



GUIDELINES FOR REGISTRATION OF PLANT GERMPLASM



National Bureau of Plant Genetic Resources
Indian Council of Agricultural Research
Pusa Campus, New Delhi-110 012



GUIDELINES FOR REGISTRATION OF PLANT GERMPLASM (Revised, 2014)

**NATIONAL BUREAU OF PLANT GENETIC RESOURCES
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)
Pusa Campus, New Delhi-110 012**

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National Bureau of Plant Genetic Resources (NBPGR)
Pusa Campus, New Delhi-110 012
Phone: 01-011-25846268; Fax: 01-011-25842495
E-mail: rktyagi@nbpgr.ernet.in
Website: <https://www.nbpgr.ernet.in>

Technical Expert Committee for Revision:

SK Datta, Deputy Director General (Crop Science), Indian Council of Agricultural Research (ICAR), New Delhi

JS Chauhan, Additional Director General (Seed), ICAR, New Delhi

KC Bansal, Director, National Bureau of Plant Genetic Resources (NBPGR), New Delhi

OP Yadav, Project Director, Directorate of Maize Research (DMR), New Delhi

RK Tyagi, Head, Division of Germplasm Conservation, NBPGR, New Delhi

Collated and Edited by:

RK Tyagi, Head, Division of Germplasm Conservation, NBPGR, New Delhi

A Kak, Principal Scientist, Division of Germplasm Conservation, NBPGR, New Delhi

Front Cover Page Photographs (from left top to right in each row):

Rice (*Oryza sativa*) RNR-2465 aromatic medium slender culture; Chrysanthemum (*Dendranthema grandiflora*) Selection IIHR-2 early and off-season flowering; Sorghum (*Sorghum bicolor*) Atharga kempu Jola; Coconut (*Cocos nucifera*) IND 092 Cameroon red dwarf with distinct bright orange colored nuts; Maize (*Zea mays*) DMR E63 source of resistance to pink bore; Chilli (*Capsicum annuum*) Pandav erect cluster bearing; Gaur (*Cyamopsis tetragonoloba*) CH/55-2 with foliaceous bracts; Maize (*Zea mays*) MCM-11/01 with 3-4 cobs/plant; Wheat (*Triticum aestivum*) VL-876 with high bread loaf volume; Chilli (*Capsicum chinense*) IC0553688 with high capsaicin; Spiked zinger Lily (*Hedychium spicatum*) NKO-24 with bold seeds; Chilli (*Capsicum annuum*) PSRKK-11287 with purple phenotype; Cotton (*Gossypium arboreum*) CINA333 with high seed cotton yield; Sunflower (*Helianthus annuus*) IC548342 ray floret less mutant

Back cover page photograph:

Front view of NBPGR Building

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FOREWORD

India has a very strong crop improvement programme undertaken by Indian Council of Agricultural Research (ICAR) in the form of All India Co-ordinated Crop Improvement Projects (AICRIPs) for almost all important crops for food and agriculture. The essential features of the AICRIPs are collaborative multi-location evaluation. This has paid rich dividends in the form of development and release of improved crop varieties and hybrids that played a pivotal role in enhancing the national agricultural production. During the process of germplasm manipulations, research and experimentation to develop improved varieties for specific or multiple traits, many useful materials are developed which may not qualify for notification and release as variety. Such material may have resistance/tolerance to biotic and abiotic stresses, and other unique traits with academic, scientific and applied values. ICAR has established a mechanism to register the trait-specific germplasm through National Bureau of Plant Genetic Resources to address the above concerns and recognizing the contributions of researchers who had developed/identified the trait-specific germplasm. The main purpose of plant germplasm registration is to bring the trait-specific germplasm in public domain and to disseminate the information thereof for using the same effectively in developing new varieties.

In 1996, the detailed guidelines and the proforma for the registration of plant germplasm were formalised for major food crops and approved in 1999. Since then several changes in management of plant genetic resources and related policies have taken place nationally and internationally. The present revision of the guidelines is an effort towards simplification and inclusion of provisions required as per the changing scenario for submission of application for registration, data requirement and deposition of seed/genetic material. This facilitates the availability of the information in public domain, which has become important to safeguard the national resources. Registered germplasm will be useful to search the new genes for incorporation in existing cultivars to ensure the food and nutritional security.

New Delhi
July, 2014



(S K Datta)
Deputy Director General (Crop Science)
Indian Council of Agricultural Research
Krishi Bhawan, New Delhi

Abbreviations

AICRP	:	All India Co-ordinated Research Project
AVT	:	Advanced Varietal Trial
CMS	:	Cytoplasmic Male Sterility
EC	:	Exotic Collection
IC	:	Indigenous Collection
ICAR	:	Indian Council of Agricultural Research
IGIC	:	Institute Germplasm Identification Committee
IPR	:	Intellectual Property Right
M&AP	:	Medicinal and Aromatic Plants
NAGS	:	National Active Germplasm Site
NARS	:	National Agricultural Research System
NBPGR	:	National Bureau of Plant Genetic Resources
NGB	:	National Genebank
NRC	:	National Research Centre
PC	:	Project Co-ordinator
PD	:	Project Director
PGRC	:	Plant Germplasm Registration Committee
PGRFA	:	Plant Genetic Resources for Food and Agriculture
PPV&FRA	:	Protection of Plant Varieties and Farmers' Rights Act

REGISTRATION OF PLANT GERMPLASM

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

PREAMBLE

The need for recognition to the developers of new improved varieties is being served by the Central Sub-Committees on Crop Standards, Notification and Release of Varieties of Agricultural Crops (CVRC) as part of the Indian National Agricultural Research System (NARS). Further, the enactment of Protection of Plant Varieties and Farmers' Rights Act (PPV&FRA) 2001 provides for protection of the intellectual property rights of plants breeders and farmers involved in development of plant varieties.

The Indian Council of Agricultural Research (ICAR) operates the mechanism for evaluation, identification and recommendation for release of crop varieties. The Ministry of Agriculture under the Seed Act, 1966, Section 5 provides procedure for notification of released varieties through CVRC and ensures production and sale of seeds meeting the Minimum Seed Certification Standards.

Plant Genetic Resources for Food and Agriculture (PGRFA) form the basis for genetic improvement of crop species in development of new varieties. Hence, it was realized that due recognition should be accorded to the persons/institutions who are associated with the development and identification of improved or unique potentially valuable germplasm and genetic stocks. It is also desirable from the point of changed world scenario of Intellectual Property Rights (IPR) regimes to inventorize, document and bring all the important genetic resources into public domain, facilitating their safe and accelerated use in research and crop improvement.

Recognizing the importance of the issue, a mechanism for "Registration of Plant Germplasm" was instituted in 1996 at the National Bureau of Plant Genetic Resources (NBPGR), New Delhi by the ICAR. This mechanism is envisaged to serve as a recognized tool for registration of PGRFA at national level. This would also provide facilitated access to the developed or identified potentially valuable germplasm for utilization in crop improvement programmes. Since the institution of this mechanism, 29 meetings have been held and a total of 1,165 germplasm belonging to 186 crop species have been registered. The present revision of the guidelines is an effort towards simplification and inclusion of provision required as per the changing scenario for submission of application and seed/genetic material, recommended by Plant Germplasm Registration Committee (PGRC).

GUIDELINES FOR REGISTRATION OF PLANT GERMPLASM

1. Plant Germplasm Registration Committee

- (i) The Plant Germplasm Registration Committee (PGRC) is constituted under the Chairmanship of Deputy Director General (Crop Science), Indian Council of Agricultural Research, New Delhi.
- (ii) It includes Director, National Bureau of Plant Genetic Resources (NBPGR), New Delhi, as a permanent member and a senior level scientist from NBPGR to function as Member Secretary, which would be identified by the Chairman, PGRC. The other members will be co-opted as per the advice of the Chairman.
- (iii) It has provision for adoption of need-based crop specialists with reference to the material under consideration, with the approval of the Chairman.

2. Nodal Agency

- (i) NBPGR, New Delhi, is the nodal agency for registration of germplasm. The application should be addressed to the Director, NBPGR, New Delhi-110 012, along with the seed sample or a certificate of submission of propagules with respective crop/plant-based National Active Germplasm Site (NAGS) for establishment/conservation (Annexure I).
- (ii) The Member Secretary, PGRC, will duly acknowledge with date, the receipt of the application and of the seed material (in case of vegetatively propagated crops after ensuring deposition and establishment of genetic material at the relevant NAGS), the acknowledgement would be issued, communicating application number and the national identity.
- (iii) NBPGR maintains a permanent record and database listing the germplasm materials approved by PGRC with details on unique trait(s) and other related information.

