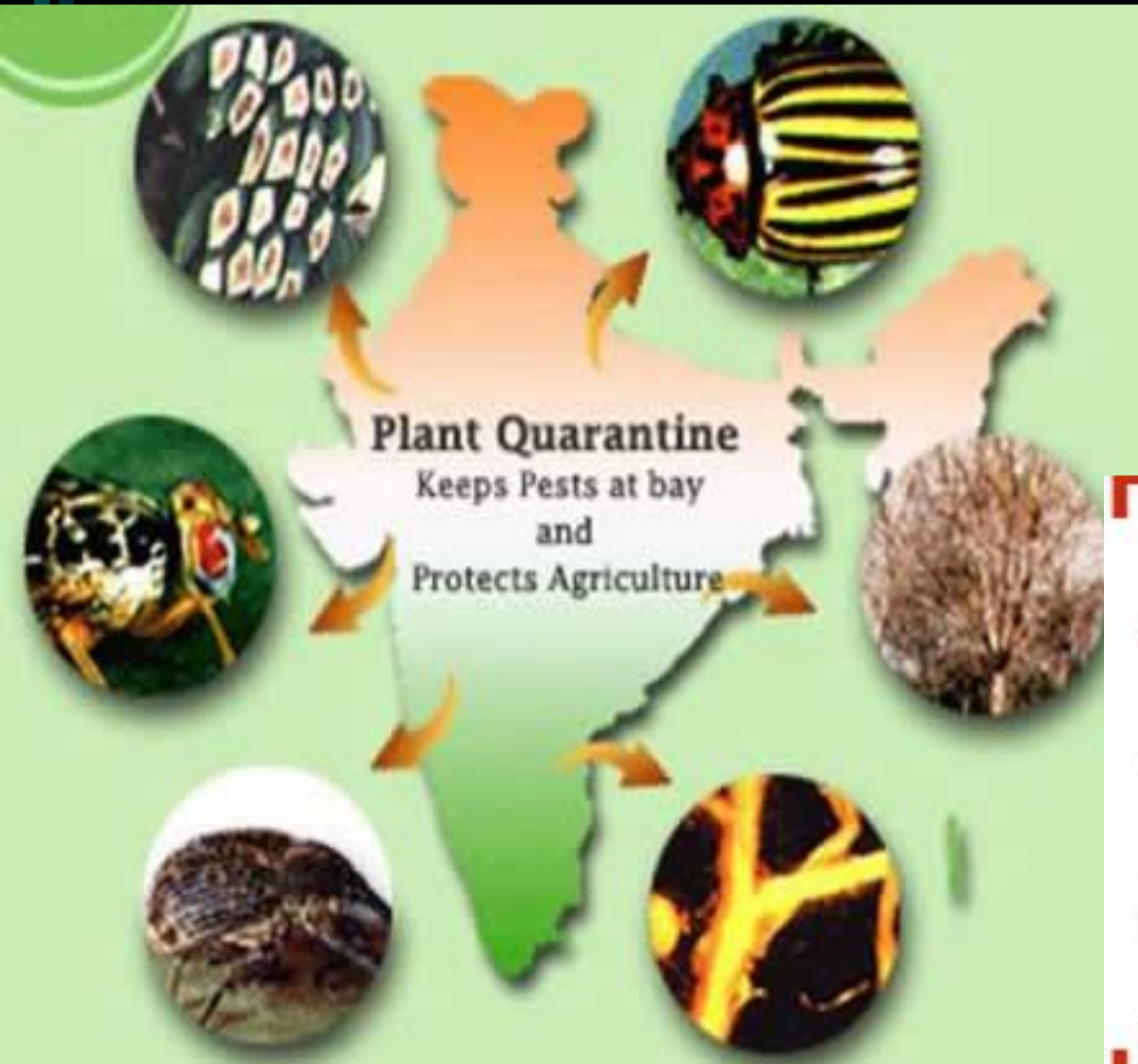


Quarantine in importation of grains



Introduction



- Growth of world trade in agricultural commodities -rapid
- **Increasing agricultural trade results -increasing risk of introducing exotic insects into new areas –increases**
- Establishment of new pests -costly owing to increased crop damage, control programs, and quarantine restrictions on trade



Plant quarantine

- Legal restrictions to prevent entrance and establishment of a plant disease or insect pest in an area where disease or pest does not exist
- **Quarantine-accomplished through prohibition, interception and elimination of pests, diseases and weeds at pre-entry, entry and post-entry points of the consignment**

International importance of quarantine

- **Grapevine phylloxera - introduced into France from America (1860)**
- **San Jose scale spread into USA in the late 19th Century**
- **First quarantine act in the USA came into operation in 1905**
- **Plant quarantine -successfully prohibited re-entry into the United States from any of the countries**
 - **Phylloxera**
 - **San Jose scale and**
 - **Black wart of potato from any of the countries**



International importance of quarantine

Examples of pests introduced from foreign countries

- San Jose scale *Quadraspidiotus perniciosus* in 44 countries
- Potato Colorado beetle *Leptinotarsa decemlineata* in (40)
- Mediteranean fruit fly *Ceratitis capitata* in 39 countries
- Apple maggot *Rhagoletis pomonelle* in 33 countries
- Oriental fruit fly *Dacus dorsalis* in 28 countries
- Japanese beetle *Popillia japonica* in 28 countries
- Boll weevil *Anthonomus grandis* in 21 countries
- Mexican fruit fly, *Anastrepha lugens* in 20 countries
- Cherry maggot *Rhagoletis cerasi* in 20 countries, and
- Potato tuber moth *Phthorimaea operculella* in 19 countries

