

Novel Approaches in Attaining Plant Diversity and Conservation: An Opinion Report

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Opinion

Mankind is facing challenges pertaining to food, energy, health, and environment, which become more intense due to the effect of climate change. Plants being the primary producers of feed, food, fibre, shelter, energy, and the detriments of climate change are the basis of healthy environments and ecosystems. Plant-based systems (fungi, microbes, and insects that live on or in plants) play a vital role in addressing these challenges of food, energy, health and environment. In order to address these challenges, there is a dire need to design projects aiming at agricultural sustainability that is not only in line with ecosystem sustainability but would ultimately lead to an improved GDP and economic condition of the country [1]. One of the challenges that the world faces due to population gain is of food insecurity, therefore, increase in food is crucial to alleviate food security problems. However, the monumental challenge is to realize increases in food in an environmentally responsible manner. The approaches used for this purpose must be eco-friendly and human friendly. In addition to this, the science of plant systems goes far beyond fibre and food producing crops. As a matter of fact, plants possess many more potential and actual uses, including medical, recreational, and ornamental uses. The extracts of hundreds of medicinal plants are being studied and explored having immunomodulatory, anti-inflammatory, antihyperglycaemic, antiulcer, antimalarial, antifungal, antibacterial, antiviral, antioxidant, antimutagenic and anticarcinogenic properties. Since plant-derived compounds exhibit less side-effects; there is a shift in trend from synthetic drugs to natural compounds. Different biotechnological approaches are being used to improve plant diversity, quantity, and quality. Extensive research is being conducted on plant growth Promoting Rhizobacteria (PGPR) which are capable of promoting plant growth by colonizing the plant root. In recent research, various projects on crop biofortification with an emphasis on improving crop quantity are under special consideration. The development of genetically modified crops by inserting or overexpressing transcription factors which, in turn, regulate entire metabolic pathways are being developed with desirable outcomes [2]. Plant molecular factories are now being re-programmed for the production of monoclonal antibodies in preparing different vaccines including Ebola vaccine. The emerging research on plant-based edible vaccines is being conducted in combating various human diseases including SARS-CoV-2 [3]. Furthermore, plants need to be used as biofuel as a source of renewable energy, unlike fossil fuels such as coal, petroleum, and natural gas. Consequently, plants being the rich and safe means of food, feed, medicine, and fuel are being overexploited which threatens their survival. Devising strategies to conserve these plants has now become crucial. At the same time, there is a need of conducting research on computational/bioinformatics approaches to predicting novel production systems for increased crop diversity, nutritional quality, quantity, and resilience to attain ecosystem sustainability. According to recent studies, launching the Transparent Plant involves experimental coupled with computational approaches that split

the phytobiome in a “parts store” which helps in prediction, query, and rapid-response problem solving. More recently, plant science has been revolutionized with the advent of artificial Intelligence. The factors limiting plant growth and diversity like population growth and climate changes have been controlled with this technology. There are various applications of artificial intelligence in agriculture which include weeding, irrigation, spraying by using sensors or other means embedded in drones and robots [4].

Since plants possess a fundamental position in any ecosystem and are indispensable for all the consumers, the conservation of plant diversity is the dire need of the hour. Designing and articulating projects on attaining agricultural sustainability is crucial to improve country’s economy. Agricultural sustainability can be achieved by using molecular/biotechnological approaches in improving qualitative, quantitative, and medicinal properties of plants. In vitro plant propagation has been found to be very promising because conventional propagation takes long time due to poor germination and dependence on season/geographic region. However, biotechnological methods of culturing plant tissues under controlled environment provide means of rapid propagation and conservation of valuable plants. Moreover, the in-vitro propagation ensures the maintenance of clonal uniformity through seeds. The

successful in-vitro propagation may provide a good yield that would be an attractive source of food, feed, fuel, fibre, or pharmacologically important bioactive compounds. Diversity, equity, and inclusion are pivotal approaches of achieving this vision. The interdisciplinary collaborative projects can bring together the two major sectors of university and industry. The ultimate target, the stakeholder/end-consumer, would be able to reap benefit of extensive research being done at universities.

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