Plant Quarantine

Safe Exchange of Plant Genetic Resources

Introduction of diverse plant genetic resources (PGR) has played a key role in changing India from a food grain importer to an exporter. However, there is an inherent risk of introduction of pests along with the movement of PGR. Testing for health status of material is important in safe exchange and pest-free conservation of PGR.

Plant quarantine is a government endeavour enforced through legislative measures to regulate the introduction of plants, plant products, soil, living organisms etc. to prevent the inadvertent introduction of pests (including quarantine pests) harmful to the agriculture of a country/ state/ region and if introduced, prevent their establishment and further spread.

- At present, India, imports agricultural commodities including germplasm as per the provisions of the Plant Quarantine (Regulation of Import into India) Order 2003 promulgated by the Ministry of Agriculture and Farmers Welfare, Government of India, which came into force from January 1, 2004.
- Indian Council Agricultural Research-National Bureau of Plant Genetic Resources (ICAR-NBPGR) is the nodal institute to undertake quarantine processing of PGR under exchange meant for research both by public and private sectors. The Director, ICAR-NBPGR has been empowered under the PQ Order 2003 to regulate the exchange of PGR including transgenics.

❖ Pest-free Exchange

- **Quarantine of PGR (germplasm) including transgenics meant for research**
- **Identification of intercepted pest (s)**
- **Post-entry quarantine growing and inspection including virus indexing**
- **Salvaging of infected/ infested material**
- **Issue of Phytosanitary Certificate for plant material meant for export**

❖ HRD and Policy Issues

- **Teaching and training on policies and procedures for quarantine and biosecurity**
- **Providing policy inputs to Govt. of India on phytosanitary and other biosecurity related issues for compliance to national and international regulations**

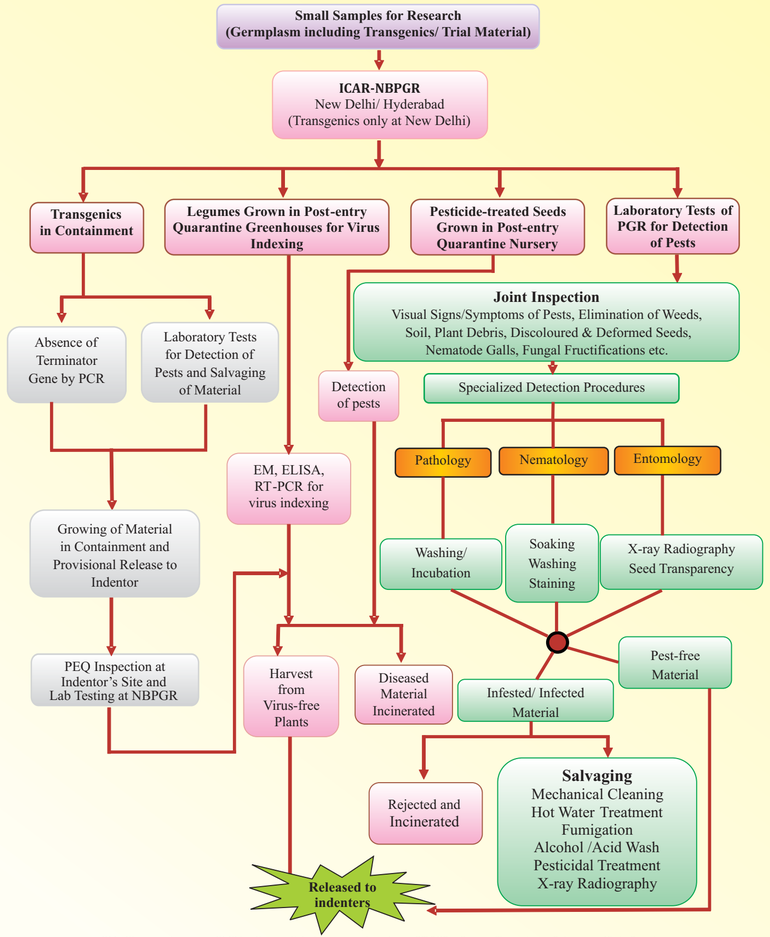
Achievements (1976-2015)