(Sangita Sharma and Meena Thakur, 2007)

International plant protection activities

- **Since pest and disease organisms move freely over national boundaries-development and application solutions require international cooperation**
- **Driving force for adoption of International Convention for the Protection of plants in 1929**
 - **Purpose- to permit and even facilitate trade without any reduction of national phytosanitary security (Ikin, 1990)**
- **In 1951- became the FAO International Plant Protection Convention- ministered procedural matters -charged with implementation of certain technical provisions**
- **A world-wide reporting service- organized by FAO in cooperation with contracting governments - circulated information on incidence of plant pests and diseases of economic importance, on degree of damage, and their control**
- **This service came into operation in October 1952 with initiation of a monthly periodical entitled FAO, Plant Protection Bulletin**

International plant protection activities

- **FAO Plant Protection Bulletin insisted-contracting Governments to undertake to cooperate with one another in establishing regional plant protection organizations in appropriate regions**
- **In accordance with IPPC requirements eight regional Plant Protection Organizations –formed**
 - **NAPPO : North American Plant Protection Organization**
 - **OIRSA : Organismo Internacional Regional de Sanidad Agropecuaria**
 - **CPPC : The FAO Carribbean Plant Protection commission**
 - **CIPA : Comite Inter- Americano de Protection Agricola**
 - **IAPSC : Inter-African Phytosanitary council**
 - **EPPPO : European and Mediterranean Plant Protection Organisation**
 - **SEAPPC : Plant Protection committee for the South East Asia and Pacific region, and**
 - **NEPPC : Near East Plant Protection Commission**



(Sangita Sharma and Meena Thakur, 2007)

Plant quarantine in India

- **Plant quarantine activities in India -carried out under the Destructive Insects and Pests Act (DIP Act) of 1914 as amended from time to time**
- **Prohibit import of plants and plant material, insects, fungi and weeds to India from foreign countries**
- **Rules and regulations -made prohibiting the movement of certain diseased and pest infested materials from one State to another in India- comes under domestic quarantines.**
- **Seed -not covered under DIP Act until 1984, when the Government of India brought forward a comprehensive Plant, Fruits and seeds order, 1984 which came into force in June 1989**
- **To provide farmers -best planting materials available in world for maximizing productivity per unit area and to encourage private seed industry in India- GOI announced a new policy on seed development in September 1988**

International plant protection activities

- **New policy covers import of seeds / planting materials of wheat, paddy, coarse cereals, oilseeds, pulses, vegetables, flowers, ornamentals and fruit crops; and procedures for their import and related plant quarantine requirements in respect to provisions of the new seed policy**
- **GOI brought forward through Gazette Notification, the updated Plants, Fruits and Seeds (Regulation of Import into India) order, 1989**
- **In this Act, provisions made for State Governments to pass their own legislation for adopting remedial measures**
- **East Punjab Agricultural Pest, Diseases and Noxious Weed Act- passed in 1949. Other states - passed similar legislations**
- **Punjab-enforced control measures for eradication of pests, diseases or weeds (locust and grasshopper, hairy caterpillars, rats, *Pyrrilla* and Gurdaspur borer of sugarcane, ergot of pearl-millet, water hyacinth and other weeds**

(Dhaliwal, 2007)

Plant quarantine facilities in India

- **Plant Quarantine regulatory measures-operative through "Destructive Insects & Pests Act, 1914 (Act 2 of 1914)"**

Purpose and intent

- To prevent introduction of any insect, fungus or other pest, which is or may be destructive to crops
- **Import of agricultural commodities- presently regulated through Plant Quarantine (Regulation of Import into India) Order, 2003 issued under DIP Act, 1914 incorporating the provisions of New Policy on Seed Development, 1988**
- **Significance of Plant Quarantine -increased in view of Globalisation and liberalisation in International trade of plants and plant material in the wake of Sanitary and Phytosanitary (SPS) Agreement under WTO**
- **Phytosanitary certification of agricultural commodities being exported -also undertaken through scheme as per International Plant Protection Convention (IPPC), 1951**

