Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 02, Issue: 04 (JULY-AUGUST, 2022)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

Role of Genomics in Plant Genetic Resources

(*Jitendra Kumar Yadav[1], Ashish Yadav[2] and Suman Yadav[3])
[1]ICAR- Indian Agricultural Research Institute, New Delhi-110012
[2]Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, M.P.
[3]Agriculture University, Kota, Rajasthan
*Corresponding Author's email: jk180811@gmail.com

Genomics established that by using current genomics approaches the genetic makeup of an individual organism and the genetic variation within and between species can known to unprecedented detail down to nucleotide resolution if required. This knowledge has potential impact on the management of PGRFA (Plant Genetic Resources for Food and Agriculture) in gene bank and is changing the process of plant breeding. The genetic information is also an effective integrator with which the plant breeding research and gene bank communities can interact.

Components

There are two components,

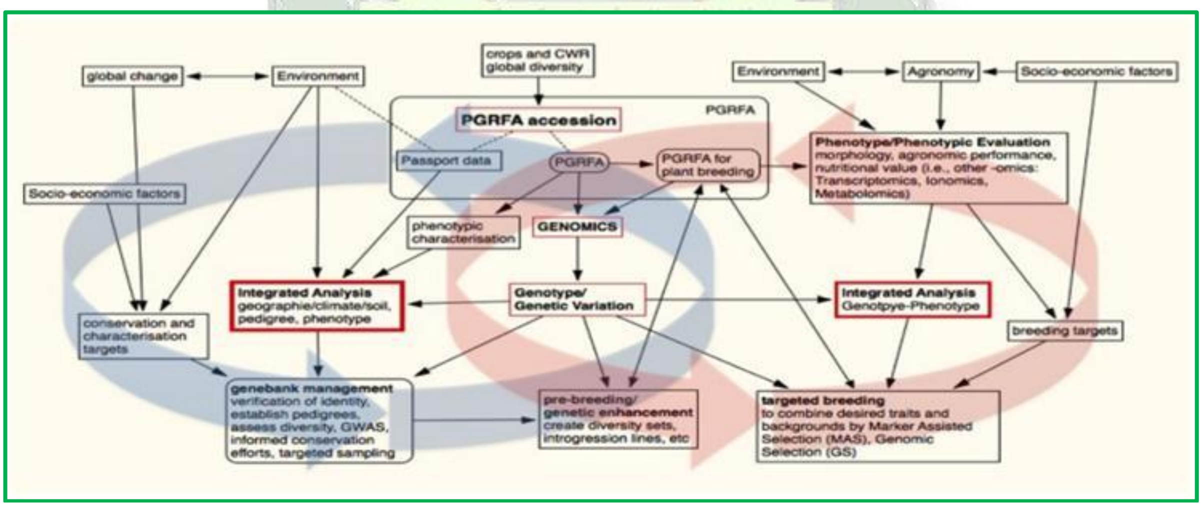
1. Genebank management
2. Applied Plant Breeding

The central role of genomics for research and development on plant genetic resources for food and agriculture.

- There is two major research cycle:

1. Genebank management research cycle (Blue)
2. Applied plant breeding research cycle (Red)

- The central role of genomics is expected to play in facilitating advanced breeding, effective pre-breeding as well as targeted breeding and informed genebank management.
- The message is that with comprehensive genotype information the genetic data can serve as an integrator.



Genebank

It is a bag of material (PGRFA) that can be used to reproduce said accession, i.e., seeds or tissue for vegetative propagation. It is drawn from the global diversity of crop plants and crop wild relatives (CWR) and usually enters the system of Plant Genetic Resources for Food and Agriculture (PGRFA) by being collected from farmer's fields or in the wild. Every accession has passport data associated with it, which at minimum contains information about its origin. Time and location of the collection links the PGR accession to the actual environment it is/was living in.

Genebank management

Genotype data: For establishing pedigrees and analyse relatedness PGRFA in the collection. Like – clones, duplicate entries and mislabels are readily identified.
Passport data: For geographic information – Allow for pl;ethora of inference about the environment envelope a particular crop and its-varieties/cultivars exist in and thrive or strive.
Genotype data: To map genetic variation.
Genetic variation along for, 1.) Pre-breeding 2.) Genetic enhancement
Applied, targeted plant breeding research cycle – It concerned with phenotype
Starting point of analysis are phenotypes evaluations of a variety of genotypes in a variety of environments and or under different agronomic management practices. With genomics genotype and phenotype data can be analysed together by methods such as genetic mapping, QTL-mapping, genome wide association studies (GWAS). All of the above will vastly accelerate breeding by shortening the breeding cycle, reducing cost and making accessible PGRFA otherwise overlooked due the desired phenotypes being masked.