3. Application Form

Application shall be made on the prescribed Proforma (Form A, Annexure II). The PGRC shall meet quarterly (preferably last month of the quarter) a year, with the concurrence of the Chairman, for consideration of applications and related matters following the guidelines (Annexure II A) and description of codes (Annexure II B) Applicant should fill Annexure IV and submit with application.



4. Eligibility Criteria for Registration

Criteria

- (i) Germplasm/genetic stock/elite material of field, horticultural and other economic crops, including argo-forestry species, spices, medicinal and aromatic plants, ornamental plants, which is unique, uniform, stable and has potential attributes of academic, scientific or commercial value shall be registered.
- (ii) Exotic germplasm (imported) can be registered for a trait other than those published or registered. Similarly, selections made from exotic germplasm can also be registered.
- (iii) Selection for unique traits from landraces (other than the landrace is known for) may be considered for registration.

Proof

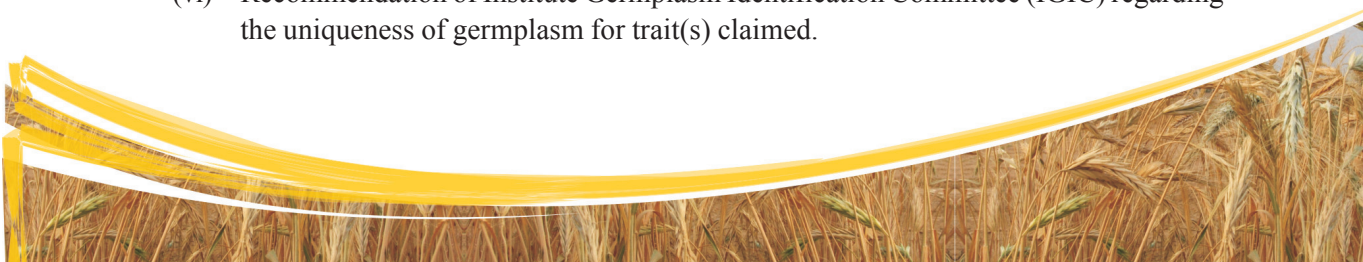
All claims concerning the germplasm submitted for registration should accompany scientific evidence for uniqueness, reproducibility and value in the form of:

- (i) Performance (yield contributing traits, adaptation traits, quality traits) data for at least four environments (location and year combination) under All India Co-ordinated Research Project (AICRP) trial/nursery tests supported with relevant extracts of the documents (*e.g.* comparative data of all entries tested) or verification by concerned Project Director/Project Co-ordinator (PD/PC) or under any other relevant system verified by Competent Authority. For qualitative traits (*e.g.* flower colour, leaf venation, seed colour) data of two environments duly supported by documents.
- (ii) For resistant/tolerance to biotic and abiotic stresses, data should be obtained for at least four environments under established hot spot locations/under artificial screening (epiphytotic) conditions. All the proposers of the germplasm/genetic stock should sign declaration that standard procedures were followed for testing/screening.
- (iii) Supporting biochemical evaluation data should be obtained from at least four environments.
- (iv) The proposed genetic stock/germplasm should also be evaluated along with already registered genetic stock(s)/germplasm(s), if available.
- (v) Supporting documentary evidence on (i), (ii) and (iii) either in Institute Annual report/ AICRP Report/peer reviewed journals.

3

AND

- (vi) Recommendation of Institute Germplasm Identification Committee (IGIC) regarding the uniqueness of germplasm for trait(s) claimed.



5. Germplasm Ineligible for Registration

- (i) Germplasm or genetic stock without accompanying documentary evidence for the claim made in the application.
- (ii) Germplasm or genetic stock that does not contain complete passport data (see Annexure III), including authenticated taxonomic identity, parentage, institutional or national identity, geographical location of origin and all such information relating to the development and contribution, if any, to the uniqueness of the germplasm.
- (iii) Exotic material *per se*, with no evidence of human intervention in its improvement.
- (iv) Varieties/hybrids of common knowledge or selection from traditional or farmers' varieties.
- (v) Germplasm which involves any technology, which is injurious to the life or health of human being, animals or plants.
- (vi) Material for which any form of protection has been sought elsewhere.

6. Screening of Application(s) and their Consideration by the PGRC

- (i) The Member Secretary, PGRC, will screen the proposal(s) submitted on prescribed Proforma (Form A, Annexure II), as per the guidelines of the checklist (Annexure IV) at NBPGR. Applicant should fill the Annexure (IV).
- (ii) Each proposal will be reviewed by the relevant Director, PD/PC, expert or head of organization for validation of information, particularly for uniqueness of the proposed germplasm (Annexure V). In case the proposals received from PC/PDs or Directors of the crop-based institutes, the proposals will be sent to concerned experts in the area.
- (iii) After initial screening the incomplete applications would be advised for appropriate revision, if required.
- (iv) The application in which the validation of the data is considered necessary, the applicant would be required to produce a validation report from an appropriate institute, as advised by the Member Secretary. The revised application should accompany such report duly endorsed by the Competent Authority of the institute, as advised for the validation.
- (v) The proposals complete in all respects along with the comments of relevant Director, PD/PC or expert, will be put up to the PGRC for consideration.
- (vi) The decision of the PGRC will be final.

7. Validity of Registration

The period for validity of registration shall be 18 years for trees and vines and 15 years for other plant species, after which the registered germplasm would be national sovereign property.

8. Publication of Registered Germplasm

All Germplasm approved for registration would be officially communicated to the applicants along with Registration Number. A certificate to this effect will also be issued to the applicant. A brief description of not more than one page (see Annexure VI for instructions) would be published in the ensuing issue of Indian Journal of Plant Genetic Resources - official publication of the Indian Society of Plant Genetic Resources, C/o NBPGR, New Delhi-110012 and updated on NBPGR Internet Website <http://www.nbpgr.ernet.in>

9. Conservation, Maintenance and Sustainable Utilization of Registered Germplasm

- (i) Registered germplasm will be conserved either in National Genebank (<http://www.nbpgr.ernet.in:8080/ircg/index.htm>) or at designated crop/plant-based NAGS.
- (ii) All the material registered with PGRC will also be sent by the developer to the relevant Director, PD/PC or NAGS with request for sowing/planting of registered germplasm in demonstration plots for annual field days and multiplication.
- (iii) The institution associated with the development of the germplasm is also mandated with the maintenance of working stock of registered germplasm for supply to *bona fide* users.

10. De-registration

A registration may be repealed by the PGRC in case of false claim(s). Appeal for counter claim, if any, should reach to the Member Secretary, PGRC, within a period of three months of the publication of brief note in the Indian Journal of Plant Genetic Resources.

PROCEDURE FOR SUBMISSION OF PROPOSAL/ GERMPLASM MATERIAL

1. Submission of Application and Germplasm

- (i) All plant germplasm proposed to be registered should be submitted to :
The Director
National Bureau of Plant Genetic Resources
Pusa Campus, New Delhi-110 012
Phone: 011-2584 3697
FAX: 011-2584 2495
Email: director@nbpgr.ernet.in
- (ii) The germplasm must be accompanied with properly filled From-A (Annexure-II) duly signed by the applicant, recommended by the IGIC and the Head of the institution with official seal (7 copies, each with attached documentary evidences to be submitted).
- (iii) The Form-A must be accompanied by complete description of the germplasm material using standard descriptors (as per concerned crop AICRP or NBPGR descriptors). It may include photograph(s) of plant/plant parts/crop and preferably fingerprints (DNA or biochemical profile *etc.* using reproducible markers wherever reported/published).
- (iv) A declaration to the effect that working-stock for supply to users would be maintained by the institution associated with the development of the material. It may be ensured by the Director/PD/PC or Competent Authority of the concerned organization.
- (v) A declaration that such germplasm does not contain any gene or gene sequence involving terminator technology would also be mandatory.

2. Guidelines for Submitting the Orthodox Seed Germplasm

Orthodox seed that can be dried to low moisture level without loss of seed viability.

- (i) A minimum number of 4000 seed in case of cross-pollinated crop species, 2000 in self-pollinated and 100-1000 in difficult species (Annexure VII), such as some vegetables, medicinal and aromatic plants, wild relatives *etc.* should be submitted.
- (ii) The seed should be supplied from a fresh harvest and should not be more than 60 days old.
- (iii) The seeds supplied should be, healthy and physiologically mature and collected/harvested from healthy plants.
- (iv) For providing good quality healthy seeds, it is advised to dry the seed material in shade immediately after the harvest.
- (v) The potential viability of seeds should be equal or more than 85% in most crop species except in special cases, such as cotton, forage grasses, sugarcane some vegetable crops *etc.* (Annexure VII).



