

Please send your comments and suggestions to:

1. Director, NBPGR
director@nbpgr.ernet.in

2. Head, Division of Germplasm Conservation
rkyagi@nbpgr.ernet.in



You are also encouraged to give a wide publicity about this among experts and stakeholders

Draft



**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**

Citation : NBPGR (2014) Guidelines for Registration of Plant Germplasm (Revised, 2014). National Bureau of Plant Genetic Resources, Pusa Campus, New Delhi-110 012

Printed : 2014

Published by : The Member Secretary
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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 (PPVFRA) 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 above need, a mechanism for "Registration of Plant Germplasm" was instituted at the National Bureau of plant Genetic Resources (NBPGR), New Delhi by the ICAR for registration of valuable sovereign genetic resources with known characteristics.

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, 27 meetings have been held and a total of 1124 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).

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 Rights
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
PPVFR&A	:	Protection of Plant Varieties and Farmers' Rights Act

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.
- (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 records 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.

4. Eligibility Criteria for Registration

- (i) Germplasm/genetic stock/elite material of field crops, 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 that for which it has been imported. 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.

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

- (i) Publication in standard peer reviewed journal (a copy of reprint to be submitted).

AND/OR

- (ii) Performance (yield contributing traits, adaptation traits, quality traits) data for at least two years and three locations 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 multi-location/year data under any other relevant system verified by Competent Authority. For quantitative traits (*e.g.* flower colour, leaf venation, seed colour) data of two environments duly supported by documents.
- (iii) Supporting biochemical evaluation data should be obtained from two different laboratories in two seasons. This is applicable for publications in standard peer reviewed journal and also applicable to clause (iv) of section 4 pertaining to landraces.

AND/OR

- (iv) Publication of information as (ii) and (iii) (*e.g.* comparative data along with the check) on potential value of proposed germplasm in institute annual report.

AND

- (v) 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 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, 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 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 to be mandated with the maintenance of working stock of 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 following address:

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 Form-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.).
- (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 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 cryogenic technology (see Annexure IX)

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

- (i) Preferably, more than 1000 seeds should be supplied. However, recognizing the importance of 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 30⁰C). Store and transport preferably in moist conditions between 15-20⁰C temperature conditions.
- (v) Extracted seeds may be treated with suitable fungicide (0.1% Captan or Thiram powder¹).
- (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, rhizoms, cuttings** etc.) has to be supplied to the concerned crop-based designated NAGS (Annexure I) for initial establishment and conservation¹. An acknowledgement to this effect has to be obtained from concerned NAGS to accompany

¹ The 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 (see Annexure XI).

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) ² 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 lables 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 airfreight.

² The 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 exceptional cases.