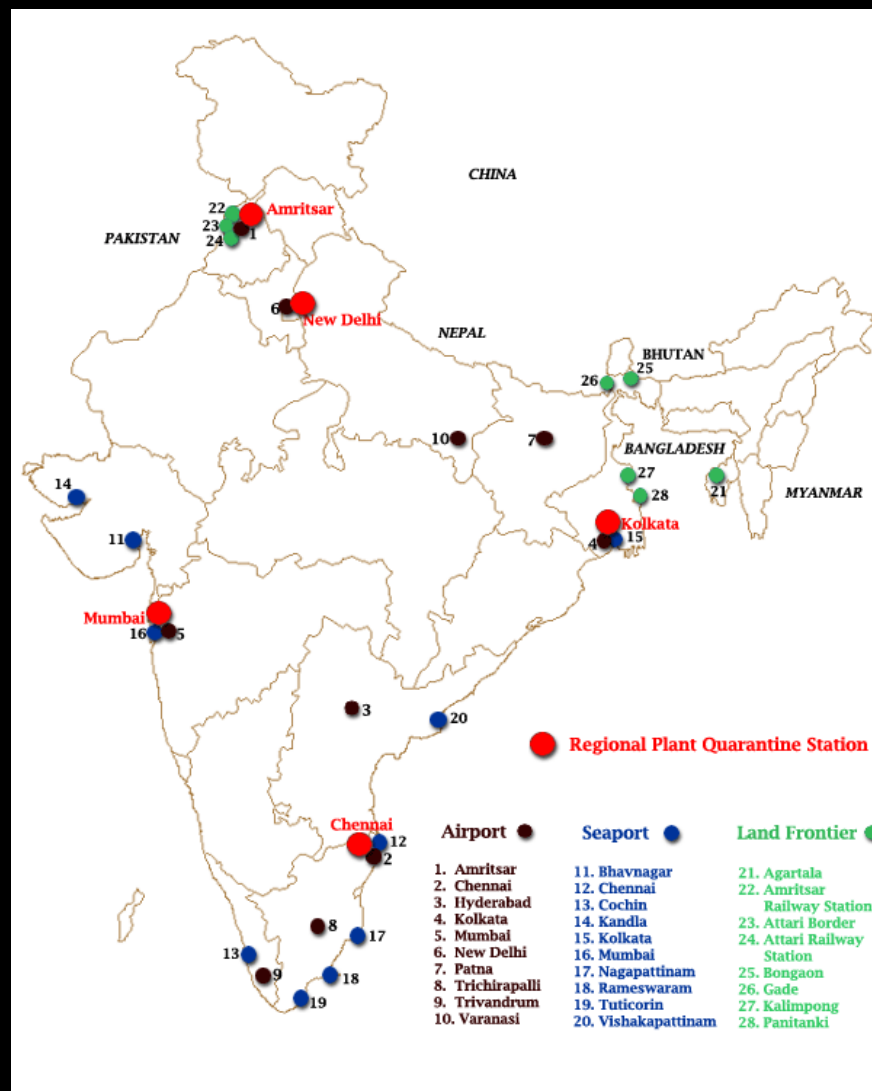
Plant quarantine facilities in India

Primary activities of scheme

- **To prevent introduction and spread of exotic pests that are destructive to crops by regulating/restricting import of plants/plant products**
- **To facilitate safe global trade in agriculture by assisting producers and exporters by providing a technically competent and reliable phytosanitary certificate system to meet requirements of trading partners**
- **Inspection of imported agricultural commodities for preventing introduction of exotic pests and diseases inimical to Indian Fauna and Flora**
- **Inspection of agricultural commodities meant for export as per requirements of importing countries under International Plant Protection Convention (IPPC)**
- **Detection of exotic pests and diseases already introduced for containing/controlling them by adopting domestic quarantine regulations**
- **Undertaking Post Entry Quarantine Inspection in respect of identified planting materials**
- **Conducting Pest Risk Analysis (PRA) to finalize phytosanitary requirements for import of plant/plant material**

Plant quarantine facilities in India

- 35 plant quarantine stations at different Airports, Seaports and Land frontiers implementing Plant Quarantine regulations
- **NPQS, New Delhi and RPQSs at Chennai, Kolkata, Amritsar and Mumbai - strengthened with modern equipment for plant quarantine testing, etc., to facilitate speedy clearance of imports and exports under the FAO- NADP Project**



Plant quarantine facilities in India

Phytosanitary Certificate and Standards

- **Sanitary and Phytosanitary Agreement of WTO envisages application of Phytosanitary measures based on scientific justifications -imperative to conduct all Plant Quarantine inspections as per International Standards/guidelines**
- **National Standards for Phytosanitary Measures for some important activities -developed and adopted including Guidelines for Development of National Standards for Phytosanitary Measures**
- **Standards which are critical for our exports –also prioritized and insisted**

Plant quarantine facilities in India

As per recent amendments made under PQ order

- **Advanced Centre for Plant Virology at IARI, New Delhi, Indian Institute of Horticultural Research, Bangalore and Institute of Himalayan Bioresource Technology, Palampur -identified for ensuring virus-free status in imported *in vitro* material**
- **Under DIP Act- provision of Domestic Quarantine to restrict inter-state movement of nine invasive pests *viz.*,**
 - **Fluted scale, San jose scale, coffee berry borer**
 - **Codling moth, banana bunchy top and mosaic viruses**
 - **Potato cyst nematode, potato wart and apple scab**
- **Keeping in view biosafety concerns associated with growing of imported transgenic material-a containment Facility of Level - 4-established at NBPGR, New Delhi for quarantine processing**

Selected definitions related to plant quarantine

- **Bio-control agent**

- Any biological agent such as parasite, predator, parasitoid, microbial organism or self replicating entity-used for control of pests

- **Consignment**

- Quantity of seeds, plants and plant products or any regulated article consigned from one party to other at any one time shipment and covered by a phytosanitary certificate, bill of entry of customs, shipping/airway bill or invoice

- **Grain**

- Seeds intended for processing or consumption and not for sowing or propagation

- **Import**

- An act of bringing into any part or place of territory of Republic of India any kind of seed, plant or plant product and other regulated article from a place outside India either by sea, land, air or across any customs frontier

Selected definitions related to plant quarantine

- **Import permit**

- **An official document authorizing importation of a consignment in accordance with specified phytosanitary requirements**

