

Access to Plant Genetic Resources: Policies and Procedures

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ABSTRACT: Exchange of plant genetic resources (PGR) is perhaps the simplest way to improve crops with new alleles. PGRs are exchanged and searched continuously for specific traits to improve crops in terms of yield and nutritional value. All countries are, therefore, interdependent on each other for sources of PGR, since many crops cultivated in a country have not originated there but are important for their food and nutritional security. Even biodiversity rich regions depend for their food production on crops/genotypes originated from other countries and this interdependence plays a very important role in the international collection and exchange of germplasm. Hence, every nation is concerned with acquisition of diverse and superior germplasm for conservation and utilization for crop improvement. The paper deals with the present status, policies and protocols relating to germplasm exchange for crop improvement in India.

Keywords: PGR, Access, Exchange, PGR policies

INTRODUCTION

Introduction of input responsive and short statured high yielding varieties in rice & wheat have played a very important role in Green Revolution. The cytoplasmic-nuclear male sterility and fertility restoration genes in crops like rice, pearl millet and sorghum enabled the exploitation of heterosis. In India, Soybean and sunflower are major crops now which were introduced long back. Introduced varieties which adapt well are directly released as varieties (primary introductions) and some may be utilized in developing new varieties (secondary introductions). Significant primary introductions and selections include wheat varieties Ridley (Australia), Lerma Rojo-64 (Mexico), Sonora 64 (Mexico); rice varieties IR 8, IR 20, IR 36, IR 50 introduced from Philippines; Oat varieties Kent (Australia), Rapida (USA); Pea varieties Bonneville (USA), Early Badger (USA), Arkel (UK), Harbhajan (Portugal); Cowpea varieties Pusa Barsati (Philippines), Pusa Phalguni (Canada); French bean varieties Kentucky wonder (USA), Contender (USA); Soybean varieties Bragg and Lee from USA.

Using exotic germplasm, India has formally released over 100 varieties of fruit crops [1]. Temperate fruit cultivation in India is largely based on introduced germplasm. Kiwi fruit which was introduced by ICAR-NBPGR, has become a commercial fruit crop in mid hills of India. In grapes, exotic varieties such as Thomson Seedless and its

superior clones Sonaka, Tas-e-Ganesh, Perlette, and Sharad Seedless continue to dominate the Indian export market. In banana, Dwarf Cavendish and Robusta are the leading varieties. Clonal rootstocks of the M and MM series introduced from the United Kingdom, such as M-9, M-26, M-4, M-7, MM-106, and MM-111 are very promising. Dog Ridge has been identified as the best rootstock for drought and salinity resistance in table grape varieties and is commercially exploited to raise scions of Thompson Seedless in Maharashtra [2].

In vegetable crops, introduced varieties which are still popular in many parts of the country are Golden Acre (Cabbage), California Wonder (Capsicum), Nantes (carrot), Arkel (pea), Japanese white (radish), Sugar Baby (water melon), Contender (French bean). Varieties namely Pusa Ruby, Pusa Early Dwarf, Punjab Chhuhara, Punjab Kesari (tomato); Arka Manik (watermelon); Pusa Yamdagni, Pusa Kesar (carrot); Pusa snowball-1 (cauliflower), etc. have been developed using exotic collections [3].

Facilitated and widespread exchange of the major food crops is critical for food security as food production is heavily dependent on the movement of seed and other forms of plant germplasm across national and regional borders. Plant breeders, molecular biologists, and agronomists achieve greater gains in crop yields and

quality in shorter times than in the past due to the exchange of germplasm. However, newer policies emerging from international environmental negotiations now regulate the movement of these genetic resources. The major was the Convention of Biological Diversity (CBD) which entered into force in 1993. The CBD reaffirmed national sovereignty over genetic resources. It provides for a bilateral approach to access/exchange between countries on prior informed consent and mutually agreed terms. At the national level various regulatory mechanisms have been put in place by different countries, which govern access to plant genetic resources.