- (vi) Seed should not be treated with any chemicals (pesticides, fungicides, naphthalene balls).
- (vii) Seeds should be packed in good quality paper, muslin cloth or plastic packet(s) with proper identity label. If required, the packets should be packed in card-board boxes to minimize damage and moisture absorption during transit.

3. Guidelines for Submission of Recalcitrant/Intermediate Seed Germplasm

Recalcitrant Seeds (Annexure VIII) are characterized by large size and high moisture contents (20-80%) at the time of shedding. These can be supplied to NBPGR, only in cases, where established protocols are available for their conservation using *in vitro* conservation methods technology (see Annexure IX) or cryopreservation method otherwise such material should be deposited to relevant NAGS (Annexure I).

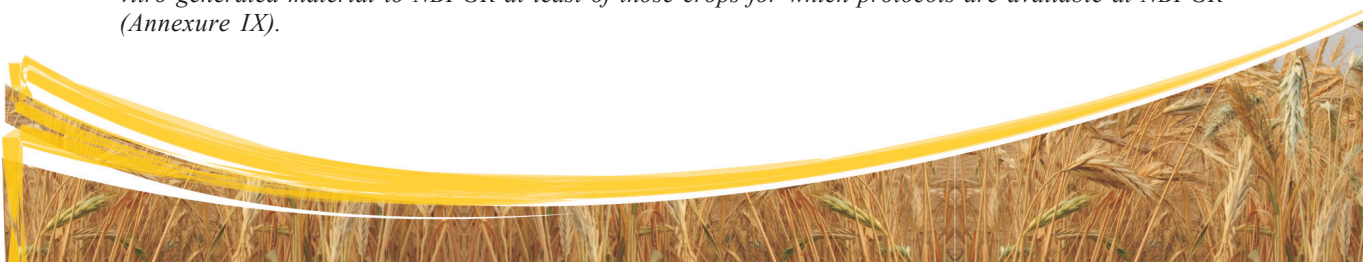
Guidelines for deposition of recalcitrant seeds are mentioned below given below:

- (i) At least 200-500 seeds should be supplied. However, recognizing the importance of the material, even small quantity will be acceptable.
- (ii) To avoid any injury to the fruit surface they should be sent in aerated polythene bags/ cardboard boxes in the form of complete fruit.
- (iii) If the fruits are bulky and difficult to transport, the seeds may be extracted without causing any injury to the embryo or embryonic axes and transported within 48 h, packed in saw dust/charcoal/peat moss *etc.*
- (iv) Avoid transporting at high temperature (above 30°C). Store and transport preferably in moist conditions between 15-20°C temperature conditions.
- (v) Extracted seeds may be treated with suitable fungicide (0.1% Captan or Thiram powder).
- (vi) Avoid air-drying and washing of seeds.
- (vii) In remaining cases the germplasm should be supplied to relevant NAGS (Annexure I) in the form of propagules for establishment in the field genebank following the guidelines given in subsequent section.
- (viii) An acknowledgement for deposition and establishment of genetic material has to be obtained from the concerned NAGS and submitted along with application.

4. Guidelines for Submission of Propagules

In case of vegetatively propagated crop species, the germplasm material/propagules (**tubers, bulbs, rhizomes, cuttings** etc.) has to be supplied to the concerned crop-based designated NAGS (Annexure I) for initial establishment and conservation¹. An acknowledgement to 7

¹The NAGS at the later stage may supply these materials to the NBPGR for *in vitro* maintenance or cryopreservation as base collections. Vegetatively propagated germplasm material preferably should be supplied *in vitro* cultures (wherever possible). The NAGS will ensure establishment and supply of *in vitro* generated material to NBPGR at least of those crops for which protocols are available at NBPGR (Annexure IX).



this effect has to be obtained from concerned NAGS to accompany the proposal. Additionally, following guidelines need to be followed for safe supply and conservation of germplasm:

- (i) At least 10-25 propagules (depending on crop)¹ should be supplied to the concerned NAGS for their maintenance in field genebank or *in vitro* genebank (if available) with a request for an acknowledgement.
- (ii) The concerned NAGS should be informed in advance about the supply of material to facilitate processing and establishment of germplasm.
- (iii) The genetic material, stocks, propagules of non-orthodox seed producing crops are generally being maintained in the form of grafts, slips, propagules, and plants.

While supplying this germplasm following steps and precautions should be followed depending on the crop:

- (a) The **slips, grafts, propagules or plants** supplied to the NAGS should be free from insects, weeds and diseases as far as possible. The material should be well-labelled and packed properly in aerated polythene bags. During the dry summer the grafts of crafts should be wrapped in moist moss grass to retain the moisture.
- (b) In case of crops like coconut, the material should be sent either as embryos or seedlings. If the **embryos** need to be transferred from the field, the embryos embedded in the endosperm should be packed in the sterile plastic bag with sterile moist cotton. These should be kept in the refrigerator overnight and transferred in the same box with proper labels on it.
- (c) In case of **seedlings** the embryos should be grown using the river sand in plastic bags/boxes. Once the seedlings are established these should be transferred to bigger pots. The healthy, vigorous seedlings should be supplied.
- (d) The material should be packed in small wooden/card-board boxes with proper aeration. Also, these boxes should be well marked with labels at 3 or 4 places **“To be handled carefully: seedlings”** in order to avoid any damage during transit.
- (e) The material should be sent to the NAGS immediately after harvest. To avoid any delay in transfer, use speed post or reliable courier services or air-freight.

¹The sample size of propagules and seed to be submitted may be revised in consultation with the Director, NBPGR, New Delhi, or Head, Division of Germplasm Conservation, NBPGR, New Delhi, in

National Active Germplasm Sites

S.No.	Crop(s)	Institute	Address	Phone	Fax
1.	Cotton	CICR, Nagpur	Central Institute for Cotton Research (CICR), Post Bag No. 2, Shankar Nagar, Nagpur-440 010, Maharashtra	07103-275536/ 37/38/39	07103-275529
		AICRP, CICR RS, Coimbatore	All India Coordinated Cotton Improvement Project, Indian Council of Agricultural Research, Central Institute for Cotton Research, Regional Station, Lawley Road, Coimbatore-641 003, Tamil Nadu	0422-2430045, 2431238	0422-2454021
2.	Crops of North East	ICAR RC NEH, Meghalaya	ICAR Research Complex for NEH Region, Umroi Road, Umiam-793 103, Meghalaya	0364- 2570257	0364- 2570355
3.	Chickpea/ pigeon pea/ other pulses	AICRP, IIPR, Kanpur	All India Coordinated Research Project on Chickpea/Pigeonpea/MULLaRP, Indian Institute of Pulses Research, Kanpur-208 024, Uttar Pradesh	0512-2570109	0512-2570109
4.	Forages	IGFRI, Jhansi	AICRP-Forages, Indian Grassland and Fodder Research Institute (IGFRI), Near Pahuj Dam, Gwalior Road Jhansi- 284 003, Uttar Pradesh	0510-2730666, 2730385, 2730158	0510-2730833
			Indian Grassland and Fodder Research Institute (IGFRI), Near Pahuj Dam, Gwalior Road Jhansi-284 003, Uttar Pradesh	0510-2730666, 2730385, 2730158	0510-2730833
5.	Field Crops	VPKAS, Almora	Vivekananda Parvatiya Krishi Anusandhan Sansthan (VPKAS), Indian Council of Agricultural Research, Almora-263 601, Uttarakhand	05962-230060, 230208	05962-231539
6.	Groundnut	DGR, Junagarh	Directorate of Groundnut Research (DGR), PO Box 5, Ivenagar Road, Junagadh-362 001, Gujarat	0285-2673382	0285 2672550
7.	Fibres	CRIJAF, Barrackpore	Central Research Institute for Jute & Allied Fibers (CRIJAF), Barrackpore, Kolkata-700 120, West Bengal	033-25356121, 25356122	033-25350415
8.	Maize	DMR, New Delhi	Directorate of Maize Research (DMR) Pusa Campus, New Delhi-110 012	011-25849725, 25842372	011-25848195
9.	Oilseeds (Castor, Sunflower, Safflower)	DOR, Hyderabad	Directorate of Oilseeds Research (DOR), Rajendranagar, Hyderabad-500 030, Andhra Pradesh	040-24015222, 24016141	040-24017969
10.	Pearl millet	AICRP, ARS, JAU, Jodhpur	All India Coordinated Pearl Millet Improvement Project, Rajasthan Agricultural University, ARS, Mandor, Jodhpur-342 304, Rajasthan	0291- 2571408	0291- 2571909
11.	Rapeseed & Mustard	DRMR, Bharatpur	Directorate of Rapeseed-Mustard Research (DRMR), Sear, Bharatpur-321 303, Rajasthan	05644-260379, 260495	05644-260565
12.	Rice	CRRI, Cuttack	Central Rice Research Institute (CRRI), Cuttack- 753 006, Odisha	0671-2367757	0671-2367663
13.	Rice & Lathyrus	IGKV, Raipur	Indira Gandhi Krishi Vishwavidyalaya (IGKV), Raipur-492 006, Madhya Pradesh	0771-2100564	0771-2442302
14.	Sesame & Niger	AICRP, JNKVV, Jabalpur	AICRP on Sesame & Niger, Jawaharlal Nehru Krishi Viswa Vidyalaya Campus (JNKVV), Jabalpur-482 004, Madhya Pradesh	0761-2680254, 4030409	0761- 4030409
15.	Small millets	SMIP, UAS, Bangalore	AIC Small Millets Improvement Project, Project Coordinating Unit (Small Millets) UAS, GKVK, Bengaluru-560 065, Karnataka	080- 23332387	080- 23332387
16.	Sorghum	DSR, Hyderabad	Directorate of Sorghum Research (DSR), Rajendranagar, Hyderabad-500 030, Andhra Pradesh	040-24015349, 24018651	040-24016378

