

POST ENTRY QUARANTINE FOR IMPORTED PLANTING MATERIALS

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The purpose of post entry quarantine isolation growing of imported planting materials is to isolate these from the existing indigenous plants that may be susceptible to exotic pests and pathogens. It is also to detect any disease which may be present in the plant but not evident at the time of entry or can not be detected in the laboratory. Seed samples, found to be heavily treated with chemicals, that can not be tested in the laboratory and those which are known to harbour pathogens like downy mildews, smuts and crops particularly leguminous which are known to carry high risk viruses, are grown in post entry quarantine nurseries/insect-proof net houses or glass houses. Ultimately only healthy progeny is released to the indentors/importers. The importers/indentors should understand the basic philosophy of the post-entry isolation growing of materials. These are held in quarantine until the quarantine personnel are fully satisfied that material in question is free from exotic pests/diseases. Basic minimum post-entry quarantine facilities are still now lacking in India. These require proper linkage between private seed growers, research organizations and agricultural universities to bring them to a satisfactory level.

Key words : Plant species, quarantine, pests / diseases

Exchange of planting material has undoubtedly helped many countries both in the conservation of genetic resources and development of high yielding varieties of food grain and other crops. This obviously has given scope to the introduction of dangerous pests/pathogens from one corner to another part of the world. There are numerous examples of introduction of potential diseases/pests/weeds in different countries that resulted in heavy losses to concerned crops. The well known Irish potato famine of 1845, is believed to be due to introduction of late blight pathogen (*Phytophthora infestans*) with potato tubers from North America into Europe. Phylloxera and the downy mildew (*Plasmopara viticola*) of grapes alongwith nursery stock from USA into France, resulted in total collapse of the wine industry in that country. The Colorado potato beetle (*Leptinotarsa decemlineata*), a native of USA, is a serious menace to potato cultivation all over Europe, the mediterranean fruitfly (*Ceratitis*

capitata). introduced from Mexico into Florida in 1929. In India, late blight of potato from Europe in 1883, downy mildew of grape (*Plasmopara viticola*) from Europe in 1910, downy mildew of maize (*Sclerospora philippinensis*) from Java in 1912, bunchy top of banana from Sri Lanka in 1940, wart of potato (*Synchytrium endobioticum*) from Holland in 1952, bacterial leaf blight (*Xanthomonas oryzae*) of rice from South East Asian countries in 1960, resulting in devastating damage to their respective host plants.

When plants/seeds are introduced through Government channels, then the responsibility of the quarantine officials is to ensure and to screen the material in question and to see that it is free from exotic pests/pathogens from quarantine angle. In majority of the cases the laboratory examination is sufficient for the imported planting material and can be handed over to the indentors without any quarantine risk. But certain type of seed and planting material and also vegetative propagules (like rooted plants, cuttings, bulbs, rhizomes, suckers, tuber etc.) may carry number of pests and pathogens like viruses, mycoplasmas, certain bacteria, downy mildews, nematodes etc. These are not easily detectable during routine laboratory examination. The behaviour of such pests/pathogens are often unpredictable under different agro-climatic conditions of the importing country/countries, which may be congenial for their establishment and spread. Hence, the vigilance against the introduction of such pests/pathogens can not be reduced. So, it is necessary to grow them in post- entry quarantine (PEQ) nurseries, screen or glass houses depending on the risk involved.

BASIC QUARANTINE REQUIREMENTS

It is therefore essential that each country should be familiar with her own important pests/diseases and provide reliable surveys of the pests known in their territory. Another aspect is to make lists of foreign pests/diseases, their occurrence, distribution, host range and mode of spread that may be regarded as potentially dangerous to important crops of each country, should be established. A list of major pests/pathogens of quarantine importance to India is listed in Table 1.

With regard to quarantine precautions, it is necessary to categorise pests/pathogens countrywise. Then only the quarantine officials will be in a position to justify the exclusion of an exotic pest/pathogen on the basis of scientific information. True quarantine objects are: a) pests/pathogens not present in the area to be protected by quarantine precautions, (b) pests/pathogens dangerous by their direct pathogenic potential, and (c) pests/pathogens dangerous because of their epidemic potential.