Annexure 1

National Active Germplasm Sites

S.No	Crop(s)	Institute	Address	Phone	Fax
1.	Vegetables	GBPUA&T, Pantnagar	G.B. Pant University of Agriculture and Technology, Pantnagar-263 145, Distt, Udham Singh Nagar, Uttarakhand	05944-233320, 233350	05944-233473
2.	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
3.	Cotton	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, TamilNadu	0422-2430045, 2431238	0422-2454021
4.	Crops of North East	ICAR RC NEH, Meghalaya	ICAR Research Complex for NEH Region, Umroi Road, Umiam-793 103, Meghalaya	0364- 2570257	0364- 2570355
5.	Chickpea	AICRP, IIPR, Kanpur	All India Coordinated Research Project on Chickpea, Indian Institute of Pulses Research, Kanpur-208 024, Uttar Pradesh	0512-2570109	0512-2570109
6.	Forages	IGFRI, Jhansi	Indian Grassland and Fodder Research Institute (IGFRI), Near Pahuj Dam, Gwalior Road Jhansi-284 003, Uttar Pradesh	0510-2730666, 2730385, 2730158	0510-2730833
7.	Forages	AICRP, IGFRI, Jhansi	Indian Grassland and Fodder Research Institute (IGFRI), Near Pahuj Dam, Gwalior Road Jhansi-284 003, Uttar Pradesh	0510-2730666, 2730385, 2730158	0510-2730833
8.	Field Crops	VPKAS, Almora	Vivekananda Parvatiya Krishi Anusandhan Sansthan (VPKAS), Indian Council of Agricultural Research, Almora-263 601, Uttarakhand	05962-230060, 230208	05962-231539
9.	Groundnut	DGR, Junagarh	Directorate of Groundnut Research (DGR), PO Box 5, Ivnagar Road, Junagadh-362 001, Gujarat	0285-2673382	0285 2672550
10.	Fibres	CRIJAF, Barrackpore	Central Research Institute for Jute & Allied Fibers (CRIJAF), Barrackpore, Kolkata-700 120, West Bengal	033-25356121, 25356122	033-25350415
11.	Maize	DMR, New Delhi	Directorate of Maize Research (DMR) Pusa Campus, New Delhi-110 012	011-25849725, 25842372	011-25848195
12.	Pulses	MULLaRP, AICRP, IIPR, Kanpur	All India Coordinated Research Project on MULLaRP, Indian Institute of Pulses Research (IIPR), Kanpur -208 024, Uttar Pradesh	0512-2570163	0512-2570163, 2572582
13.	Oilseeds	DOR, Hyderabad	Directorate of Oilseeds Research (DOR), Rajendranagar, Hyderabad-500 030, Andhra Pradesh	040-24598444, 24016141	040-24017969
14.	Pearl millet	AICRP, ARS,RAU, Jodhpur	All India Coordinated Pearl Millet Improvement Project, Rajasthan Agricultural University, ARS, Mandor, Jodhpur-342 304, Rajasthan	0291- 2571408	0291- 2571909
15.	Pigeonpea	AICRP, IIPR, Kanpur	All India Coordinated Research Project on Pigeonpea, Indian Institute of Pulses Research (IIPR), Kalyanpur, Kanpur-208 024, Uttar Pradesh	0512- 2570145	0512- 2572582
16.	Pulses	IIPR, Kanpur	Indian Institute of Pulses Research (IIPR), Kalyanpur, Kanpur-208 024, Uttar Pradesh	0512-2572464, 2572465, 2572012, 2573761	0512-2572582
17.	Rapeseed & Mustard	DRMR, Bharatpur	Directorate of Rapeseed-Mustard Research (DRMR), Sewar, Bharatpur-321 303, Rajasthan	05644-260379, 260495	05644-260565
18.	Rice	CRRI, Cuttack	Central Rice Research Institute (CRRI), Cuttack-753 006, Orissa	0671-2367757	0671-2367663
19.	Rice &	IGKV, Raipur	Indira Gandhi Krishi Vishwavidyalaya	0771-2100564	0771-2442302

	Lathyrus		(IGKV), Raipur-492 006, Madhya Pradesh		
20.	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
21.	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
22.	Sorghum	DSR, Hyderabad	Directorate of Sorghum Research (DSR), Rajendranagar, Hyderabad-500 030, Andhra Pradesh	040-24015349, 24018651	040-24016378
23.	Soybean	DSR, Indore	Directorate of Soybean Research, Khandwa Road, Indore-452 001, Madhya Pradesh	0731-2476188, 2478414, 2362835, 2364879	0731-2470520
24.	Sugarcane	SBI, Coimbatore	Sugarcane Breeding Institute (SBI), Coimbatore-641 007, Tamil Nadu	0422-2472621	0422-2472923
25.	Sugarcane	AICRP, IISR, Lucknow	Indian Institute of Sugarcane Research (IISR), Raibareli Road, P.O. Dilkusha, Lucknow-226 002, Uttar Pradesh	0522-2480726	0522-2480738
26.	Underutilized crops	NBPGR, New Delhi	National Bureau of Plant Genetic Resources (NBPGR), Pusa Campus, New Delhi-110 012	011-25843697	011- 25842495
27.	Wheat & Barley	DWR, Karnal	Directorate of Wheat Research (DWR), Post Box No-158, Agrasain Marg, Karnal-132 001, Haryana	0184-2267307	0184-2267390
28.	Agro forestry crops	NRC, 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
29.	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
30.	Banana	NRCB, Tiruchirapalli	National Research Centre for Banana (NRCB), Thogamalai Road, Thayanur Post, Tiruchirapalli -620 102, Tamil Nadu	0431-2618104, 2618106	0431-2618115
31.	Cashew	DCR, Puttur	Directorate of Cashew Research (DCR), Post Darbe, Puttur-574 202, Dakshina Kannada, Karnataka	08251-231530, 230902, 236490	08251-234350
32.	Citrus species	NRC, Nagpur	National Research Centre for Citrus, Amravati Road, Nagpur-440 010, Maharashtra	0712-2500249, 2500615	
33.	Flowers	DFR, IARI, New Delhi	Directorate of Floricultural Research (Indian Council of Agricultural Research) IARI Campus, PUSA, New Delhi-110 012	25843983	2584376
34.	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
35.	Leechi, Bael, Aonla & Jackfruit	NRC, Muzaffarpur	National Research Centre for Litchi, Mushahari, P.O. Ramna, Muzaffarpur-842 002, Bihar	0621 - 2289475, 2281160	0621 - 2281162
36.	Medicinal & Aromatic plants	NRC, Anand	Directorate of Medicinal & Aromatic Plants Research (DMAPR), Borivi-387 310, Anand, Gujarat	2692-271602	2692-271601
37.	Mango	CISH, Lucknow	Central Institute for Subtropical Horticulture (CISH), Rehmankhara, Kakori-Lucknow-227 107, Uttar Pradesh	0522-2841022, 2841023	0522-2841025
38.	Sub tropical fruits	AICRP, CISH, Lucknow	Central Institute for Subtropical Horticulture (CISH), Rehmankhara, Kakori-Lucknow-227 107, Uttar Pradesh	0522- 2841115	0522- 2841115
39.	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
40.	Oil Palm	DOPR, Pedavegi,	Directorate of Oil Palm research (DOPR),	08812-259532,	08812-259531