S.No.	Crop(s)	Institute	Address	Phone	Fax
17.	Soybean	DSR, Indore	Directorate of Soybean Research, Khandwa Road, Indore-452 001, Madhya Pradesh	0731-2476188, 2478414, 2362835, 2364879	0731-2470520
18.	Sugarcane	SBI, Coimbatore	Sugarcane Breeding Institute (SBI), Coimbatore-641 007, Tamil Nadu	0422-2472621	0422-2472923
		AICRP, IISR, Lucknow	Indian Institute of Sugarcane Research (IISR), Raibareli Road, P.O. Dilkusha, Lucknow-226 002, Uttar Pradesh	0522-2480726	0522-2480738
19.	Underutilized crops	NBPGR, New Delhi	National Bureau of Plant Genetic Resources (NBPGR), Pusa Campus, New Delhi-110 012	011-25843697	011- 25842495
20.	Wheat & Barley	DWR, Karnal	Directorate of Wheat Research (DWR), Post Box No-158, Agrasain Marg, Karnal-132 001, Haryana	0184-2267307	0184-2267390
21.	Agro forestry crops	NRCFA, IGFR, Jhansi	AICRP on Agroforestry, National Research Centre for Agroforestry, Jhansi-Gwalior Road, Near Pahuj Dam, Jhansi-284 003, Uttar Pradesh	0510- 2730214	0517- 2730364
22.	Arid fruits	CIAH, Bikaner	Central Institute for Arid Horticulture (CIAH), Sri Ganganagar Road, NH-15, Beechwal, Bikaner-334 006, Rajasthan	0151-2250960, 2250147	0151-2250145
23.	Banana	NRCB, Tiruchirapalli	National Research Centre for Banana (NRCB), Thogamalai Road, Thayanur Post, Tiruchirapalli -620 102, Tamil Nadu	0431-2618104, 2618106	0431-2618115
24.	Cashew	DCR, Puttur	Directorate of Cashew Research (DCR), Post Darbe, Puttur-574 202, Dakshina Kannada, Karnataka	08251-231530, 230902, 236490	08251-234350
25.	Citrus species	NRC, Nagpur	National Research Centre for Citrus, Amravati Road, Nagpur-440 010, Maharashtra	0712-2500249, 2500615	
26.	Flowers	DFR, IARI, New Delhi	Directorate of Floricultural Research (Indian Council of Agricultural Research) IARI Campus, New Delhi-110 012	25843983	2584376
27.	Grapes	NRC, Pune	National Research Centre for Grapes, P.B. No. 3, P.O. Manjri Farm, Solapur Road, Pune-412 307, Maharashtra	020-26956000	020-26956099
28.	Litchi, Bael, Aonla & Jackfruit	NRC, Muzaffarpur	National Research Centre for Litchi, Mushahari, P.O. Ramna, Muzaffarpur-842 002, Bihar	0621-2289475, 2281160	0621-2281162
29.	Medicinal & Aromatic plants	DMAPR, Anand	Directorate of Medicinal & Aromatic Plants Research (DMAPR), Boriavi-387 310, Anand, Gujarat	2692-271602	2692-271601
30.	Mango	CISH, Lucknow	Central Institute for Subtropical Horticulture (CISH), Rehmankhera, Kakori, Lucknow-227 107, Uttar Pradesh	0522-2841022, 2841023	0522-2841025
31.	Subtropical fruits	AICRP, CISH, Lucknow	Central Institute for Subtropical Horticulture (CISH), Rehmankhera, Kakori, Lucknow-227 107, Uttar Pradesh	0522- 2841115	0522- 2841115
32.	Mulberry	CSGRC, Hosur	Central Sericultural Germplasm Resources Centre, Central Silk Board, Ministry of Textile, Government of India, P.B.-44, Thally Road, Hosur-635 109, Dharmapuri, Tamil Nadu	04344-222013, 221148, 221149	04344-220520
33.	Oil Palm	DOPR, Pedavegi, West Godavari	Directorate of Oil Palm Research (DOPR), Pedavegi-534 450, West Godavari District, Andhra Pradesh	08812-259532, 259524	08812-259531
34.	Onion & Garlic	DOGR, Pune	Directorate of Onion and Garlic Research (DOGR), Rajgurunagar, Pune-410 505, Maharashtra	02135-222026	02135-224056

S.No.	Crop(s)	Institute	Address	Phone	Fax
35.	Orchids	NRC, Pakyong	National Research Centre for Orchids, Pakyong-737 106, Sikkim	03592-257954, 257289, 257703	03592-257289, 257282
36.	Ornamental & non-traditional crops	NBRI, Lucknow	National Botanical Research Institute (NBRI), Po Box No-436, Rana Pratap Marg, Lucknow-226 001, Uttar Pradesh	0522-2205848	0522-2205839
37.	Plantation crops	CPCRI, Kasaragod	Central Plantation Crop Research Institute (CPCRI), Kudlu.P.O., Kasaragod-671 124, Kerala	04994-232894	04994-232322
38.	Potato	CPRI, Shimla	Central Potato Research Institute (CPRI), Shimla-171 001, Himachal Pradesh	0177-2625182, 2625073	0177-2624460
39.	Spices	IISR, Calicut	AICRPS, Indian Institute of Spices Research (IISR), Marikunnu P.O., Kozhikode (Calicut)-673 012, Kerala	0495-2730294	0495-2731187
			Indian Institute of Spices Research (IISR), Marikunnu P.O., Kozhikode-673 012, Calicut, Kerala	0495-2731410, 2731753	0495-2731187
40.	Tea	UPASI TRF, Coimbatore	UPASI Tea Research Foundation, Tea Research Institute, Nirar Dam, Valparai, Coimbatore-642 127, Tamil Nadu	04253 -235201, 235301, 235303	04253- 235302
			Tea Research Association (TRA), Tocklai Tea Research Institute, (TTRI), Jorhat-785 008, Assam	0376-2360467, 2360972	0376-23600974
41.	Temperate horticultural crops	CITH, Srinagar	Central Institute for Temperate Horticulture (CITH), Old Airport Road, Rangreth, Srinagar, Jammu and Kashmir-190 007	0194-2305044	0194-2305045
		NBPGR RS, Shimla	National Bureau of Plant Genetic Resources, Regional Station, Phagli, Shimla-171 004, Himachal Pradesh	0177-2835459	0177-2835453
42.	Tobacco	CTRI, Rajahmundry	Central Tobacco Research Institute (CTRI), Bhaskarnagar, Rajahmundry-533 105, Andhra Pradesh	0883-2448995, 2449871	0883-2448341, 2410555
43.	Tropical fruits	IIHR, Bangalore	Indian Institute of Horticultural Research (IIHR), Hessaraghatta Lake Post, Bangaluru-560 089, Karnataka	080-28466471, 28466353	080-28466291
		AICRP, IIHR, Bangalore	All India Coordinated Research Project on Tropical Fruits, Indian Institute of Horticultural Research (IIHR), Hessaraghatta Lake Post, Bangalore-560 089, Karnataka	080-28466471, 28466353	080-28466291
44.	Tuber crops	CTCRI, Thiruvananthapuram	Central Tuber Crops Research Institute (CTCRI), Sreekariyam, Thiruvananthapuram-695 017, Kerala	0471-2598551	0471-2590063
		AICRP(TC), CTCRI, Thiruvananthapuram	All India Coordinated Research Project on Tuber Crops, Central Tuber Crops Research Institute (CTCRI), Sreekariyam, Thiruvananthapuram-695 017, Kerala	0471-2590071	0471-2590063
45.	Vegetables	IIVR, Varanasi	Indian Institute of Vegetable Research (IIVR), Post Bag No. 01; P. O. Jakhini (Shahanshapur), Varanasi - 221 305, Uttar Pradesh	0542-2635247, 2635236	05443-229007
		IARI RS, Katrain	Indian Agricultural Research Institute (IARI) Regional Station, Katrain, Kullu-175 129, Himachal Pradesh	01902-240124, 241280	01902-240124
		GBPUA&T, Pantnagar	G.B. Pant University of Agriculture and Technology, Pantnagar-263 145, Udham Singh Nagar, Uttarakhand	05944-233320, 233350	05944-233473
46.	Ornamental crops	IIHR, Bangalore	Indian Institute of Horticultural Research (IIHR), Hessaraghatta Lake Post, Bangaluru-560 089, Karnataka	080-28466353, 28466471	080-28466291

