers worldwide to modify the scale and speed for current rate of climate change. To bring forth an opportunity to get climate smart results, there should be improvement in methods and practices for climate smart technologies which takes into account the progress of high yielding, climate resilient cultivars and rapid access for farmer's cultivation (Atlin *et al*.,2017). The rapid population growth along with water scarcity and climate change is a global matter of concern which aims to focus at improvement of crop for nutritional and food security (Hickey *et al*., 2019). In facing the threats, the current breeding program will not give enough improvement in yield of crop to fulfill the needs of near future.

To face the future demands, five breeding approaches have been proposed to accelerate the genetic crop improvement. Varshney *et al.* (2020) suggested five approaches as Genome assembly (for every crop species), Germplasm characterization (at agronomic and genomic stages), Gene function identification, methods for Genomic breeding and technologies for Gene editing. Therefore, these strategies will help in boosting the crop improvement.

GENOME ASSEMBLY

More than 264 genomes of plant including crops as maize, wheat, rice, sorghum, barley, groundnut, chickpea, pigeon pea, tomato, soybean and cotton have promoted de novo method through improvement in genome assembly algorithms along with NGS (next-generation sequencing. The genome assembly's quality differs from completed genomes to draft genomes but most genomes of plant are draft type genomes. In molecular breeding and trait discovery, the usefulness of assembly of genome gives an opportunity for genomic technologies and tools development Insertions, transversions, deletions, epigenetic changes, variation in copy number and SNPs are all included under genetic variation (Johannes

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