- **Inspection Authority**

- **An authority specified in Part I of Schedule XI or an officer of Directorate of Plant Protection, Quarantine and Storage duly authorized by Plant Protection Adviser for the purpose of approval and certification of Post-Entry Quarantine facilities and inspection of growing plants in such facilities in accordance with the guidelines issued by the Plant Protection Adviser and for any specified purpose, an authority specified in Part II of the said Schedule**

- **Irradiation**

- **Treatment of food or agricultural products with any type of processing of ionized radiation such as gamma irradiation or micro-electron acceleration processing**

Plant quarantine facilities in India

- **Issuing authority**

- An authority as envisaged under Schedule-IV of this order or duly notified by the Central Government from time to time either generally or specifically for issuance of import permit

- **Packing material**

- Any kind of material of plant origin used for packing of goods;

- **Pest**

- Any species, strain or biotype of plant, animal or pathogenic agent injurious to plants and plant products;

- **Pest risk analysis**

- Process of evaluating biological or other scientific and economic evidence to determine whether a pest should be regulated and strength of any phytosanitary measures to be taken against it

- **Phytosanitary certificate**

- Certificate issued in the model format prescribed under the International Plant Protection Convention of the Food & Agricultural Organization and issued by an authorized officer at the country of origin of consignment or re-export;

Plant quarantine facilities in India

- **Point of entry**

- Any sea port, airport, or land-border check-post or rail station, river port, foreign post office, courier terminal, container freight station or inland container depot notified as specified in Schedule-I or Schedule-II or Schedule-III as the case may be;

- **Post-entry quarantine**

- Growing of imported plants in confinement for a specified period of time in a glass house, screen house, poly house or any other facility, or isolated field or an off-shore island that is established in accordance with guidelines/standards and are duly approved and certified by an inspection authority notified under this order;

- **Quarantine pest**

- Pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled;

Plant quarantine facilities in India

- **Inspection at point of destination**
 - Necessary because many insect pest can discovered and their accidental introduction may be eliminated;
- **Inspection at the point of origin**
 - Materials are allowed to enter the state or country as the case may be, provided they bear a certificate issued by the plant quarantine officer that the material have been inspected and to be free from insect infestation or plant disease infection
- **Embargoes**
 - By this we mean the exclusion of all plant materials or commodities which are classed as hosts of the insects
- **Controlled introduction**
 - This consists of allowing the importation of a only very limited amount of material for propagating purposes, obtaining it from pest or disease free areas and from plants believed to be insect or disease free

General conditions for import grains, plants, plant products

- **No consignment of plants and plant products and other regulated articles shall be imported into India without a valid permit**
- **No categories of plant materials in respect of the plant species or variety mentioned in Schedule-IV shall be allowed to be imported into India from the countries mentioned against each in column (4) of the said Schedule**
- **Every application for a permit under this clause shall be made at least seven days in advance to the Issuing Authority**
- **Import of consignments of seeds of coarse cereals, pulses, oil seeds and fodder seeds and seeds/stock material of fruit plant species for propagation shall only be permitted based on the recommendations of EXIM Committee of Department of Agriculture & Cooperation,**

General conditions for import grains, plants, plant products

- **A fee of Rs.150/- shall be payable along with the application for the import of seeds, fruits and plants for consumption and Rs.300/- for application for the import of seeds and plants for sowing or planting**
- **The Issuing Authority issue permit in quadruplicate in form PQ 03 for import of plants and plant products for consumption and in form PQ 04 for import of seeds and plants for sowing or planting, if he is satisfied that the applicant meets all the necessary conditions.**

General conditions for import grains, plants, plant products

- **The import permit issued shall not be transferable and no amendments to the permit shall be issued.**
- **An orange and green colour tag shall be issued in form PQ 05 in the case of permits issued for import of seeds and plants for sowing or planting so as to facilitate the identification of consignments at the time of their arrival at the point of entry.**
- **No consignment of seed or grain shall be permitted to be imported with contamination of quarantine weeds,**
- **All the consignments of plants and plant products and other regulated articles shall be imported into India only through ports of entry as specified in Schedule-I and Inland Container Depots/Container Freight Stations and foreign post offices**