Form A

Application for Registration of plant Germplasm

(To be submitted to The Director, NBPGR, New Delhi-110012)

Please refer to guidelines for filling the application form and codes (Annexure II A, B)

1. Application status (code)

N	R
---	---

2. Crop name

3. Botanical name

4. Crop group (Code)

5. Biological status of the material to be registered

6. Identity

7. Criteria for registration[Unique feature(s) maximum three]

I.

II.

III.

8. Nature of genetic material (Code)

9. Quantity deposited (Actual)

10. Value referred to (Code)

SC	CM	AC
----	----	----

11. Basis of eligibility (Code)

AR	PR	CT	OT
----	----	----	----

12

12. Has it been registered/protected anywhere

Y	N
---	---

13. Manuscript (one-page note on proposed germplasm enclosed)

Y	N
---	---

For Use of NBPGR

(i) Application number

(ii) Date of application

(iii) Whether new or revised?

v) If revised, Date of 1st Application

(v) If validation test suggested whether report attached

(vi) Action taken

a) Forwarded for registration

b) Sent for validation

c) Incomplete, sent for revision

(vii) Whether registered or rejected

(viii) Date of registration or rejection

(ix) Registration Number

INGR No.

(x) Validation test suggested

Y	N
---	---

(xi) Notified on: (Code)

(xii) Remarks:

Name (Dr/Ms/Mr)

[illegible][illegible][illegible][illegible][illegible][illegible][illegible]

15. Name and address of the corresponding person (Developer/Depositor)

[illegible][illegible][illegible][illegible][illegible][illegible][illegible]

(Please attach separate sheet for additional name(s) and address(es) of co-authors (persons responsible))

IC/EC No.

Other Identity

Source

Place of origin
Tehsil/Distt/Province

Genes if any identified

--	--	--	--	--

Farmers/community Contribution, if any,

13

(b) Pedigree of the genetic stock

Pedigree

Breeding method (Code)

--	--



17. Salient characteristics/chief botanical and morpho-agronomic description* (attach details)

S. No.	Trait Description
1.	
2.	
3.	

**Provide salient description of the material as per All India Co-ordinated Research Project (AICRP) Proforma with comparative data of lines/germplasm over best two checks for unique trait in the form of table.*

18. Usefulness of identified germplasm/genetic stock

19. Year of seed production

20. Location of seed production

21. Quantity of seed available

22. Seed viability (%)

23. Additional information/Remarks (if any)

24. Recommendation of Institute's Germplasm Identification Committee

UNDERTAKING

1. I/We undertake to ensure deposition of seed/genetic material for long-term conservation of the aforesaid germplasm/genetic stock at the National Genebank, NBPGR and also its sustainable use by maintaining appropriate quantity of Active/Working Collection and providing access as appropriate on prior informed consent and on mutually agreed terms. I/We also agree to provide any further information or data pertaining to the description and unique characteristics to the ICAR/NBPGR in a transparent manner.
2. I/We assure genetic purity and truthfulness of seed material supplied with the application.
3. I/We assure that such germplasm does not contain any gene or gene sequence involving terminator technology.

SIGNATURE OF THE ASSOCIATES

Signature

Full Name

Designation & Address

SIGNATURE OF THE DEPOSIT

Signature

Full Name

Designation & Address

Guidelines for Filling Form A and Description of Codes

1. Use capital letters or write legibly. All items are self-explanatory. Give minimal explanation for particular item in “Remarks” (*Item 23*), wherever needed.
2. For *Item 7*, give maximum three most specific features, traits or alleles, considered suitable for consideration of registration.
3. Detailed description of traits and characteristics of the germplasm under *Item 17* can be given. Follow the format of variety release application or AICRP data sheets for respective crops. Use separate sheet, if needed.
4. Give main botanical and morpho-agronomic characteristics in description. Include isozyme or DNA profile or other chemical/biochemical characteristics, if available. (As per Form-A)
- 5.. Use codes for filling in *Item 1, 2, 5, 8, 9* [actual], *10, 11, 12, 13* and *16(b)* [Breeding Method]. In case of the code “Other” fill in specific details.
6. For filling crop name (*Item 2*) give English or Hindi name, if known. In case a local name is given then also specify in parenthesis the language or dialect in which this name is used.
7. Give name(s) of all persons associated with development of the material in *Item 14*. Use separate sheet and fill in additional names along with designation, address and phone/fax/email *etc.* beginning with S. No. 2 on new sheet, in the same format.
8. *Item 16* has two alternate parts, (a) and (b) to fill in :
 - (a) In case nature of the material to be registered as given in *Item 16* is “Germplasm” then you must give its basic passport information (Annexure III), that should include National Identity (IC/EC) given by NBPGR or other Identity Number allotted and maintained locally. In case of non-availability of national identity, NBPGR will provide a unique National Identity (IC), based on passport data provided by the applicant.
 - (b) In case the nature of the germplasm to be registered is genetic stock, then clearly give its pedigree, including parentage, year of crossing or selection. Also give breeding method used in codes (Annexure II B).
9. Give particulars of developers in *Item 14* over and that of corresponding person in *Item 15* as the applicant and developer may not be always the same as the first person responsible for development of the material.
10. Undertaking to the effect ensuring long-term conservation and maintenance of active material for facilitating access and sustainable use has been given, which may be read and implied before signing the undertaking.



Codes for filling information in Col.1, 2, 5, 8, 9 [actual], 10, 11, 12, 13 and 16 (b) Breeding Method] of Form A

Item 1: Application Status		Item 9: Quantity deposited with application	
N	New		Actual
R	Revised	Item 10: Value referred to by applicant	
Item 2: Crop Group		SC	Scientific
CL	Cereals	CM	Commercial
PC	Pseudo cereals	AC	Academic
MT	Millet	Item 11: Basis of eligibility for registration	
MM	Minor millets	PR	Published with peer review
GL	Grain legumes	CT	All India Co-ordinated trials data
OS	Oilseeds	AR	Institute annual report
PC	Fiber crops	OT	Any other report
FG	Forage	Item 12: Has been registered /protected any where	
FT	Fruits	Y	Yes
VG	Vegetable crops	N	No
SP	Spices	Item 13: Manuscript (One Page Note) submitted	
MP	Medicinal and aromatic plants	Y	Yes
NC	Narcotics	N	No
OR	Ornamentals	Item 16(b): Breeding method used	
FR	Forestry	IN	Introduction and selection
CC	Commercial crops	MS	Mass selection
OT	Other (Specify in Col.19)	PS	Pedigree selection
Item 5: Biological status of material to be registered		PL	Pure line selection
GP	Germplasm collection	RS	Recurrent selection
GS	Genetic Stock	BC	Backcross method
RE	Recombinant	OT	Other (Specify in Item 19)
MU	Mutant		
Item 8: Nature of genetic material			
SD	Seed		
TR	Tubers/Roots/Bulbs		
VP	Vegetative cuttings		
WP	Whole plant		
OT	Other (Specify in Col.20)		

Furnish the form complete in all respects with requisite quantity of seed or propagules (propagules to the concerned NAGS) and send to The Director, NBPGR, Pusa Campus, New Delhi-110 012

Supplying/co-operating Institute:

Date:

[illegible]

Source: In = Institute/NRC/IARCs; F= Famer; M= Market; NGO= Non-Governmental organizations; OT= others

Biological status: W= wild; RC= Released cultivar; LR= Landraces; BL=Breeding line; Mu= Mutant; GS= Genetic stock; OT = others