Plant Genetic Resources for Food and Agriculture (PGRFA) are very essential and crucial for achieving the food and nutritional security. Before the implementation of the CBD, PGR was considered as the heritage of mankind and it was freely available without restriction. However, the implementation of CBD in the year 1993, emphasized the sovereign rights of the nation over its genetic resources. However, a parallel development was adoption of a non-binding International Undertaking on Plant Genetic Resources (IUPGR) by FAO in 1983 with the objective to ensure that PGR are of economic and / or social interest, particularly for agriculture, will be explored, preserved, evaluated and made available for plant breeding and research purposes. FAO Commission on Genetic Resources for Food & Agriculture (CGRFA) monitored the implementation of IUPGR. The revised text of IUPGR was submitted to the 31st Session of FAO Conference that adopted it as the International Treaty on Plant Genetic Resources for Food and Agriculture on 3 November, 2001 (FAO, 2001). Legally binding ITPGRFA was thus negotiated as a direct response to CBD in 2001, and came into force in 2004 to facilitate access to PGRFA in harmony with CBD, through an efficient mutually agreed system of access and benefit sharing. Access is only for research, breeding and training and not for chemical, pharmaceutical or nonfood/feed industrial use. No Intellectual Property rights can be claimed on PGRFA in the form received from the multilateral system (MLS) that limit the facilitated access to PGRFA/genetic parts or components. The treaty which is legally binding is an international commitment to the improvement of the world's key food and feed crops. Its centerpiece is a multilateral system (MLS) of facilitated access and benefit sharing that directly supports the work of breeders and farmers everywhere. Its objectives, aim for conservation and sustainable use of PGR for food and agriculture and the fair and equitable sharing of benefits derived from

their use, in harmony with the CBD for sustainable agriculture and food security. It covers all PGR relevant to food and agriculture. Each ratifying government agreed to ensure the conformity of its laws, regulations and procedures with its obligations under the treaty. The Governments of the countries that ratified the treaty form its governing body.

ICAR-NBPGR is the nodal agency for the import of the germplasm for research purposes in Germplasm Exchange and Policy Unit at ICAR- NBPGR has the major responsibility of introducing/ importing genetic resources of diverse crop plants and their wild relatives for research purposes and distributing the same within the country. It also facilitates export of the germplasm to foreign collaborators for research needs under the provisions of Biological Diversity Act, 2002 of India. In addition to being a single window system, the unit has the responsibility for national (inland) supply of PGR for research purposes. The Unit is entrusted with the responsibility of issuing import permits and quarantine processing of germplasm and planting material meant for research including that of transgenics in order to ensure the safe exchange. An analysis for understanding the implications of CBD on access of PGR in India during pre- and post-CBD periods revealed an overall decline of 14.5% in the imported germplasm during post CBD period [4].

Over the years the Bureau has developed a well-defined mechanism and infrastructure for undertaking the exchange activities for both public and private sectors. It also provides technical support to ICAR, Ministry of Agriculture and Ministry of Environment and Forests on various international and national policies related to management of PGR [5].

Policies for Regulating Access to Plant Genetic Resources

Accessing Plant Genetic Resources from other countries

The Government of India has made it obligatory for all plant breeders and researchers intending to import seed/ planting materials, from other countries for research purposes to fulfill the following two mandatory requirements under the Plant Quarantine (Regulation of Import into India) Order 2003 (PQ Order 2003) (www.plantquarantineindia.org)

- (i) Import permit (IP) before import of any material.
- (ii) Phytosanitary certificate (PC) from the country of origin.

These two documents must accompany every consignment of seed/planting material imported from foreign countries.

For Commercial import of seeds of coarse cereals, pulses, oil seeds and fodder seeds and seeds/stock material of fruit plant species for propagation shall only be permitted based on the recommendations of EXIM Committee of the Department of Agriculture & Cooperation, by Department of Plant Protection, Quarantine and Storage (DPPQS), NH-IV, Faridabad

Director, NBPGR has been authorized to issue IP for import of germplasm/ transgenic or genetically modified organisms for research purposes and receive imported materials from custom authorities for its quarantine inspection and clearance and further distribution to the researchers in the country. The IP is issued as plant quarantine form 09 (PQ 09) in triplicate within 24 hours. For specific crops, the requests for import permits are to be routed first through Directors of respective ICAR crop-based institutes for non-transgenic as well as for transgenic crops (as per schedule V, clause 3 (3)(6) and 10 and 11 (3) of PQ Order 2003). This applies to all indents from NARS/SAUs/Private Sector/ any other.