		West Godavari	Pedavegi-534 450, West Godavari District, Andhra Pradesh	259524	
41.	Onion & Garlic	DOGR, Pune	Directorate of Onion and Garlic Research (DOGR), Rajgurunagar, Pune-410 505, Maharashtra	02135-222026	02135-224056
42.	Orchids	NRC, Pakyong	National Research Centre for Orchids, Pakyong-737 106, Sikkim	03592-257954, 257289, 257703	03592-257289, 257282
43.	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
44.	Plantation crops	CPCRI, Kasargod	Central Plantation Crop Research Institute (CPCRI), Kudlu.P.O, Kasaragod-671 124, Kerala	04994-232894	04994-232322
45.	Potato	CPRI, Shimla	Central Potato Research Institute (CPRI), Shimla-171 001, Himachal Pradesh	0177-2625182, 2625073	0177-2624460
46.	Spices	IISR, Calicut	Indian Institute of Spices Research (IISR), Marikunnu P.O., Kozhikode (Calicut), Kerala-673 012	0495-2730294	0495-2731187
47.	Spices	AICRPS, IISR, Calicut	Indian Institute of Spices Research (IISR), Marikunnu P.O., Kozhikode-673 012, Calicut, Kerala	0495-2731410, 2731753	0495-2731187
48.	Tea	UPASI TRF, Coimbatore	UPASI Tea Research Foundation, Tea Research Institute, Nirar Dam, Valparai-642 127, Coimbatore, Tamil Nadu	04253 -235201, 235301, 235303	04253- 235302
49.	Temperate horticultural crops	CITH, Srinagar	Central Institute for Temperate Horticulture (CITH), Old AirPort Road, Rangreth, Srinagar, Kashmir-190 007	0194-2305044	0194-2305045
50.	Temperate horticultural crops	NBPGR RS, Shimla	National Bureau of Plant Genetic Resources, Regional Station, Phagli, Shimla-171 004, Himachal Pradesh	0177-2835459	0177-2835453
51.	Tobacco	CTRI, Rajahmundry	Central Tobacco Research Institute (CTRI), Bhaskarnagar, Rajahmundry-533 105, Andhra Pradesh	0883-2448995, 2449871	0883-2448341, 2410555
52.	Tropical fruits	IIHR, Bangalore	Indian Institute of Horticultural Research (IIHR), Hessaraghatta lake post, Bangaluru-560 089, Karnataka	080- 28466471, 28466353	080- 28466291
53.	Tropical fruits	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
54.	Tuber crops	CTCRI, Thiruvananthapuram	Central Tuber Crops Research Institute (CTCRI), Sreekariyam, Thiruvananthapuram-695 017, Kerala	0471-2598551	0471-2590063
55.	Tuber crops	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
56.	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
57.	Vegetables	IARI RS, Katrain	Indian Agricultural Research Institute (IARI) Regional Station, Katrain, Kullu-175 129, Himachal Pradesh	01902-240124, 241280	01902-240124
58.	Ornamental crops	IIHR, Bangalore	Indian Institute of Horticultural Research (IIHR), Hessaraghatta lake post, Bangaluru-560 089, Karnataka	080-28466353, 28466471	080-28466291
59.	Tea	Tea Research Association, TES, Jorhat	Tea Research Association (TRA), Tocklai Experimental Station, Jorhat-785 008, Assam	0376-2360467, 2360972	0376-23600974