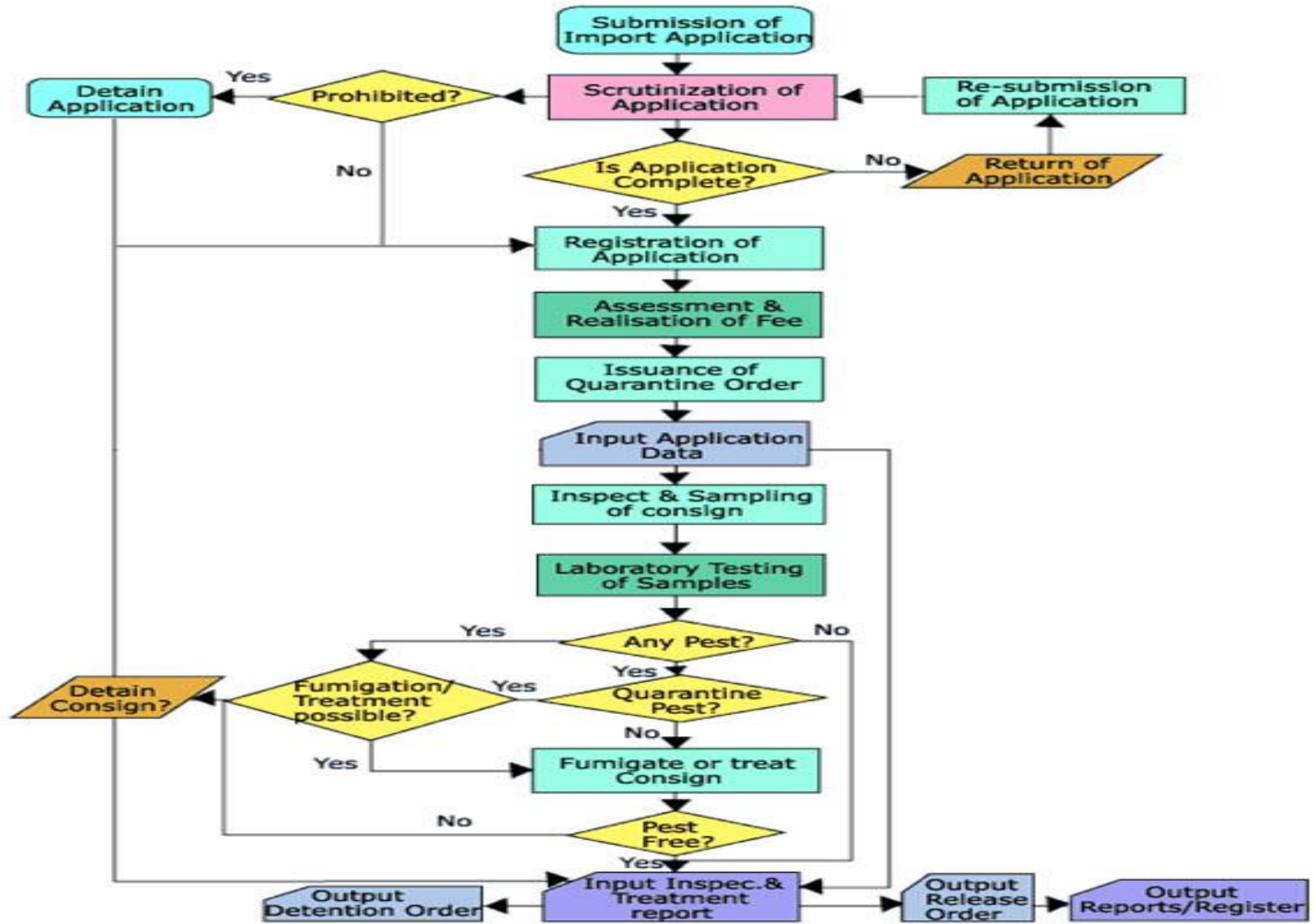
General conditions for import grains, plants, plant products

- **All consignments of seeds and plants for propagation and regulated articles such as live insects, microbial cultures, bio-control agents and soil shall only be imported into India through regional plant quarantine stations of Amritsar, Chennai, Kolkata, Mumbai or New Delhi or through any other points of entry as may be notified from time to time for this purpose, provided that no import of germplasm/transgenic plant material and genetically modified organisms shall be permitted through New Delhi Airport**
- **On arrival, at the first point of entry the consignment shall be inspected by the Plant Protection Adviser or any other officer duly authorized by him in this behalf and appropriate samples shall be drawn for laboratory testing, in accordance with the guidelines issued by Plant Protection Adviser from time to time.**
- **The Plant Protection Adviser or the officer authorized by him may, after inspection and laboratory testing, fumigation, irradiation, disinfection or disinfestation, as may be considered necessary by him, accord quarantine clearance for the entry of a consignment or grant provisional clearance for growing under post-entry quarantine**

General conditions for import grains, plants, plant products

- **Where fumigation or disinfestation or disinfection is considered necessary in respect of a consignment of plants, seeds and fruits the importer shall on his own and at his cost arrange for the fumigation, disinfection or disinfestation of the consignment, through an agency approved by the Plant Protection Adviser under the supervision of an officer duly authorized by the Plant Protection Adviser in that behalf**
- **“Provided that where irradiation is necessary in respect of any consignment of fresh fruits or vegetables or other plant products, the same shall be carried out by the importer at his own cost, at an irradiation facility, established as per the regulations of the “Atomic Energy Regulatory Board” and duly approved by the “Plant Protection Adviser” to the Government of India (PPA)**