Quarantine Processing of PGR

- A total of 41,74,403 samples including 14,453 transgenics of various crops comprising seeds, vegetative propagules and *in vitro* cultures were processed for quarantine clearance. Of these, 33,47,690 were imported and 8,26,713 were meant for export to different countries (Fig. 1).
- Detailed quarantine examination of imported samples revealed infestation/ infection/ contamination in 2,01,932 samples [insects and mites (1,06,992), pathogens (59,996), nematodes (29,776) and weeds (5,066)] (Fig. 2), of which, 1,95,898 were salvaged using various treatments/ techniques (Table 1) and released to the indenters.
- Post-entry quarantine inspection was undertaken for 16,28,102 entries of international trials of wheat, barley and triticale which were grown in isolation. Exotic material of legumes (~ 28,200 samples) was grown in quarantine green houses at ICAR-NBPGR, New Delhi and its Regional Station at Hyderabad, and ICRISAT, Hyderabad for virus indexing.
- Several important quarantine pests were intercepted and some are listed in Table 2.

Source: ICAR-NBPGR Annual Reports

QUARANTINE PROCESSING OF PGR UNDER EXCHANGE



EM= Electron microscopy; ELISA = Enzyme linked Immunosorbent Assay. RT-PCR = Reverse Transcriptase Polymerase Chain Reaction

Table 1: Techniques/ Treatments for Disinfestation/ Disinfection of Infested/ Infected/ Contaminated Planting Material

Techniques	Fungi	Bacteria	Virus	Insects	Mites	Nematodes	Weed
Physical							
Mechanical cleaning	+	+	+	+	+	+	+
X-ray radiography	-	-	-	+	-	-	-
Hot water treatment	+	+	-	+	-	+	-
Isolation Growing	+	+	+	+	+	+	+
Chemical							
Fumigation	-	-	-	+	+	-	-
Pesticidal dip/ spray	+	+	-	+	+	+	-
Seed dressing	+	-	-	-	-	-	-
Alcohol wash	+	-	-	-	-	-	-
Acid wash	+	-	-	-	-	-	-
10% Trisodium orthophosphate	-	-	+	-	-	-	-

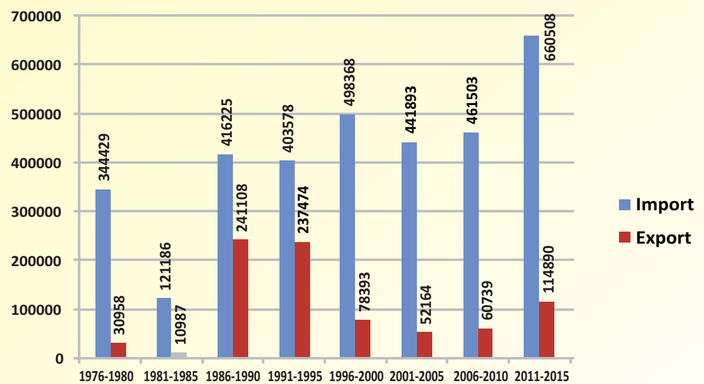


Fig. 1: Quarantine Processing of PGR under Exchange (1976-2015)
(Source: ICAR-NBPGR Annual Reports)