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

1.	Application status (code)	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;">N</td> <td style="width: 50px; text-align: center;">R</td> </tr> </table>	N	R	<u>For Use of NBPGR</u>				
N	R								
2.	Crop name	<input style="width: 150px;" type="text"/>	(i) Application number <input style="width: 100px;" type="text"/>						
			(ii) Date of application <input style="width: 100px;" type="text"/>						
3.	Botanical name	<input style="width: 250px;" type="text"/>	(iii) Whether new or revised? <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;">N</td> <td style="width: 50px; text-align: center;">R</td> </tr> </table>	N	R				
N	R								
4.	Crop group (Code)	<input style="width: 200px;" type="text"/>							
5.	Biological status of the material to be registered		(iv) If revised, Date of 1st Application <input style="width: 100px;" type="text"/>						
6.	Identity		(v) If validation test suggested whether report attached						
7.	Criteria for registration[Unique feature(s) maximum three]	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;">I.</td> <td style="width: 150px; height: 20px;"></td> </tr> <tr> <td style="width: 50px; text-align: center;">II.</td> <td style="width: 150px; height: 20px;"></td> </tr> <tr> <td style="width: 50px; text-align: center;">III.</td> <td style="width: 150px; height: 20px;"></td> </tr> </table>	I.		II.		III.		(vi) Action taken <input style="width: 50px;" type="text"/> a) Forwarded for registration b) Sent for validation c) Incomplete, sent for revision
I.									
II.									
III.									
	(vii) Whether registered or rejected								
8.	Nature of genetic material (code)	<input style="width: 50px;" type="text"/>	(viii) Date of registration or rejection <input style="width: 100px;" type="text"/>						
9.	Quantity deposited (Actual)	<input style="width: 50px;" type="text"/>	(ix) Registration Number <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 100px; text-align: center;">INGR No.</td> </tr> </table>	INGR No.					
INGR No.									
10.	Value referred to (Code)	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;">SC</td> <td style="width: 50px; text-align: center;">CM</td> <td style="width: 50px; text-align: center;">AC</td> </tr> </table>	SC	CM	AC	(x) Validation test suggested <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;">Y </td> <td style="width: 50px; text-align: center;">N</td> </tr> </table>	Y	N	
SC	CM	AC							
Y	N								
11.	Basis of eligibility (Code)	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;">AR</td> <td style="width: 50px; text-align: center;">PR</td> <td style="width: 50px; text-align: center;">CT</td> <td style="width: 50px; text-align: center;">OT</td> </tr> </table>	AR	PR	CT	OT	(xi) Notified on: (xii) Remarks:		
AR	PR	CT	OT						
12.	Has it been registered /protected anywhere	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;">Y </td> <td style="width: 50px; text-align: center;">N</td> </tr> </table>	Y	N					
Y	N								
13.	Manuscript (One-page note on proposed germplasm enclosed	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;">Y </td> <td style="width: 50px; text-align: center;">N</td> </tr> </table>	Y	N					
Y	N								
14.	Particulars of the scientist(s)/person(s)/organisation/farmer/farming community who developed germplasm/genetic stock*								
	Name (Dr/Ms/Mr.)								
	<input style="width: 100%; height: 20px;" type="text"/>								
	Designation								
	<input style="width: 100%; height: 20px;" type="text"/>								
	Address								
	<input style="width: 100%; height: 20px;" type="text"/>								

23. 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 DEPOSITOR

Signature
Full Name
Designation &Address

COUNTERSIGNED BY HEAD OF THE INSTITUTE

Signature (SEAL)
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 20*), 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 16* can be given. Follow the format of variety release application or AICRP data sheets for respective crops. Use separate sheet, if needed.
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)
4. Use codes for filling in *Item 1, 4, 5, 8, 9* [actual], *10, 11* and *15(B)* [Breeding Method]. In case of the code “Other” fill in specific details in *Item 20*.
5. 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.
6. Give name(s) of all persons associated with development of the material in *Item 13*. 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.
7. *Item 15* has two alternate parts, (a) and (b) to fill in :
 - (a) In case nature of the material to be registered as given in *Item 15* 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 described below.
8. Give particulars of developers in *Item 13* over and that of corresponding person in *Item 14* as the applicant and developer may not be always the same as the first person responsible for development of the material.
9. 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.