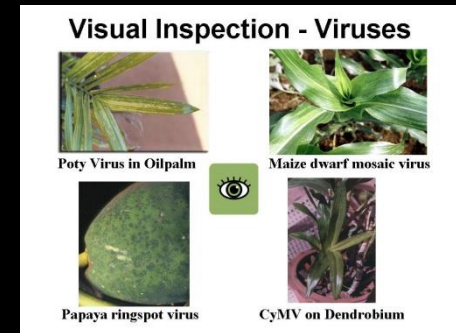
Import Inspection - Flowchart



Pest or pathogen detection techniques during quarantine

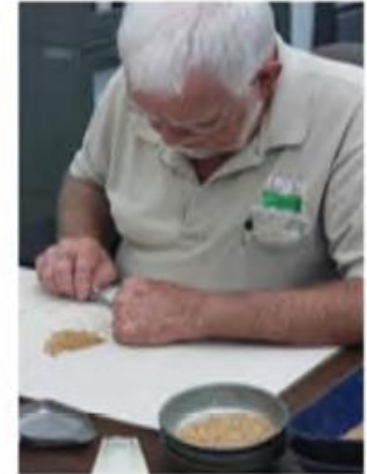
Generalized tests

- **Widely used method -inspection of dry seed with the naked eye or under the low power of microscope- method would reveal a wide range of free moving insects, their eggs and larval stages, mites on or with the seed, weeds, soil, infected/infested plant debris, fungal fructifications like sclerotia, smut and bunt balls, nematode galls, discoloured or deformed seeds mixed with seed; bacterial crusts, acervuli, pycnidia, sclerotia and even free spores of rusts, smuts and many other fungi on the seed surface**
- **Examination of dry seed under UV or NUV light-reveal infections of fungi and bacteria through emission of fluorescence of different colours**
- **Examination of seed washings may reveal surface contamination by rusts, smuts, downy mildews and a large number of other fungi**



Pest or pathogen detection techniques during quarantine

- **Incubation methods for the detection of fungi are the common moist blotter and agar tests wherein seeds are incubated on these media for a specific length of time (generally about a week) at a suitable temperature under alternating light and dark cycles. These two media reveal a wide range of internally seed-borne fungal and some bacterial pathogens in a wide variety of crops.**
- **Seedling symptom test and the grow out test- quite versatile and reveal the symptoms produced by any category of plant pathogens including fungi, bacteria and viruses.**
- **Grow out test-simplest of tests extensively used for the detection of viruses. However, some viruses may be carried symptomless in the plant and, therefore, it should be used in combination with other tests like indexing on indicator test plants and serology**

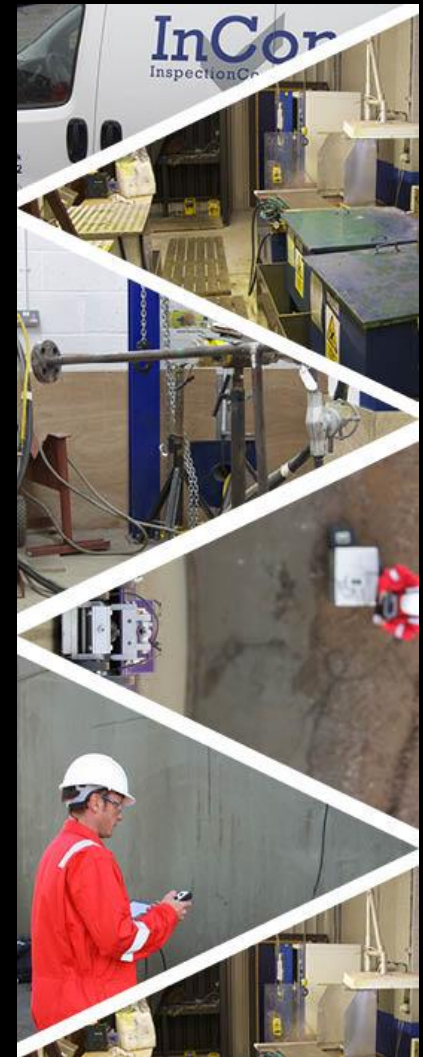


Pest or pathogen detection techniques during quarantine

Specialized tests

- **Insects**

- **X-ray radiography -used very successfully all over the world for the detection of hidden infestation (with no apparent sign of infestation on the seed surface) of insects-seed infesting bruchids**
- **Seed transparency test (boiling the seeds in lactophenol to make them transparent) may also be used for the detection of hidden infestation and extraction of insects for identification**
- **X-ray radiography-also very effective in salvaging infested seed lots**



Pest or pathogen detection techniques during quarantine

Specialized tests

• Nematodes

- For the detection of seed-borne nematodes, seeds are soaked in water for about 24 hours- makes nematodes active, which then come out of the seed into the water, or the seeds may be teased out with the help of forceps and a needle and examined for detection of nematodes under a stereo microscope
- In rooted plants, accompanying soil and plant debris may similarly be soaked in water and nematodes may be extracted for identification using nematological sieves or tissue paper



Pest or pathogen detection techniques during quarantine

Fungi, bacteria and viruses

- **Serological tests -very effective for the detection and identification of viruses and bacterial pathogens - being used in various plant quarantine stations with great success.**
- **Phage-plague technique-still more sensitive for bacterial pathogens as even strains of bacteria can be identified.**
- **Indicator test plants-very helpful as they may reveal pathogenic races within a species of a fungus, bacterium and specific strains within a virus.**
- **Modifications of generalized incubation tests (agar and blotter tests)-used for the detection of specific plant pathogens**
 - **Deep-freezing blotter test and 2,4-D blotter test-very efficient for detection of black-leg pathogen (*Phoma lingam*) in crucifer crops**
 - **Potato-dextrose- agar-useful for the detection of *Septoria nodorum* in wheat**
 - **PCNB agar- a selective medium for detection of *Fusarium* species in cereals.**

Pest or pathogen detection techniques during quarantine

- **In vegetative propagules, laboratory methods may suffice for the detection of insects and mites, nematodes, majority of fungi and certain bacteria. However, for the detection of systemic fungal pathogens, bacteria, viruses, viroids and MLOs, isolation growing for a season or a year or more in quarantine glass-houses/net-houses -required.**
- **Modern diagnostic tests like nucleic acid based methods (PCR, ITS-PCR, NESTED PCR, SCAR, RAPD and DNA MICROARRAY) and immunological methods (ELISA and Dipstick) - also used**