IP is valid for six months from the date of issue and valid for successive shipment provided the exporter and importer, bill of entry, country of origin and phytosanitary certificate are the same for the entire consignment. Validity may be extended up to one year on request before the expiry of permit and payment of prescribed fee, if adequate reasons provided in writing are justified. The import permit issued is non-transferable and no amendments to the permit shall be issued except for change of point of entry subject to reasons to be recorded in writing.

Issuance of Import Permit (IP)

Any researcher/user desirous of importing seed/planting material into India has to apply to the Director, ICAR-NBPGR on a prescribed application form for issuance of Import Permit which is plant quarantine form 08 ((PQ 08) and is available at ICAR- NBPGR website www.nbpgr.ernet.in. Application for issuance of IP, processing fee (to be paid online) should be forwarded to Director, ICAR-NBPGR, New Delhi. The fee is non-refundable. The fee is subject to revision from time to time.

Import by Public Institutions/ Organizations

The indenter is required to fill the online application form for issuance of IP (PQ08). For online submission and monitoring of applications for Import of Plant Germplasm, create the account by signing up at the following URL in the web browser <http://www.nbpgr.ernet.in/geq>.

As a new user, there is need to create account. Click on the Signup Button as shown in Fig.1.

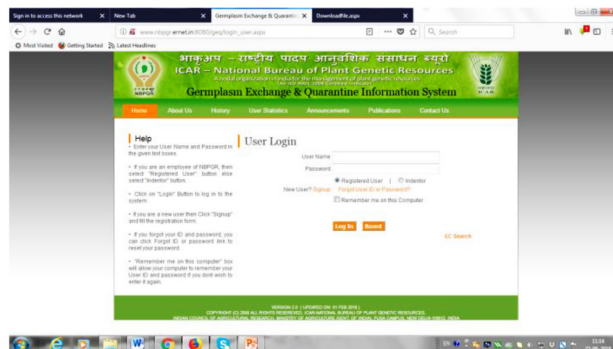


Figure 1. Interface for creating account on germplasm exchange and quarantine information system

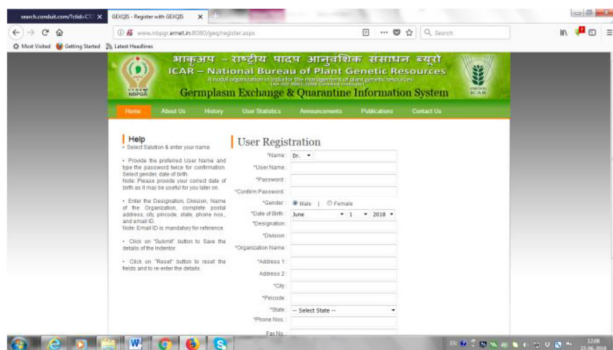


Figure 2. User registration form

After clicking on signup button, user registration form will open. Complete the user registration and click on the submit button. After the submission of the user registration form, you will get a message about your successful submission of user registration form. You shall receive confirmation email containing your account information you have submitted in the registration form. You will not be able to access the system unless your account is activated by the administrator. After your registration form is activated by the administrator, you shall get a notification in your email account. Once you get the notification regarding the activation of your account, you can login to the "User Login" screen with your "User Name" and "Password". Fill in PQ08 Form (Fig.3).