Country of origin; Please provide ISO codes

CHECK-LIST FOR SCREENING OF APPLICATIONS

The Member Secretary, PGRC at NBPGR shall screen application along with annexure and make recommendations to the PGRC for *inter alia* the following points:

S.No.	Item	Yes/No
1.	Whether this is a new application?	Yes ☐ No ☐
2.	Whether this is a revised application?	Yes ☐ No ☐
3.	Whether same or similar material has been registered earlier?	Yes ☐ No ☐
4.	Whether unique or distinguishing characteristics of potential value merit consideration for registration?	Yes ☐ No ☐
5.	Whether documentary evidence or data (as per the guidelines) is provided in support of the claim on potential value of germplasm?	Yes ☐ No ☐
6.	State any other economic potential value of germplasm, if possible.	Yes ☐ No ☐
7.	Whether applicant, institution, university or centre has given a commitment for maintenance and supply of germplasm for use?	Yes ☐ No ☐
8.	Whether appropriate size of germplasm sample for long-term storage at National Genebank or for conservation and maintenance of active collections at the concerned NAGS has been sent?	Yes ☐ No ☐
9.	Whether the applicant has sent maintainer line of the CMS line to the National Genebank?	Yes ☐ No ☐
10.	Whether all the proposers signed the declaration regarding evaluation of the germplasm/genetic stock under hot spots/under artificial (epiphytotic) conditions.	Yes ☐ No ☐
11.	Whether acknowledgement receipt of germplasm from concerned NAGS for deposition and establishment is attached, wherever required?	Yes ☐ No ☐
12.	Whether detailed address of the corresponding person is given?	Yes ☐ No ☐
13.	Whether Recommendations of IGIC (Institute Germplasm Identification Committee) attached?	Yes ☐ No ☐
14.	Whether Competent Authority of the institute has duly endorsed the application?	Yes ☐ No ☐

Signature of the Applicant

CHECK-LIST FOR REVIEWER/EXPERT FOR RECOMMENDATION

Recommendation

- | | | |
|-------|--|----------------------------------|
| (i) | Importance of trait | : Scientific/Commercial/Academic |
| (ii) | Data sufficient as per guidelines (See Section 4 of eligiblity criteria of guidelines) | : Yes/No |
| (iii) | Validation test required | : Yes/No |
| (iv) | Recommended for registration | : Yes/No |

Signature of the Expert
(with seal)

Instructions to Authors For Organization of Manuscript of One-Page Note on Proposed Registered Germplasm

1. The manuscript should be typed in double-space leaving a margin of 3-4 cm on all sides
2. The total length of the manuscript should not be more than **one and a half page**.
3. Format of Indian Journal of Plant Genetic Resources (IJPGR) should be followed.
4. Oxford English spelling should be followed and the consistency of spelling should be maintained throughout the manuscript.

The contents of the manuscript should be in the form of a Short Communication that is structured as follows:

- (a) **Introduction:** It should deal with the unique characteristics for which the germplasm has been registered. It should include information about the parental material, breeding methodologies followed, and the place/institute where the material was developed.
- (b) **Morpho-agronomic Characteristics:** It should provide in brief morpho-agronomic description of the material along with information on multi-location performance on important traits like yield and yield components.
- (c) **Associated Characters and Cultivated Practices:** It should mention about the other relevant traits of potential value, particularly reaction to major biotic/abiotic stresses. It may include the general recommendation on cultivation practices, and the area of adaptation.
- (d) **References:** References in the text should be cited by author, year of publication (e.g., Joshi, 1995) and multiple citations should be in chronological order. Nothing should be underlined and Latin names should be italicized. These should be listed in alphabetical order under the first author's name citing all authors. The names of journals should be abbreviated according to the latest edition of the "World list of Scientific Periodicals" (eds. P. Brown and G.B. Stratton), Butterworths, London. The following examples may be used for citations:
 - (i) Bisht IS, RK Mahajan, TR Loknathan and RC Agarwal (1998) Diversity in Indian sesame collection and stratification of germplasm accessions in different diversity groups. *Genet. Resour. Crop Evol.* **45**: 325-335.
 - (ii) Withers LA and F Engelman (1998) *In vitro* conservation of plant genetic resources. In: A Altman (ed.) *Agricultural Biotechnology*, Marcell Dekker Inc., New York, pp 57-58.
 - (iii) Wealth of India (1985) (Revised) *The Wealth of India-Raw Materials. A Dictionary of Indian Raw Materials and Industrial Products*, Raw Material Series Vol 1: Publications and information Directorate (now NISCOM), Council of Scientific and Industrial Research, New Delhi, 513 p.
 - (iv) FAO (1998) *The State of the World's Plant Genetic Resources for Food and Agriculture*. Food and Agriculture Organization of the United Nations, Rome, Italy, 510 p.
 - (v) Engels, JMM and V Ramanatha Rao (eds) (1988) *Regeneration of seed Crop and their Wild Relatives*. Proceedings of a Consultation Meeting, 4-7 December 1995. ICRISAT, Hyderabad, India and IPGRI, Rome, Italy, 167 p.
5. The manuscript can have a maximum of one table, preferably in continuation of text. The numerical data along with minimum statistical analysis should be provided after thorough checking.
6. A maximum of one good quality figure or line diagram displaying either the characteristic features or providing clear understanding of the uniqueness of the germplasm is acceptable.
7. Internationally accepted S.I. units should be used.

Minimum Standards of Seed Viability and Quantity in some species¹ for Long-term Conservation

Botanical Name	Minimum Germination (%)	Seed Quantity (No.)
<i>Abelmoschus moschatus</i> var. <i>betulifolius</i> (Mast.) Hocher.	50	500
<i>Abelmoschus angulosus</i> Wight & Arn.	50	500
<i>Abelmoschus bitiliolius</i> L.	50	500
<i>Abelmoschus callei</i> (A.Chev.) Stevels.	50	500
<i>Abelmoschus crinitus</i> Wall.	50	500
<i>Abelmoschus ficulneus</i> (L.) W. & A.ex Wight	50	500
<i>Abelmoschus manihot</i> (L.) Moench	50	500
<i>Abelmoschus manihot</i> spp. <i>manihot</i> (L.) Medik	30	1000
<i>Abelmoschus manihot</i> var. <i>pungens</i> (L.) Medik.	50	500
<i>Abelmoschus manihot</i> var. <i>tetraphyllus</i> (Hornem.) Borss.Waalk.	50	500
<i>Abelmoschus moschatus</i> Medik	50	500
<i>Abelmoschus moschatus</i> ssp. <i>tuberosus</i> (Span.) Borss	50	500
<i>Abelmoschus pungens</i> Wall.	50	500
<i>Abelmoschus tetraphyllus</i> Wall	30	1000
<i>Abelmoschus tuberculatus</i> Pal & Singh	30	1000
<i>Abrus precatorius</i> L.	30	500
<i>Aegilops</i> L. spp.	60	500
<i>Ailanthus excelsa</i> Roxb.	30	100
<i>Allium</i> L. spp.	30	500
<i>Allium tuberosum</i> Rottl. ex Spreng.	50	500
<i>Alloteropsis cimicina</i> (L.) Stapf.	30	100
<i>Alysicarpus longifolius</i> (Spreng.) Wight & Arn.	30	100
<i>Alysicarpus vaginalis</i> Wall	30	100
<i>Andrographis paniculata</i> Nees, <i>Andrographis echinoides</i> Nees	30	500
<i>Apluda mutica</i> L.	30	500
<i>Arachis appressipila</i> Karpov.&W.C.Gerg	60	100-300
<i>Arachis</i> L. spp.	60	100-500
<i>Aristida adscensionis</i> L.	30	500
<i>Aristolochia bracteata</i> Retz. and speices	30	500
<i>Arthraxon longifolius</i> Henard	30	500
<i>Arthraxon prionodes</i> (Steud.) Dandy	30	500

¹Less seed producing species with low natural seed viability.