Table 2: Important Pests of Quarantine Significance Intercepted in Imported PGR

Pest	Host	Source
Insects		
**Anthonomus grandis*	*Gossypium* sp., *Hibiscus* sp.	USA
**Bruchidius atrolineatus*	*Vigna unguiculata*	IITA (Nigeria)
**Bruchus dentipes*	*Vicia faba*	ICARDA (Syria), Lebanon
**B. ervi*	*Lens culinaris*	Several countries
**Bruchophagus gibbus*	*Trifolium* spp.	USA
**Ephestia elutella*	*Triticum aestivum*	Italy
**Gymnetron plantaginis*	*Plantago lanceolata*	Italy
**Pachymerus lacerdae*	*Orbygnya phalerata*	Brazil
**Quadrastichodella eucalypti*	*Eucalyptus camaldulensis*	Australia
Nematodes		
**Ditylenchus dipsaci*	*Allium cepa*	England
**Heterodera schachtii*	*Beta vulgaris*	Germany
**Pratylenchus hamatus*	*Mentha spicata*	Brazil
Fungi		
Claviceps purpurea	Cereals	Several countries
Drechslera maydis	*Zea mays*	- do -
Fusarium nivale	Cereals	- do -
F. oxysporum, F. solani, Macrophomina phaseolina	Many hosts	- do -
**Peronospora manshurica*	*Glycine* spp.	- do -
**Uromyces beticola*	*Beta vulgaris*	Belgium, Germany, Italy, UK, USA
Bacteria		
Burkholderia solanacearum	*Arachis hypogaea*	USA
Xanthomonas campestris pv. *campestris*	*Brassica* spp.	Canada, France, Pakistan, Sweden, Taiwan, UK, USA
Viruses		
** Barley stripe mosic virus*	*T. aestivum*	USA
**Bean mild mosaic virus*	*Glycine max*	Canada, Columbia
**Broad bean stain virus*	*V. faba*	ICARDA (Syria), Bulgaria
**Cherry leaf roll virus*	*Phaseolus vulgaris*	CIAT (Colombia)
**Cowpea mottle virus*	*V. unguiculata*	Philippines
**Cowpea severe mosaic virus*	*G. max*	USA
**High plains virus*	*Z. mays*	USA
**Maize chlorotic mottle virus*	*Z. mays*	Puerto Rico, USA
**Pea enaton mosaic virus*	*Pisum sativum*	Spain, USA
**Raspberry ring spot virus*	*G. max*	AVRDC (Taiwan), Costa Rica Sri Lanka, Thailand, USA
**Tomato ring spot virus*	*G. max*	Brazil, Canada, Costa Rica
Weeds		
**Anthemis cotula*	*Hordeum vulgare*	Syria
**Bifora testiculata*	*T. aestivum*	Australia, Mexico, USA
**Cichorium spinasum*	*Trifolium alexandrium*	Egypt
**Polygonum argyrocoleon*	*T. aestivum*	Mexico
**Sinapsis arvensis*	*Oryza sativa*	USA

* Pest not reported from India

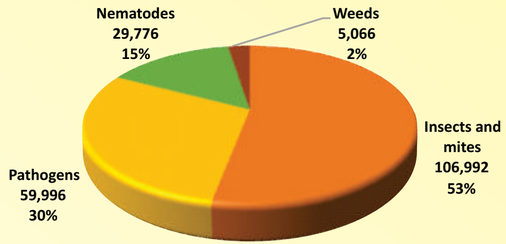


Fig. 2: Infested/ Infected/Contaminated Samples in Imported Germplasm

Human Resource Development

- PGR courses for Post Graduate students of ICAR-Indian Agricultural Research Institute, New Delhi
  - PGR 502: Germplasm Exchange and Plant Quarantine
  - PGR 509: Plant Biosecurity
- Training of undergraduate/ post-graduate students:
  - Project work for 3-6 months durations
- Regular training courses on Biosafety and Biosecurity
  - National Orientation Course on *Biosafety Considerations for Evaluation of Transgenic Crops* every year from 2000-2007
  - Winter School on *Biosafety and Biosecurity Policies, procedures and issues* in 2009
  - Training Course on *Diagnostic Methods for Detection and Identification of Pests of Seed and other Planting Material and their Management* in 2011
  - Training Workshops on *Strengthening Capacities of Enforcement Agencies (Plant Quarantine and Customs Officials) for Transboundary Movement of LMOs*
- Audio-visual CD on *Safe Movement of Transgenics*

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