Impact of Genomics on Genebank

- Analysis of passport information
- Phenotypic characterisation
- Genotypic collection (measure diversity within collection)
- Combining genotype information with passport data
- Combining genotypic information with phenotypic data
- Global Information System (GIS)

Impact of Genomics on Plant Breeding

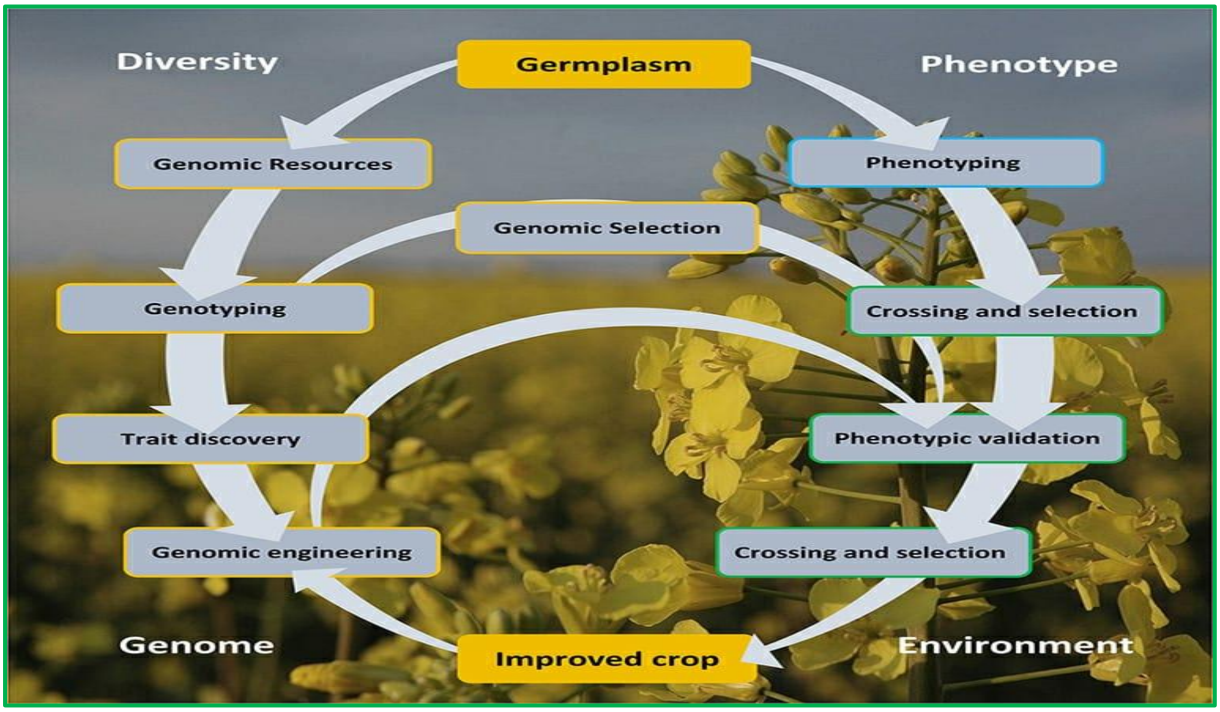
- Genotype-Phenotype association
- Selecting parental lines
- Marker assisted selection

Impact of Genomics on Pre-breeding

- Opening genetic bottlenecks
- Finish the domestication of landraces
- Recreating allelic combination

Conclusion

- To identify global diversity of crop plant and CWR.
- To measure differences within verities and cultivars.
- To map genetic variation
- To link phenotypes to genetic variants
- To support the selection of ideal parental lines
- To monitor inheritance of the genomic segments in the progeny



References

1. http://www.croptrust.org/content/pre-breeding
2. Karas, B. J. (2012), and http://syntheticyeast.org
3. http://genomicsandhealth.org
4. http://agro.biodiver.se/wp-content/uploads/2012/12/Technical-appraisal-NGS-for-genebanks-please-comment.pdf