PGR Informatics

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Ever-increasing significance of conservation and utilization of plant genetic resources (PGR) on one hand and advancements in computer technology for digitization and management of data on the other have catapulted PGR Informatics into limelight.

What is PGR Informatics

PGR Informatics is the management (creation, storage, retrieval and presentation) and analyses (discovery, exploration and extraction) of diverse information (facts, figures, statistics, knowledge and news). PGR Informatics has assumed significance because of the following factors:

(i) Increased awareness about PGRFA
(ii) Various international agreements (CBD, GPA, ITPGRFA) coming into force
(iii) Availability of information in text, images, maps, videos, etc.
(iv) Technologies to record, link and archive such diverse types of information
(v) Growing power (and falling costs) of computers and internet to facilitate access and retrieval

Fundamental merit of an organized digital information system is that it provides fair and just opportunity for all to access. On-line portals, as a consequence of PGR Informatics, enable non-exclusive access to PGR information to a large number of users involved in overlapping research areas on PGR management.

Typically information is collected on details of multitude of *Passport* data including taxonomy, biogeography, and ethnobotany of the germplasm acquisitions (domestic collections and exotic introductions), their *Seed Health*, multiplication for *Supply* and *Conservation*, *Regeneration*, experimental data on *Characterization* and *Evaluation* leading to *Utilization*. In addition to field data, it also includes biochemical and genomic data as well as publications. Once the information is digitized and stored, computer technologies allow management and analysis irrespective of the scale and types of data leading better visualization and predictions.

Biodiversity informatics as a discipline started with the construction of the first taxonomic coding system by researchers at the Virginia Institute of Marine Science for the Biota of Chesapeake Bay in 1972. This work led to development of a number of other taxonomic databases specializing in particular groups of organisms culminating into the "Catalogue of Life" in 2001 as well as into "Biodiversity Information Projects of the World."

Encyclopedia of Life, Consortium for the Barcode of Life (CBOL), TreeBASE, Species 2000, Global Biodiversity Information Forum (GBIF), Inter-American Biodiversity Information Network (IABIN), World Biodiversity Information Network (REMIB), Indian Bioresources Information Network (IBIN) *inter alia* have been the torchbearers of biodiversity informatics (Agrawal et al. 2012).

Relevance of PGR informatics

The need for countries to develop, maintain and exchange information "from all publicly available sources, relevant to conservation and sustainable use of biological diversity" including "results of technical, scientific and socioeconomic research" has been recognized in the Convention on Biological Diversity (CBD, Articles 7d, 17), and the Global Plan of Action (GPA, priority activities 17 and 18). Information of this nature is imperative for planning and implementing activities; sustainable use and sharing of benefits accrued from its use.

Global assessment indicates that many of the world's PGR are insufficiently and poorly documented. The passport information and characterization and evaluation data on genebank accessions conserved

in genebanks are either lacking or poorly recorded or scattered at different places, such as passport data sheets, reports of collection and exploration missions, crop catalogues, published articles, etc. In addition, there exist informal or non-coded knowledge held by traditional farmers and indigenous people. To use this information efficiently and effectively, the valuable information need to be collected, collated, maintained and exchanged with the help of PGR Informatics.

Global initiatives on PGR informatics

These mainly include database systems and online portals associated with genebanks (Table 1).

(i) Germplasm Resources Information Network (GRIN): supports the national germplasm collections important to food and agriculture, collectively called the National Genetic Resources Program of United States Department of Agriculture. GRIN provides genebank personnel and germplasm users with access to databases that maintain passport, characterization, evaluation, inventory, and distribution data important for the effective management and utilization of national germplasm collections.

(ii) European Search Catalogue for Plant Genetic Resources (EURISCO) is a search catalogue providing information about *ex situ* plant collections maintained mainly in Europe. It is based on a network of National Inventories of 43 member countries and 400 institutes providing information on ~2 million accessions.

(iii) The Japanese Genebank of National Agriculture and Food Research Organization (NARO), manages databases that include information on passport data, evaluation as well as more general information on genetic resources.

(iv) GENESYS is a global portal to information about PGR, from which information on germplasm accessions from genebanks around the world can be found. GENESYS resulted from collaboration between Bioversity International on behalf of System-wide Genetic Resources Programme of the CGIAR, the Global Crop Diversity Trust and the International Treaty on the Plant Genetic Resources for Food and Agriculture. In addition to passport data, GENESYS provides access to over 11 million records of characterization and evaluation data.

(v) PGR Portal: It is a gateway to information on PGR conserved in the Indian National Genebank housed at ICAR-NBPGR, New Delhi, with information on about 400,000 accessions.

Important PGR Informatics applications developed and maintained at NBPGR

1. PGR Portal	pgrportal.nbpgr.ernet.in
2. Import Permit and EC Data Search	exchange.nbpgr.ernet.in
3. Genebank Dashboard	genebank.nbpgr.ernet.in
4. PGR Map	pgrinformatics.nbpgr.ernet.in/pgrmap
5. National Herbarium of Crop Plants	pgrinformatics.nbpgr.ernet.in/nhcp
6. Biosystematics Portal	pgrinformatics.nbpgr.ernet.in/cwr
7. PGR Climate	pgrinformatics.nbpgr.ernet.in/pgrclim
8. PGR and IPRs	http://pgrinformatics.nbpgr.ernet.in/ip-pgr/

Recent advances in PGR Informatics in India

NBPGR has been striving to establish PGR information set up since 2002 (Archak and Agrawal, 2012). Development of mobile apps in PGR Informatics facilitates Enhanced access to PGR information can lead to enhanced utilization. NBPGR has developed two mobile apps "*Genebank*" and "*PGR Map*". Both the apps are first of their kind for any genebank in the world. The apps have been developed for both Android and iOS. No other ICAR app is available for iPhone. Licenses were purchased and the apps have been hosted on Google Play and App Store.

Genebank app provides a dashboard view of indigenous collections (state-wise), exotic collections (country-wise), addition of accessions to genebank, etc. The app also helps generate routine genebank reports. The app uses databases live on the backend and hence always gives updated information.

PGR Map app offers three benefits: "*What's around me*" helps user to obtain quickly the accessions that have been collected and conserved in the genebank from a particular location in India where the user is located at the moment; *"Search the map"* helps user to list the accessions that have been collected and conserved in the genebank from any selected location in India; *"Search for species"* helps user to map the collection sites of a crop species.

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References

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Table 1: PGR Informatics databases, portals and websites

Information resource	Web address
Japanese genebank portal	www.gene.affrc.go.jp/databases_en.php
European genebanks portal	eurisco.ipk-gatersleben.de
Genesys portal	www.genesys-pgr.org
Indian genebank portal	pgrportal.nbpgr.ernet.in
Barcode of Life	www.barcodeoflife.org
Convention on Biological Diversity	www.cbd.int
Encyclopedia of Life	www.eol.org
Global Biodiversity Information Forum	www.gbif.org
Indian Bio-resources Information Network	www.ibin.gov.in
International Legume Database	www.ildis.org
International variety protection database	www.upov.int
National Plant Germplasm System of USDA	www.ars-grin.gov/npgs
Species 2000	www.sp2000.org
World Information and Early Warning System	www.fao.org/wiews/en