Annexure II B

Codes for filling information in Col.1, 4, 5, 8, 9 [actual], 10, 11 and 15 (B) Breeding Method] of Form A

Item 1: Application Status		TR	Tubers/Roots/Bulbs
N	New	VP	Vegetative cuttings
R	Revised	WP	Whole plant
Item 2: Crop Group		OT	Other (Specify in Col.20)
CL	Cereals	Item 9: Qunantity deposited with application	
PC	Pseudo cereals		Actual
MT	Millets	Item 10: Value referred to by applicant	
MM	Minor millets	SC	Scientific
GL	Grain legumes	CM	Commercial
OS	Oilseeds	AC	Academic
PC	Fiber crops	Item 11: Basis of eligibility for registration	
FG	Forage	PR	Published with peer review
FT	Fruits	CT	All India Co-ordinated trials data
VG	Vegetable crops	AR	Institute annual report
SP	Spices	OT	Any other report
MP	Medicinal and aromatic plants	Item 12: Manuscript (One Page Note) submitted	
NC	Narcotics	Y	Yes
OR	Ornamentals	N	No
FR	Forestry	Item 15: Breeding method used	
CC	Commercial crops	IN	Introduction and selection
OT	Other (Specify in Col.19)	MS	Mass selection
Item 5: Biological status of material to be registered		PS	Pedigree selection
GP	Germplasm collection	PL	Pure line selection
GS	Genetic Stock	RS	Recurrent selection
RE	Recombinant	BC	Backcross method
MU	Mutant	OT	Other(Specify in Item 19)
Item 8: Nature of genetic material			
SD	Seed		

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

CHECK-LIST FOR SCREENING OF APPLICATIONS

The Member Secretary, PGRC at NBPGR shall screen all application 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 or a revised one?	
2.	Whether same or similar material has been registered earlier?	
3.	Whether unique or distinguishing characteristics of potential value merit consideration for registration?	
4.	Whether documentary evidence or data (as per the guidelines) is provided in support of the claim on potential value of germplasm?	
5.	State any other economic potential value of germplasm, if possible	
6.	Whether applicant, institution, university or centre has given a commitment for maintenance and supply of germplasm for use?	
7.	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?	
8.	Whether the applicant has sent maintainer/restorer line of the CMS line to the National Genebank?	
9.	Whether acknowledgement receipt of germplasm from concerned NAGS for deposition and establishment is attached, wherever required?	
10.	Whether detailed address of the corresponding person is given?	
11.	Whether Recommendations of IGIC (Institute Germplasm Identification Committee) attached?	
12.	Whether competent authority of the institute has duly endorsed the application?	

(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 IJPGR should be followed.
4. Oxford English spelling should be followed and the consistency of spelling should be maintained through out 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-locational 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 Engelmann (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 viability and Seed Quantity in selected species 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> sspp. <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 echioides</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>Arista</i> spp.	30	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
<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
<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 assamicus</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
<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> spp. <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> L.f	30	500
<i>Rumex vesicarius</i> L.	30	2000
<i>Saussurea</i> DC. spp.	30	500
<i>Schoenefeldia gracilis</i> Kunth	30	500

<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	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 cuminii</i> (L.) Skeels
Karonda	<i>Carissa congesta</i> Wt.
Ker	<i>Capparis deciduas</i> (Forsk.) Edgew.
Khirni	<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> Hoult.
Oil plam	<i>Elaeis guneensis</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.

Annexure IX

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. AA, AB, AAA, AAB, ABB
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>Piper colubrinum</i> Link., <i>P. hapnium</i> Buch. Ham., <i>P. longum</i> L., <i>P. nigrum</i> L.
Vanilla	<i>Vanilla planifolia</i> Jacks ex Andrew
Ginger	<i>Zingiber</i> Mill. spp.
Brahmi	<i>Bacopa monnieri</i> (L.) Wettst.
Safed musali	<i>Chlorophytum borivillianum</i> Sant. et Fern.
Coleus	<i>Coleus</i> Lour. spp.
Kali musali	<i>Curculigo orchioides</i> Gaertn.
Foxglove	<i>Digitalis</i> L. spp.
Eremostachys	<i>Eremostachys superba</i> Royle ex Benth.
Kutki	<i>Gentiana kurroo</i> Royle
Chandermool	<i>Kaempferia</i> L. spp.
Mint	<i>Mentha</i> L. spp.
Kutki	<i>Picrorhiza kurroa</i> Royal ex Benth.
Chitrak	<i>Plumbago</i> L. spp.
Patchouli	<i>Pogostemon patchouli</i>
Sarpgandha	<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz.
Kuth	<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
Wild cicer	<i>Cicer microphyllum</i> Benth.

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