Botanical Name	Minimum Germination (%)	Seed Quantity (No.)
<i>Asparagus</i> L.spp.	90	500
<i>Atriplex hortensis</i> L.	30	500
<i>Avena byzantina</i> K.Koch	30	500
<i>Avena fatua</i> L.	30	500
<i>Avena sterilis</i> L.	30	500
<i>Boerhavia diffusa</i> L.	30	500
<i>Bothriochloa</i> Kuntze. spp.	30	500
<i>Brachypodium distachyon</i> (L.) P.Beau	30	500
<i>Brassica tournfortii</i> Gouan	>75	2000
<i>Bromus japonicus</i> Thunb.	30	500
<i>Calotropis gigantea</i> (L.) W.T.Aiton	30	500
<i>Calotropis procera</i> (Aiton) W.T.Aiton	30	500
<i>Canarium strictum</i> Roxb.	30	500
<i>Canavalia ensiformis</i> (L.) DC.	30	100
<i>Canna indica</i> L.	30	500
<i>Capillipedium hugelii</i> Stapf.	30	100
<i>Capillipedium parviflorum</i> Stapf.	30	100
<i>Cardiocrinum giganteum</i> Makino	30	100
<i>Cardiospermum halicacabum</i> L.	30	500
<i>Carthamus</i> L. spp.	75	500-1000
<i>Cassia rotundifolia</i> Pers.	30	100
<i>Ceiba pentandra</i> (L.) Gaertn.	30	100
<i>Cenchrus biflorus</i> Roxb.	30	500
<i>Cenchrus ciliaris</i> L.	30	500
<i>Cenchrus prieurii</i> (Kunth) Maire	30	500
<i>Cenchrus setigerus</i> Vahl.	30	500
<i>Centaurea cyanus</i> L.	65	500
<i>Chloris barbata</i> (L.) Nash	30	500
<i>Chloris dolichostachya</i> Lag.	30	500
<i>Chloris gayana</i> Kunth	30	500
<i>Chloris virgata</i> Sw.	30	500
<i>Chrysanthemum coronarium</i> L.	65	500
<i>Chrysanthemum morifolium</i> Ramat.	30	500
<i>Chrysopogon fulvus</i> (Spreng.) Chiov.	30	500
<i>Chrysopogon montanus</i> Trin.	30	500
<i>Chrysopogon zeylanicus</i> Thwaites	30	500
<i>Cichorium intybus</i> L.	30	500
<i>Citrullus vulgaris</i> var <i>citroide</i> L.H.Bailey	50	500
<i>Costus speciosus</i> (J.Koenig) Sm.	30	500
<i>Crambe hispanica</i> subsp. <i>abyssinica</i> (Hochst ex R.E.Fr.)	>75	500-1000
<i>Cymbopogon flexuosus</i> Stapf.	30	500
<i>Cymbopogon jwarancusa</i> Boiss.	30	500

Botanical Name	Minimum Germination (%)	Seed Quantity (No.)
<i>Cymbopogon martini</i> (Roxb.) Wats.	30	500
<i>Cymbopogon martinii</i> var. <i>motia</i> (Roxb.) Wats.	30	500
<i>Cynodon dactylon</i> Pers	30	500
<i>Dactylis glomerata</i> L.	30	500
<i>Dactyloctenium aegyptium</i> (L.) K.Richt.	30	500
<i>Dactyloctenium aristatum</i> Link.	30	500
<i>Dactyloctenium indicum</i> Boiss.	30	500
<i>Descurainia sophia</i> (L.) Webb ex Prantl	30	2000
<i>Desmodium</i> Desv. spp.	30	500
<i>Desmostachya bipinatifida</i> Stapf.	30	500
<i>Dianthus sinensis</i> Link	65	500
<i>Dichanthium annulatum</i> stapf	30	500
<i>Digitaria adscendens</i> Kunth Henrard	30	500
<i>Digitaria granularis</i> (Trin.) Henrard	30	500
<i>Digitaria pennata</i> Chiov.	30	500
<i>Dinebra retroflexa</i> Panz.	30	500
<i>Dipsacus mitis</i> D. Don	30	500
<i>Eleusine flagellifera</i> Nees	30	500
<i>Elionurus royleanus</i> Nees ex A.Rich.	30	500
<i>Enneapogon elegans</i> Stapf	30	500
<i>Entada</i> Adans spp.	30	100
<i>Eragrostiella bifaria</i> (Vahl) Bor	30	500
<i>Eruca sativa</i> Mill.	>75	500-1000
<i>Euryale ferox</i> Salisb.	30	500
<i>Glycine latifolia</i> (Benth.) C.A.Newell & Hymowitz	60	500
<i>Glycine curvata</i> Tindale	60	500
<i>Gossypium anomalum</i> Wawr. & Peyr	30	500
<i>Gossypium raimondii</i> Ulbr.	30	500
<i>Gossypium religiosum</i> L	30	500
<i>Gossypium triphyllum</i> Hochr.	30	500
<i>Gymnocladus assamica</i> Kanjilal ex P.C.Kanjilal	30	100
<i>Hackelochloa granularis</i> Kuntze	30	500
<i>Helianthus</i> L. spp.	65	500-700
<i>Hemarthra</i> R. Brown spp.	30	500
<i>Heracleum candicans</i> Wall	30	500
<i>Heteropogon contortus</i> (L.) Beauv. ex Roem. & Schult.	30	500
<i>Hibiscus pungens</i> Roxb.	30	500
<i>Holarrhena antidysenterica</i> (L.) Wall.	30	500
<i>Hordeum</i> L. spp.	50	300
<i>Isachne disperma</i> (Lam.) Döll	30	500
<i>Ischaemum pilosum</i> Trimen	30	500
<i>Ischaemum rugosum</i> Salisb.	30	500

Botanical Name	Minimum Germination (%)	Seed Quantity (No.)
<i>Iseilema laxum</i> Hack.	30	500
<i>Jatropha curcas</i> L.	65	100-500
<i>Juncus</i> L. spp.	30	500
<i>Lasiurus hirsutus</i> (forsk.) boiss.	30	500
<i>Lasiurus scindicus</i> Henrard	30	500
<i>Lepidium sativum</i> L.	>75	500-1000
<i>Leptochloa chinensis</i> Nees	30	500
<i>Leucaena leucocephala</i> (Lam.) de Wit	30	500
<i>Lolium temulentum</i> Bert. ex Steud.	30	500
<i>Lonicera japonica</i> Thunb.	65	500
<i>Luffa echinata</i> Roxb	50	500
<i>Luffa pentandra</i> Roxb	50	500
<i>Mimosa pudica</i> Mill	60	500
<i>Momordica dioica</i> Roxb. ex Willd	60	500
<i>Momordica sahyadrica</i> Kattuk. & V.T.Antony	30	500
<i>Momordica subangulata</i> ssp. <i>renigera</i>	30	500
<i>Momordica tuberosa</i> (Roxb.) Cogn..	30	500
<i>Morinda citrifolia</i> L.	90	500
<i>Oroxylum indicum</i> (L.) Benth. ex Kurz	50	250
<i>Oryza</i> L.spp.	50	250
<i>Panicum maximum</i> Jacq.	30	2000
<i>Panicum repens</i> Burm.f.	30	2000
<i>Panicum turgidum</i> Hochst. ex Steud.	30	2000
<i>Paspalidium flavidum</i> (Retz.) A.Camus	30	500
<i>Paspalum dilatatum</i> Poir	30	500
<i>Pedaliium murex</i> L.	90	500
<i>Perilla frutescens</i> (L.) Britton	>75	500-1000
<i>Perotis indica</i> Schum	30	500
<i>Phalaris minor</i> Retz.	30	500
<i>Phragmites australis</i> (Cav) Steud.	30	500
<i>Phragmites karka</i> (Retz.) Steud.	30	500
<i>Polypogon monspeliensis</i> (L.) Desf.	30	500
<i>Pongamia pinnata</i> (L.)Pierre	65	100-500
<i>Pseudoraphis spinescens</i> (R.Br.) Vickery	30	500
<i>Pseudosorghum fasciculare</i> A.Camus	30	500
<i>Rheum australe</i> D.Don	30	500
<i>Rhynchelytrum villosum</i> chiov.	30	500
<i>Ricinus communis</i> L.	80	1000-1500
<i>Rottboellia exaltata</i> (Lour.) Clayton	30	500
<i>Rumex vesicarius</i> L.	30	2000
<i>Saussurea</i> DC. spp.	30	500
<i>Schoenefeldia gracilis</i> Kunth	30	500