Salvage of infested or infected materials

- **Once a pest, pathogen or a weed -detected in introduced planting material, quarantine officials must make all efforts to disinfect/decontaminate material and make available for further exploitation in the country without undue delay**
- **Treatments, which only reduce the inoculum, may be acceptable for general agricultural practices, but they are not acceptable in plant quarantine**
- **For quarantine purposes- tolerances -zero and, no residual inoculum of exotic pests/pathogens remain.**

Fumigation

- **Fumigation of material under atmospheric or under reduced pressure -found acceptable as a quarantine treatment against insects and mites**
- **Fumigants like methyl bromide, HCN, phosphine and EDCT (ethylene dichloride + carbon tetrachloride mixture)-used**



Salvage of infested or infected materials



Heat treatment

- **Basic principle-treatment temperature - sufficiently high to kill associated pest/pathogen- but not the host**
- **Hot water treatment or hot air treatment -also used in quarantine for eradication of insects, mites, nematodes, fungi, bacteria and viruses**
Some recommended hot water treatments are:
 - ***Against nematodes:*** Flower bulbs, 44° C for 240 min; chrysanthemum, 48° C for 25 min; potato tubers, 45° C for 5 min
 - ***Against insects and mites:*** Narcissus bulbs, 44° C for 180 min; strawberry runners, 46° C for 10 min
 - ***Against viruses:*** Grape vine, 45° C for 120-180 min; sugarcane setts, 50° C for 120 min.; potato tubers, 50° C for 17 min
 - ***Against fungi:*** Celery seed, 50° C for 25 min; wheat seed, 52-54° C for 10 min
 - **Lambat *et al.* (1974) reported eradication of *Phoma betae* in sugarbeet seed by hot water treatment at 50° C for 30 min**

Salvage of infested or infected materials

Chemical treatments

- Chemicals -applied as dust, slurry, spray or as dip
- Ensure-dosage of chemical enough to eradicate inoculum but not kill host –chemical not be hazardous to personnel handling treated seed
- Treatment -given on arrival and only after ascertaining health status of the material
- Choice of chemical and dosage to be used -made depending upon the pest/pathogen involved
- Heavily treated seed- makes inspection difficult- denied entry
- Hot water seed treatment – also reported to eradicate certain bacterial pathogens like black-rot pathogen (*Xanthomonas campestris* pv. *campestris*) in crucifer seeds at 50° C for 30 min; bacterial blight of cluster bean (*X. campestris* pv. *cyamopsidis*) at 56° C for 10 min; and bacterial blight of sesame (*X. campestris* pv. *sesami*) at 52° C for 10 min.

Salvage of infested or infected materials

Tissue culture

- Reduces pest/pathogen introduction risk in two ways
 - Size of consignment is very much reduced since the introductions are represented by meristem tips, excised buds or embryos
 - Aseptic plantlet system -built-in pest/pathogen detection capability
- **All insects, mites, nematodes and most fungi-eliminated**
- Symptoms on young seedlings, and growth of organisms on agar medium, if any, may be visible through transparent culture tubes-could be discarded
- **Tissue culture in combination with thermotherapy and chemotherapy - an excellent safeguard from quarantine angle**
- However, pathogens like rusts, downy mildews, bacteria, viruses, viroids and MLOs, may still get transported- as an additional safeguard-tissue culture material could be passed through post-entry quarantine isolation growing and indexed/tested for suspected pathogens
- **Tissue culture technology provides-exciting prospect for large scale exchange of genetic stocks with very little pest/pathogen introduction risk**

Insect species of quarantine importance in India

- Lesser grain borer, *Prostephanus truncatus* on cereals
- Granary weevil, *Sitophilus granarius* on cereals
- Maize weevil, *Sitophilus zeamais* on maize
- Grain dermestid, *Trogoderma variable* on cereals
- Bean bruchids, *Acanthoscelides obtectus* on pulses
- Larger green chaffer beetle, *Anomala cupripes*, *A. pallida* on pulses
- Bruchid, *Bruchus lentis*, *Specularis impressithorax* on pulses
- Seed bruchid, *Status pruininus* on oil seed
- Dermestid beetle *Trogoderma versicolor* on oil seed
- Cocoa moth *Conopomorpha cremerella* on cocoa
- Tropical nut borer *Hypothenemus obscurus* on cocoa
- Coffee berry borer *Hypothenemus hampei* on coffee
- Chocolate moth *Ephestia elutella* on sheanut

Larger grain borer, *Prostephanus truncates*

- **Adult – typical cylindrical – many small tubercles over surface**



Quarantine Measures

- **Import of maize seeds – free from *P. truncates* – prior approval of DAC**
- **Import of maize grains – accompany with PSC**
- **Fumikgateb consignment with methyl bromide @ 32 gm/cu.m for 24 hrs at 28° C**



Granary weevil, *Sitophilus granarius*

- Characteristic rostrum and elbowed antennae
- Chestnut brown or reddish brown to shiny black in colour
- Adults do not have hind wings and cannot fly



Quarantine Measures

- Import of rice, wheat & barley seed for sowing – free from *S. granarius*
- Consignment of rice seed – soaked overnight & treated in hot water at 52°C for 10 min.
- Monitoring & tested by Director, NBPGR & Project Director, DRR
- Rice & Wheat – accompany with PSC containing information on fumigation with methyl bromide @ 32 gm/m³ for 24 hrs at 28°C



