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Editorial

Biotechnology Augmenting the Growth of Global Seed Industry

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Seed is the vital input in farming, it can act as a catalyst to boost food crop production in terms of quality and quantity, thereby helps to achieve food security as well as nutritional security. Due to the increased quality consciousness, the quest for higher productivity and incomes, the farmers are relying more on commercially produced seeds with novel traits such as higher yield, resistance to pests and diseases, improved nutritional quality etc. instead of using their own saved seeds from the previous harvest.

In this context, Plant Biotechnology has been offering a large number of scientific tools and techniques for the Seed Industry viz., crop breeding programmes especially for the traits such as improved nutritional quality, climate resilience, pest and disease resistance, herbicide tolerance, etc. Aiding in the development of new varieties and novel traits through Marker Assisted Selection (MAS), Genetic Engineering, Transgenics, Gene mapping, Proteomics etc.

The global seeds market is being estimated to the value of USD 63.0 billion in 2020 and is expected to reach a value of USD 86.8 billion by 2026 at a CAGR of 6.6% during 2021-2026. The Biotech crop/Genetically modified crop segment account for a larger market share with a value of about USD 22.0 billion in 2020 and is expected to reach USD 32.0 billion by 2026. Over the past decade, Biotech crop/Genetically modified crop seeds including soybeans, corn, cotton, and canola have been playing an important role in many countries and now dominate the global seed markets.

The global Biotech/Genetically modified seeds market is expected to grow vigorously, especially in the US, Argentina and Brazil, as the use of Biotech/Genetically modified seeds, offers considerable benefits such as more convenient and flexible crop management, lower cost of production, higher productivity, and net returns, and reduced need for environmentally harmful pesticides/chemicals. In the Asia Pacific region, even though GM technology is restricted to few crops such as cotton and focus is on the adoption of hybrid crop varieties to attain yield improvement and disease resistance. Some Southeast and East Asian countries have been slowly relaxing the restriction and extending the approval to GM events for few more crops such as corn, soybean, potato, canola, and sugar beet.

Therefore, the share of Biotech/GM crop seeds in the global commercial seed market is expected to rise in the coming years and certainly leads to the exemplary growth in the global seed industry.

Further, divergent datasets like morphological traits, isozymes and molecular markers have been used for discriminating genotypes, establishing the identity of a crop variety/hybrid and for assessing the genetic purity of seeds. Among these, molecular markers, especially DNA markers are the most suitable as they are available in abundance, are environmentally neutral and can be used at any crop growth stage including seeds/grains. DNA molecular techniques are increasingly used in the following areas: DUS testing, variety identification, the establishment of varietal fingerprints and the judgment of essential derivation.

UPOV is exploring the potential of marker data to help determine the distinctness of varieties and for varietal fingerprinting and IPR protection and preliminary results in various crops are very encouraging (UPOV 2017). The International Seed Federation (ISF) supports the use of molecular markers to measure genotypic

conformity as a means to helping determine Essentially Derived Varieties (EDV) status (ISF 2012). Seed Association of America (SAA) also strongly supports the use of DNA-based markers for enforcement of varieties with PBR, including determining genetic similarity between varieties for use in disputes on essential derivation.

DNA markers due to their high precision and throughput are the markers of choice for varietal fingerprinting, crop IPR protection, DUS testing, and seed purity assessment. Among the DNA markers, presently SSRs are widely used in India, and in the future, the use of SNP markers for the purposes mentioned above expected to increase exponentially with the assays getting cheaper and the number of markers that are available in the public domain increasing rapidly. In order to gainfully exploit DNA markers, it is essential to establish a network of DNA fingerprinting laboratories along with the establishment of uniform protocols for sample collection, DNA isolation, genotyping, scoring, and databases for various crops. For use in DUS testing, DNA markers should be harmonized with the established DUS testing protocols and markers can clearly serve as a tool for complementing the supplementing the conventional DUS testing procedures. UPOV is in the process of evaluation and validation of the utility of DNA markers like SSRs and SNPs for varietal fingerprinting and the establishment of varietal identity. In India also coordinated efforts are required for assessing the potential of DNA markers for DNA fingerprinting, varietal identification, and for DUS and also develop uniform protocols for the assays. Fortunately, most of the information about markers in the major field and horticultural crops is publicly available, and commercial assays with these markers are increasingly available from various service providers in India. SNP markers will be the markers of choice in the future and there is a specific need to establish SNP marker database in various crops. With the above-mentioned initiatives and efforts mentioned above, India can also march along with other international agencies like UPOV, ISTA, ISF, and SAA in terms of harnessing modern tools of biotechnology, i.e. molecular markers for varietal fingerprinting and identity, DUS testing and seed genetic purity assessments. Thus the biotechnology is a modern tool for seed sector development to ensure quality seed supply for farming.

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