Figure 3. Interface for generating Import Permit (PQ 08)

Successful submission of PQ08 form will generate unique ID that can be seen on the screen. The unique request ID will help you to track your application in future. Click print application button to print the form if required. Intender is required to deposit processing fee through online payment gateway at ICAR-NBPGR website. The charges applicable are available at http://www.nbpgr.ernet.in/Portals/6/services/Fee_Stru_2023.pdf. IP (PQ09) will be generated based on the information entered and issued. The processing charges for ICAR Institutes/SAUs and other public funded Institutes/ organization have been approved by ICAR and rates are available at http://www.nbpgr.ernet.in/Portals/6/services/Fee_Stru_2023.pdf. The charges are subject to revision from time to time.

Import by Private Institutes/ Organizations

The private organization/seed companies applying for Import Permit are required to complete the procedure as described earlier. They are required to submit a copy of valid R&D recognition certificate from Department of Scientific & Industrial Research (DSIR), Ministry of Science & Technology, Government of India.

Import of Transgenic seed/planting materials

Under the provisions of clause 6(1) (2) of Plant Quarantine (Regulation of Import into India) Order 2003 the import of transgenic seeds/ genetically modified organism is also permitted for research purposes subject to the clearance from Department of Biotechnology (DBT). DBT and the Ministry of Environment, Forest and Climate Change (MoEFCC) have separate set of prescribed procedures for providing permission for import of transgenics into India for research/experimental

purposes (for further details log on to <http://dbtindia.nic.in/uniquepage.asp>).

Review Committee on Genetic Manipulation (RCGM), constituted by DBT examines the desirability of import of transgenic line, from the biosafety point of view under the Environment (Protection) Act, 1986. As per provisions of this, all transgenic plants are regulated items.

For import of transgenic, IP is issued by the Director ICAR-NBPGR subject to the issue of Import Clearance by the RCGM of the DBT. After getting the technical clearance for Seed Transfer Clearance Letter issued by DBT, application for issuance of IP is submitted to the Director, ICAR-NBPGR in the prescribed PQ08 form, along with the application fee. The fee is non-refundable. The procedure is available online at www.nbpgr.ernet.in/geq. Importer who wishes to import a transgenic seed or planting material for research or experimental purposes must have in place, (i) Institute Biosafety Committee (IBSC), and (ii) post-entry quarantine facility certified by DBT. The importer submits the proposal for import to RCGM through the IBSC. RCGM assesses the import application and examines the desirability of import from biosafety point of view. As per the revised simplified procedure/guidelines on import, export and exchange of Genetically engineered organisms and products thereof for research and development purpose issued by DBT in January 2020, model organisms such as plants (*Arabidopsis*), common laboratory models and other model organisms which are routinely used in laboratories globally, the IP may be issued for import for laboratory use only subject to certification of IBSC. The IBSC is required to certify that the plants/ model organisms carry routine and standard experimental insertions and do not carry foreign gene-insertions from non-model organisms.

Requirement of Phytosanitary Certificate (PC)

Phytosanitary certificate (PC) is a document regarding the health status of consignment. Every import should be accompanied with phytosanitary certificate (original copy) issued by Govt. official from the country of origin in the prescribed format of Food and Agriculture Organization (FAO). PC is to be issued by the official agency of the donor country.

Every consignment shall be accompanied by PC issued by authorized officer at country of origin/ supplier country with additional declarations for freedom from specific pests and diseases as specified or that the pests specified

do not occur in the country or state of origin as supported by documentary evidence thereof.

Specific pests for the crops are mentioned in Schedule V and VI of PQ Order 2003 (www.plantquarantineindia.org). For crops not listed in schedule, pest risk analysis (PRA) is done before import.

The Central Government may, in public interest, relax any of the conditions (IP and PC) of this Order relating to the import of any consignment. In the event of grant of relaxation by competent authority, the consignment shall be released after charging the fee for import permit and fee for plant quarantine inspection at five times of normal rates.

Quantity of seed permitted for import

Importing a small amount of seed/planting material for research purposes is permitted. The optimum and safest quantity of seed or planting material is considered to be just enough for plant establishment. The approved quantity for import of seed/ planting material is available at http://www.nbpgr.ernet.in/Portals/6/services/Perm_Qty.pdf. The seed quantity for transgenic plants is specified in the DBT clearance letter. Five to ten per cent or 5-10 seeds depending on the quantity imported of the seed/planting material is parted for keeping in the National Genebank as a voucher specimen for future reference.