Maize weevil, *Sitophilus zeamais*

- **Blacker than *S. oryzae* – females with lateral lobes of the Y – shaped sclerite pointed**
- **Differentiated from *S. granarius* - presence of wings beneath the elytra**

Quarantine Measures

- **Import of maize seeds – free from *S. zeamais* – prior approval of DAC**
- **Import of maize grains – accompany with PSC**
- **Consignment -fumigated with methyl bromide @ 32 gm/cu.m for 24 hrs at 28^o C – treatment endorsed in PSC**



Grain dermestid, *Trogoderma variable*

- Resemble to *T. granarium* in shape and size
- Dorsal surface moderately clothed with fine hairs
- A median ocellus present between compound eyes



Quarantine Measures

- Import oat grains for consumption from Australia – accompany with PSC – free from insect
- Special condition – consignment fumigated with methyl bromide @ 80 gm/m³ for 48 h at 21°C
- Treatment duly approved by the Plant Protection Adviser to the Government of India & treatment endorsed in PSC



Bean bruchid, *Acanthoscelides obtectus*

- Grey brown and reddish brown body colour
- Each hind femur has inner ventral ridge near the apex
- Large tooth followed by two or three smaller sharp teeth



Quarantine Measures

- Import beans for consumption – accompany with PSC – free from insect
- Special condition – consignment fumigated with methyl bromide @ 32 gm/cm³ for 24 h at 28°C - treatment endorsed in PSC



Tropical nut borer, *Hypothenemus obscurus*

- Colour of female light immediately after emergence – darkens within a day to very dark - brown
- Males – half the size of the females & very rare



Quarantine Measures

- Import cocoa beans for processing / industrial – accompany with PSC – free from insect
- Consignment is fumigated with methyl bromide @ 16 m³ for 24 hrs at 21°C – treatment shall be endorsed in PSC



Coffee berry borer, *Hypothenemus hampei*

- Males apterous, stunted & deformed
- Antennal funicle usually 5 segmented
- Pronotum with fine – raised basal & posterolateral marginal bead



Quarantine Measures

- Import beans (seeds) / berries (freshly harvested) / grafts / bud wood / seedlings / rooted cuttings of coffee – prohibited from Africa & South America
- Beans (seeds) / berries (freshly harvested coffee) – post entry quarantine for one year period – tested by Director, Central Coffee Research Institute



Chocolate moth, *Ephestia elutella*

- Head & thorax – greyish brown with abdomen usually paler
- Forewing greyish brown, variably suffused with darker brown
- Postmedian & antemedian fascias are dark greyish brown – postmedian fascia double with a pale line dividing



Quarantine Measures

- Import cocoa beans for processing / industrial – accompany with PSC – free from insect
- Consignment -fumigated with methyl bromide @ 16 m³ for 24 hrs at 21°C – treatment and endorsed in PSC





Plant quarantine information system

- **Recent development in plant quarantine of India**
- **Objective -to provide an efficient and effective service, which fully satisfies customers, such as importers, exporters, individuals and the Government**
- **Facilitates Importers to apply online (<http://www.plantquarantineindia.nic.in>) for Import Permit, Import Release Order and Exporters to apply online for Phyto-sanitary Certificate**
- **Exporters and Importers -can view status of their application online and access history of application during entire life cycle of application-help in brining transparency in functioning**
- **Automation of background workflow processes- result in speedy processing of applications saving time and workload**
- **Availability of searchable information from related documents of Import (Plant Quarantine Order) and Exports (Export inspection and certification procedure) –made reference to these documents easy for Importers and Exporters**

Conclusion

- **Plant quarantine regulations by government of different countries - peculiar mixture of activities**
- **Primary function- advisory and regulatory, reaching to the problems of the clients**
- **Plant quarantine -effective only against such pests which have no natural means of transport**
- **Success of plant quarantine measure depends on proper composition of State service for plant quarantine, scientific background and quantification of insects and specialists, availability of technical equipment and quarantine statics and laboratories**
- **Quarantine measures can be successfully applied with knowledge of habits and biology of pests**
- **Plant quarantine-not a 100 per cent control. The old saying "Prevention is better than cure" also applies here**
- **Better quarantine programs -to be developed and coordinated at the international level-International cooperation and strengthening of regional organization- paramount importance in attaining the objectives of plant quarantine without risking environmental safety and ecological balance**

Phytosanitary Certificate

No. _____

From
Plant Protection Organisation of _____

To:
Plant Protection organisation(s) of _____

Description of Consignment

Name and address of exporter

Declared name and address of consignee

Number and description of packages

Distinguishing marks

Place of Origin

Declared means of conveyance

Declared point of entry

Name of produce and quantity declared

Botanical name of plants

This is to certify that the plants or plant products described above have been inspected according to appropriate procedures and are considered to be free from quarantine pests and practically free from the injurious pests and that they are considered to conform to the current phytosanitary regulations at the importing country

Desinfestation and/ or Disinfection Treatment

Date _____

Temperature: _____

Duration: _____

Chemical (active ingredient) _____ concentration

Treatment _____

Additional information: _____

Additional declarations:

Place of issue:

Stamp of Organization

Name & Signature of authorized officer

Date of issue

THANK YOU