Botanical Name	Minimum Germination (%)	Seed Quantity (No.)
<i>Sehima nervosum</i> (Rottl.) Stapf	30	2000
<i>Selinum vaginatum</i> C.B. Clarke	30	500
<i>Sesamum</i> L. spp.	60	500-1000
<i>Sida ovata</i> G. Don	30	2000
<i>Solanum</i> L. spp.	30	500
<i>Spilanthes acmella</i> Murr.	30	1000
<i>Sporobolus diander</i> P. Bboauv.	30	1000
<i>Stylosanthes hamata</i> (L.) Taub.	30	500
<i>Teramnus labialis</i> (L.f.) Spreng.	30	500
<i>Terminalia chebula</i> Willd. ex Flem.	30	500
<i>Tetrapogon tenellus</i> Chlov.	30	500
<i>Themeda</i> Forssk. spp.	30	500
<i>Tribulus terrestris</i> L.	30	500
<i>Tricholepis glaberrima</i> DC.	30	500
<i>Trichosanthes bracteata</i> (L.) Voigt	30	500
<i>Trichosanthes cucumeriana</i> L.	30	500
<i>Trichosanthes cuspidata</i> Lam.	30	500
<i>Trichosanthes lobata</i> Wall	30	500
<i>Trichosanthes nervifolia</i> L.	30	500
<i>Trichosanthes palmata</i> L.	30	500
<i>Trichosanthes tricuspidata</i> Lour.	50	500
<i>Tripogon roxburghianus</i> Bhide	20	2000
<i>Triticum</i> spp. (Wild)	60-70	500-1000
<i>Typha angustifolia</i> L.	30	2000
<i>Typha elephantina</i> Roxb.	30	2000
<i>Uraria lagopodioides</i> (L.) Desv. ex DC.	30	2000
<i>Urena lobata</i> subsp. <i>lobata</i> L.	30	500
<i>Urena sinuata</i> L.	30	500
<i>Urochloa panicoides</i> P. Beauv.	30	500
<i>Wrightia tintoria</i> R. Br., <i>Wrightia tomentosa</i> Roem. & Schult., <i>Wrightia arborea</i> (Dennst.) Mabb.	90	500
<i>Zanthoxylum alatum</i> Wall.	30	500
<i>Zea mays</i> L. (inbred lines)	85	500-1000

Note: Ideally in all species the seed number should be minimum 2000 for self-pollinated and 4000 for cross-pollinated crops but in wild species where it is not possible to get this number the minimum number of seeds should be 500 with at least 30% germination. In case the seed size is >3-4 cm and in tree species the number can be reduced to 100. In wild species where seed formation is not a problem, the number can be elevated to 2000-4000, as the case may be.

List of the Plant Species with known or likely Recalcitrant or Intermediate seed Storage Behavior

Common Name	Botanical Name
Acer	<i>Acer platanoides</i> L.
Almond	<i>Prunus amygdalus</i> Betsch.
Arecanut	<i>Areca catechu</i> L.
Bael	<i>Aegle marmelos</i> L.
Baher (myrobalan)	<i>Terminalia bellirica</i> Roxb., <i>T. chebula</i> Retz.
Banana (wild)	<i>Musa</i> spp.
Black pepper	<i>Piper nigrum</i> L.
Cardamon	<i>Elettaria cardamomum</i> Maton.
Cheura	<i>Diploknema butyraceae</i> (Roxb.) H.J.Lam
Citrus spp.	All <i>Citrus</i> spp.
Cocoa	<i>Theobroma cacao</i> L.
Coffee	<i>Coffea arabica</i> L.
Coconut	<i>Cocos nucifera</i> L.
Hazel nut	<i>Corylus avellana</i> L.
Jamun	<i>Syzygium cumini</i> (L.) Skeels
Karonda	<i>Carissa congesta</i> Wt.
Ker	<i>Capparis deciduas</i> (Forsk.) Edgew.
Khirmi	<i>Manikara hexandra</i> (Roxb.) Dubard.
Jack fruit	<i>Artocarpus heterophyllus</i> Lamk.
Lac tree	<i>Schleichera oleosa</i> (Lour.) Oken
Lasora	<i>Cordia myxa</i> Roxb.
Litchi	<i>Litchi chinensis</i> (Gaertn.) Sonn.
Longan	<i>Dimocarpus logan</i> Lour.
Mahua	<i>Madhuca indica</i> J.F. Gmel.
Mango	<i>Mangifera indica</i> L.
Neem	<i>Azadirachta indica</i> A. Juss.
Nutmeg	<i>Myristica fragrans</i> Houtt.
Oil plam	<i>Elaeis guineensis</i> Jacq.
Papaya	<i>Carica papaya</i> L.
Pecan nut	<i>Carya illinoensis</i> (Wang.) Koch.
Pilu	<i>Salvadora oleoides</i> Decne. And other spp.
Poplar	<i>Populus deltoids</i> W. Bartam ex Marshall and other spp.
Rambutan	<i>Nephelium lappaceum</i> L.
Rice (wild)	<i>Zizania</i> spp.
Rubber	<i>Hevea brasiliensis</i> (Willd.ex A. Juss) Müll.Arg.
Sal	<i>Shorea robusta</i> Gaertn.
Sapota	<i>Achras zapota</i> L.
Trifoliolate orange	<i>Poncirus trifoliata</i> (L.) Rafin.
Tea	<i>Camellia sinensis</i> (L.) O. Kuntze
Teak	<i>Tectona grandis</i> L. f.
Walnut	<i>Juglans regia</i> L.

**List of the Crop Species with Established Protocols for *In Vitro* Conservation at
Tissue Culture and Cryopreservation Unit, NBPGR, New Delhi**

Common Name	Botanical Name
Kiwi	<i>Actinidia chinensis</i> Planch
Strawberry	<i>Fragaria x ananassa</i> L. and <i>F. vesca</i>
Mulberry	<i>Morus</i> spp.
Banana and plantain	<i>Musa</i> L. spp. <i>AA</i> , <i>AB</i> , <i>AAA</i> , <i>AAB</i> , <i>ABB</i>
Blackberry, raspberry	<i>Rubus</i> L. hybrid and <i>Rubus idaeus</i> L.
Pear	<i>Pyrus</i> spp.
Garlic and other alliums	<i>Allium albidum</i> Fisch. ex M.Bieb., <i>A. chinense</i> G. Don, <i>A. fistulosum</i> L., <i>A. hookeri</i> Thw., <i>A. lineare</i> L., <i>A. ramosum</i> L., <i>A. sativum</i> L., <i>A. tuberosum</i> Rottl. ex Spreng.
Giant taro	<i>Alocasia</i> (L.) G. Don
Taro	<i>Colocasia esculenta</i> (L.) Schott.
Dahlia	<i>Dahlia</i> Thunb. sp.
Yams	<i>Dioscorea alata</i> L., <i>D. bulbifera</i> L., <i>D. floribunda</i> Martens et Galeotti, <i>D. rotundata</i> Poir., <i>D. deltoidea</i> Wall., <i>D. esculenta</i> (Lour.) Burk.
Gladiolus	<i>Gladiolus</i> L. sp.
Sweet potato	<i>Ipomoea batatas</i> (L.) Lam.
Tannia	<i>Xanthosoma sagittifolium</i> (L.) Schott
Turmeric	<i>Curcuma aeruginosa</i> Roxb., <i>C. aromatica</i> Salisb., <i>C. brog</i> Val., <i>C. caesia</i> Roxb., <i>C. longa</i> L., <i>C. latifolia</i> Rosc., <i>C. malabarica</i> Velayudhan et al., <i>C. manga</i> Val., <i>C. raktakanta</i> Mangaly and Sabu., and <i>C. soloensis</i> Vel.,
Cardamom	<i>Elettaria cardamomum</i> Maton.
Pepper <i>longum</i> L., <i>P. nigrum</i> L.	<i>Piper colubrinum</i> Link., <i>P. hapnium</i> Buch. Ham., <i>P.</i>
Vanilla	<i>Vanilla planifolia</i> Jacks ex Andrew
Ginger	<i>Zingiber</i> Mill. spp.
<i>Brahmi</i>	<i>Bacopa monnieri</i> (L.) Wettst.
<i>Safed musali</i>	<i>Chlorophytum borivilianum</i> Sant. et Fern.

Common Name	Botanical Name
Coleus	<i>Coleus</i> Lour. spp.
<i>Kali musali</i>	<i>Curculigo orchioides</i> Gaertn.
Foxglove	<i>Digitalis</i> L. spp.
Eremostachys	<i>Eremostachys superba</i> Royle ex Benth.
<i>Kutki</i>	<i>Gentiana kurroo</i> Royle
<i>Chandermool</i>	<i>Kaempferia</i> L. spp.
Mint	<i>Mentha</i> L. spp.
<i>Kutki</i>	<i>Picrorhiza kurroa</i> Royal ex Benth.
<i>Chitrak</i>	<i>Plumbago</i> L. spp.
Patchouli	<i>Pogostemon patchouli</i>
Sarpagandha	<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz.
<i>Kuth</i>	<i>Saussurea lappa</i> (Decne.) Sch.Bip.
Anantamul	<i>Tylophora indica</i> (Burm. f.) Merr.
Indian valerian	<i>Valeriana jatamansi</i> Jones.
Hops	<i>Humulus lupulus</i> L.
Jojoba	<i>Simmondsia chinensis</i> (Link) Schneider

For temperate fruits the material may also be sent to NBPGR Regional Station, Bhowali or Shimla for initial establishment.