Release of Consignment from Customs

It should be ensured that the consignment must be addressed to the Director, ICAR-NBPGR, New Delhi 110012. The port of entry of germplasm is New Delhi Airport only.

All the document required for release of consignment must be addressed to Director, ICAR-NBPGR such as Airway bill, packing list, invoice, PC. The copy of IP, PC and other relevant documents from the country shall be forwarded to Director, ICAR-NBPGR.

Registration of imported consignment and quarantine processing

After the consignment is released from customs, it is registered online and all details viz. PC number, PC date, IP number, IP date, Material details (Crop name), number of packages and the source country are documented online. Unopened parcels and all the relevant documents are submitted to Plant Quarantine Division for Quarantine examination. If by any reason the consignment directly reaches the applicant/indentor, the unopened packet/

parcel must be sent to ICAR-NBPGR for quarantine processing. The accessioning of samples after quarantine clearance is done online and each accession is assigned a national identity i.e. Exotic Collection (EC) number. Voucher sample is deposited in the National Genebank. The consignment is dispatched to the indentor after payment of handling charges and quarantine examination fee (http://www.nbpgr.ernet.in/Portals/6/services/Fee_Stru_2023.pdf). The unique national identity EC number must always be retained. If the seed/planting material is received under any material transfer agreement/ standard material transfer agreement, the terms and agreement must be strictly followed.

Accessing Plant Genetic Resources (Export) from India by Institutions in other Countries

Under the provisions of the Convention on Biological Diversity (CBD), Government of India enacted legislation called Biological Diversity Act (BDA), 2002 and also notified the Biological Diversity Rules, 2004. The BDA, 2002 was revised for certain clauses in 2023. As per section 3 of the Act, no person from outside India or a body corporate, association, organization incorporated or registered in India having non -Indian participation in its share capital or management, can access any biological resources or knowledge associated, for research, commercial utilization, bio-prospecting or bio-utilization, without prior approval of National Biodiversity Authority (NBA).

The person who shall be required to take the approval of the NBA are the following, namely:

- (a) a person who is not a citizen of India;
- (b) a citizen of India, who is a non-resident as defined in clause (30) of section 2 of the Income Tax Act, 1961; (43 of 1961);
- (c) a body corporate, association or organization
 - (i) not incorporated or registered in India,
 - ii) incorporated or registered in India under any law for the time being in force, which is controlled by a foreigner within the meaning of Clause (27) of Section 2 of the Companies Act, 2013

[Clause (27) of Section 2 of the Companies Act, 2013 (describes the phrase 'Control' & control shall include the right to appoint majority of the directors or to control the management or policy decisions exercisable by a

person or persons acting individually or in concert, directly or indirectly, including by virtue of their shareholding or management rights or shareholders agreements or voting agreements or in any other manner]

As per Section 5 of BDA, 2002, exchange of germplasm for collaborative research under the bilateral agreements/ collaborative projects is, however, exempted which confirm to the policy guidelines issued by the Central Government or approved by the Central Government.

Access under collaborative research projects

As mentioned above, Section 5 of the BDA, 2002 provides for exemption of export under collaborative research projects compliant to MoEFCC Guidelines issued in year 2008 (<http://nbaindia.org/uploaded/pdf/notification/7%20%20collaborative%20guidelines.pdf>). The requests for export under the provisions of collaborative research projects are facilitated by ICAR-NBPGR, however, for seeking approval, competent authority is Department of Agricultural Research and Education (DARE), Ministry of Agriculture and Farmers Welfare, Government of India (MoA&FW).

The applicant/ indenter while submitting proposal to ICAR-NBPGR for export must enclose the following documents – 1. Copy of the collaborative project; 2. Approval of ICAR/DARE for the project; 3. Request letter; 4. List of material; 5. Signed copy of MTA; 7. Duly signed undertaking by both PIs (Indian and Foreign).

