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Research and development in plant genetic resources for sustainable food security

Ijinu T P, Anzar S, Bincy A J and P Pushpangadan
Amity Institute for Herbal and Biotech Products Development, India

Ensuring food security ought to be an issue of great importance for a country like India where more than one-third of the population is estimated to be absolutely poor and one-half of all children malnourished in one way or another. There have been many emerging issues in the context of food security in India in the last two decades. Recently the Indian National Food Security Act, 2013 (also Right to Food Act), was signed into law in September 12, 2013. This law aims to provide subsidized food grains to approximately two thirds of India's 1.2 billion people.

Plant genetic resources in the world faces some major challenges, associated with the need to deliver food security worldwide at a time of increasing pressures from population growth, climate change and economic instability and the continuing imperative to avoid further losses in biodiversity. Making better use of plant genetic resources is a very important part of the necessary response to the challenges for agriculture. Information in IPCC AR4 suggests that approximately 10% of species assessed so far are at an increasingly high risk of extinction for every 1°C rise in global mean temperature.

Advances in biotechnology, including methods in molecular biology, genetic engineering, and the new emerging technologies, such as genomics, transcriptomics, proteomics, metabolomics, nutrigenomics, etc., have generated new opportunities for genetic resources conservation and utilization. Techniques like *in vitro* culture and cryopreservation have made it easy to collect and conserve genetic resources, especially of species that are difficult to conserve as seeds. While technologies like enzyme-linked immunosorbent assay (ELISA) and polymerase chain reaction (PCR) have provided tools that are more sensitive and pathogen specific for seed health testing. Tissue culture methods are now widely applied for elimination of systemic diseases, for safe exchange of germplasm. Molecular markers are increasingly used for screening of germplasm to study genetic diversity, identify redundancies in the collections, test accession stability and integrity, and resolve taxonomic relationships. The marker assisted selection and transgene based genetic modification were evidenced to be wisely implemented in many crop improvement programs and they still appear promising in ensuring food security.

The importance of indigenous traditional knowledge, innovation and practices is clearly evident in light of the current climate and food crisis. Local food systems, traditional seed exchange systems, maintaining ecosystem and seed diversity are examples of how indigenous peoples use their traditional knowledge to respond to climatic pressures and to ensure food self-sufficiency. In the face of climate change, indigenous farmers are doing better with more genetic variation and are selecting from a larger pool of local material rather than waiting for breeders to supply them with varieties that will be at best only narrowly adapted. Local communities depend on indigenous crop varieties for sustainable agriculture and for selection of superior genotypes. Traditional knowledge is based on the experience, often tested over centuries of use, adapted to local culture and local environment, dynamic and changing. Production in traditional agriculture is based on sustainability in long term rather than maximizing the yield in short term. Many effective innovations are generated locally based on the knowledge and expertise of indigenous and local communities rather than on formal scientific research. Traditional farmers embody ways of life relevant for the conservation of biodiversity and for sustainable rural development. Thus sustainable agriculture development and conservation of resources could be significantly advanced if modern scientific knowledge could be incorporated with the traditional knowledge system.

Biography

Ijinu T P has completed his post graduation in Biotechnology from Bharathiar University and now doing his Ph.D. in Biotechnology from University of Kerala. He is the Senior Research Fellow of Amity Institute for Herbal and Biotech Products Development (AIHBPD), Thiruvananthapuram, Kerala. He has published 6 papers in journals, filed 2 patents and contributed 4 book chapters. He is also a Founder Member of Amity International Society for Natural Products (AISNP).

ijinutp@gmail.com