ICAR-NBPGR forwards the proposal for approval of competent authority with duly filled checklist with comments of the Director/ Project Director/ Project Coordinator of the crop concerned. After the approval for the export of seed/planting material, the material is sent for quarantine examination for issuance of PC by Plant Quarantine Division, ICAR-NBPGR. The seed/planting material is dispatched to the indenter along with IP and PC.

Access under the provisions of International Treaty on Plant genetic resources for Food and Agriculture (ITPGRFA)

The ITPGRFA, 2001 provides for facilitated access to the crops mentioned in Annex 1 of ITPGRFA to all its member countries. The purpose of access however, is solely for utilization and conservation for research, breeding and training. ITPGRFA facilitates the importance of plant genetic resources for research and sustainable use, however, the benefit arising from the user must be

shared equitably for conservation of genetic resources and also taking measures to enhance the coverage of MLS of Access and Benefit-sharing and revisions required in SMTA (1).

Under Section 40 of the BDA, 2002 the Annex 1 crops are exempted from its purview. Notification for exemption of Annex 1 crops is issued by government of India through the Department of Agriculture & Cooperation and Farmers Welfare (DAFW), MoA&FW on February 16, 2014 including the approved Guidelines for the implementation of the ITPGRFA (Office Memorandum No. 13-5/2013 SD-V). MoEFCC has also issued a notification for exemption of Annex crops of the Treaty. (http://nbaindia.org/uploaded/pdf/Gazette_Notification_on_exemption_of_crops_listed_in_the_Annex-I_of_the_ITPGRFA.pdf). Thus, as per the notification issued the access under the multilateral system is exempted from section 3 and 4 of the BDA, 2002 (18 of 2003) and is on par with section 5 under which the collaborative research projects are exempted from section 3 & 4.

Any request for Annex 1 Crops (MLS) of the Treaty is submitted to DAFW as per the guidelines for Implementation of the ITPGRFA. These requests are processed by ICAR-NBPGR and based on recommendations of the GEFC constituted for the purpose and the approval is granted by DAFW.

ICAR-NBPGR being the nodal agency for the management and exchange of PGR for research purposes in India coordinates the supply of PGRFA of Annex 1 crops for the purpose of the Treaty, in consultation with other relevant national research institutions/organizations. PGRFA collected before 1993 and held in 'trust' by International Agricultural Research Centres (IARC's) shall also be made available in accordance with the provisions of SMTA after the agreements between IARCs and FAO.

Sending germplasm for non-commercial research or research for emergency purposes outside India other than collaborative research

If an Indian researcher/ Government institution wants to carry/send germplasm outside India for non-commercial research or research for emergency purposes other than collaborative research, he/she needs to fill form B and undertaking to NBA, Chennai. Such applications are required to be submitted online (http://nbaindia.org/uploaded/pdf/Gazette_Notification_of_ABS_Guidelines.pdf) as per the ABS Guidelines notified in year

2014. Approvals for such export are granted within 45 days of submission. The applicant is also required to submit voucher sample to the designated repository and obtain acknowledgement certificate for deposition within 30 days after receiving approval of NBA. The designated repository for plant germplasm is ICAR-NBPGR (<http://nbaindia.org/uploaded/pdf/notification/1%20designated%20repositories.pdf>). After the approval of NBA, Chennai the seed/planting material shall be submitted to ICAR-NBPGR for obtaining PC after quarantine inspection.

Access by non-Indian entity for any biological resource occurring in India which is neither Annex I crop under ITPGRFA nor covered under any collaborative research project

Any non-Indian entity (defined under section 3 (2) of the Biological Diversity Act, 2002 & Revision 2023) for accessing any biological resource occurring in India, is required to apply in Form 1 and submit the requisite fees to NBA, Chennai (<https://absefiling.nic.in/NBA/login/auth>). NBA grants approval within six months for such exports. The services for the same are available online.

Access by Indian Citizens for bio survey/ bio-utilization (commercial purposes)

As per Section 7 of BDA, 2002 & Revision 2023, Indian citizens can access any biological resource occurring in India and its associated knowledge for commercial utilization only with prior intimation to the concerned State Biodiversity Board.

Accessing Plant Genetic Resources within country

ICAR-NBPGR is also serving the needs of researchers for various crop improvement program through supply of the desired germplasm from National Genebank and from active collections maintained at regional stations in different agro-climatic zones of the country. National Active Germplasm Sites (NAGS) are effective partners in collaborating with ICAR- NBPGR for meeting the requirements of researchers in the country.

Access at national level is based on the provisions of Biological Diversity Act, (BDA), 2002 and Rules (2004). The request for supply of germplasm in small quantities and only for research purposes are being considered by Director, ICAR-NBPGR. The indenter is desired to submit its request in requisition proforma for supply of seed/planting material in small quantities (GEX 01). The applicant is also required to fill in and submit the duly

signed Material Transfer Agreement for research use within India for public and private entities (MTA). The two documents are available at NBPGR website. ICAR-NBPGR arranges for the supply of germplasm maintained in network mode from its regional stations and other National Active Germplasm Sites (NAGS), where the active collections are held. If the desired materials are available at ICAR- NBPGR, they are collected and forwarded to the indenter, or else the requests are forwarded to various sources in India including NAGS and the material thus procured is forwarded to the indenter. The indenter is required to pay for the processing and handling charges as applicable available at http://www.nbpgr.ernet.in/Portals/6/services/Fee_Stru_2023.pdf

Accessing PGR within country by Private Institutes/ Organizations in India not falling under Section 3 (2) of the Biological Diversity Act 2002 and Amendment 2023

All the requests for the supply of PGR stored/maintained by ICAR-NBPGR/NAGS are to be submitted to the Director, ICAR- NBPGR, in the requisition proforma for the supply of seed/planting material or Form GEX 01, alongwith Material Transfer Agreement (MTA) duly filled and signed by recipient of the seed material. The indenter is required to pay for the processing and handling charges as applicable available at http://www.nbpgr.ernet.in/Portals/6/services/Fee_Stru_2023.pdf. They are also required to submit an affidavit stating that they do not fall under section 3 (2) of the Biological Diversity Act and are wholly Indian. Additionally, they need to submit the Certificate of R&D recognition from Department of Scientific & Industrial Research (DSIR), Ministry of Science & Technology, Govt. of India.

Accessing PGR within country by Private Institutes/ Organizations falling under Section 3(2) of the Biological Diversity Act 2002 and Amendment 2023

The private entities falling under Section 3 (2) of BDA, 2002 shall submit the request to Director, ICAR-NBPGR to check for the availability of the seed material with ICAR-NBPGR. After confirming the availability, they are required to obtain approval of NBA, Chennai. Once NBA approves the request the indenter is requested to submit the request with duly filled in MTA and enclosing NBA approval for the same. Applicable handling and processing charges are to be paid for the supply of the seed material (available at http://www.nbpgr.ernet.in/Portals/6/services/Fee_Stru_2023.pdf).

CONCLUSIONS

For increasing productivity and achieving sustainable development goals of zero hunger, global and national network of plant genetic resources should be strengthened. Genetic resources of all the crop genera need to be maintained at respective crop institutes/designated sites for expeditious supply. Since countries including India have started exercising sovereign rights over biological resources as established under CBD, by enacting various legislations, the new rules potentially create an environment to reduce biopiracy-patents on natural product inventions, unless all sources of raw material and public knowledge about the species are fully disclosed. As a single window system of exchange in India, ICAR-NBPGR is regulating access of germplasm to other countries as per the current legal framework. It is continually serving the needs of researchers/breeders/other stakeholders by facilitating germplasm supply through a single window system in the country.

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Related Websites

<http://www.biodiv.org> home page CBD

<http://www.biodiv.org/doc/legal/cbd-en.pdf> full text of the Convention

www.nbaindia.org home page Biological Diversity Act

www.planttreaty.org home page ITPGRFA

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