Table 1. Major pests of Quarantine importance to India against which precautions to be taken to prevent introduction

Scientific name	Common name	Host range	Geographic distribution
(A) INSECTS AND MITE			
<i>Anthonomus grandis</i>	Cottonboll weevil	Cotton hollyhock, okra, <i>Abutilon</i> <i>Thespesia papulnea</i> , <i>Thurberia</i> <i>thespesioides</i>	USA
<i>Ceratitis capitata</i>	Mediterranean fruitfly	Citrus, coffee, cocoa, ficus, guava, <i>Prunus</i> , <i>Solanum</i>	Africa Australia (SW), Berumuda, Hawaii, S.Europe, USA
<i>Leptinotarsa decemlineata</i>	Colorado potato beetle	Belladonna, groundcherry, eggplant, potato, tomato, tobacco, pepper	Europe, USA
<i>Prophantis smaragdina</i> (= <i>Hypothenemus hampei</i>)	Coffee berry borer	Coffee, woody Rubiaceae	Africa, Colombia, Mexico
<i>Brevipalpus lewisi</i>	Citrus flat mite	Citrus, grape pomegranate, walnut	Australia, Bulgaria, Egypt, Japan, Lebanon, USA
<i>Ditylenchus dipsaci</i>	Stem & bulb nematode	Garlic, braodbean, flower bulbs, onion	Most temperate regions of the world: Australia, Europe, Japan S. Africa, N&S USA, USSR
<i>Globodera tabacum</i> <i>G.solanacearum</i>	Tobacco cyst nematode	Tobacco & other solanaceous plants	USA
<i>Heterodera schachtii</i>	Sugarbeet cyst nematode	beet Cruciferous plants & chenopodiaceae	Africa, Australia, Europe, Isreal, 40 North & South USA
<i>Rhadinaphelenchus cocophilus</i>	Coconut palm nematode	Cocount, datepalm oilpalm	Brazil, Costa Rica, Carribean Islands, Mexico, Tobago, Trinidad, W. Indies

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(C) FUNGI, BACTERIA, VIRUS AND VIRUS LIKE ORGANISMS

<i>Fusarium nivale</i>	Snow mould/bown foot rot	Wheat, Barley, Rye	Australia, Europe, Japan, Canada, Newzealand, NE & NW USA, USSR
<i>Peronospora manshurica</i>	Downy mildew	Soybean	Asia, Africa, N&S America, Europe
<i>P. tabacina</i>	Blue mould/downey mildew	Tobacco	Africa, America, Australia, Asia/Iran, Iraq, Burma, Europe
<i>Tilletia contraversa</i>	Dwarf bunt	Wheat	Africa, Asia, N&S America, Europe
(ii) Bacteria			
<i>Corynebacterium flaccumfaciens</i> pv. <i>flaccumfaciens</i>	Bacterial wilt	Bean soybean	Australia, Europe (Bulgaria, Yugoslavia) N & Central America
<i>Erwinia stewartii</i>	Bacterial wilt/stewart's wilt	Maize	Asia, Europe, N&S America
<i>Pseudomonas syringae</i> pv. <i>astrofaciens</i>	Spikelet rot	Wheat	Australia, Europe, New Zealand, South Africa, North America
(iii) Viruses and virus like organism			
Fiji disease virus		Sugarcane	Australia, Fiji, Madagascar & Thailand
Swollen shoot virus		Cacao	Malaysia, Srilanka, West Africa
Lethal yellowing (MLO)		Cocounut	Bathamas, Cuba, Dominican Republic, Jamaica, USA

Adopted from : (a) Insects: Lal and Kapur, 1992, (b) Nematode: Lal and Mathur, 1987, (c) Fungi etc: Agarwal, Majumdar and Parakh, 1990.

PURPOSE OF POST ENTRY GROWING

As stated above, certain categories of seed and planting material which may harbour pests/pathogens, not easily detectable during routine laboratory examination require to be grown in isolation in post-entry quarantine. The purpose of growing of imported planting materials is to isolate these from

the existing indigenous plants that may be susceptible to exotic pests/pathogens. The detention period should be long enough to break the life cycle and the virulence of the exotic pests/pathogens. It is also to be noted that while growing imported material in isolation, one must be careful that no vector or alternate host is present in the vicinity. To prevent cross infection occurring between different imported materials in the PEQ areas/glasshouses, they must be grown at a safer distance or placed in separate benches/racks in the net/glass houses. The plants in quarantine must be examined regularly during the growing season of the crop for the presence of any disease, insect/pests or other abnormality.

The usual PEQ detention period is atleast for one growing season. The importers/indentors should understand the basic philosophy of the PEQ isolation growing of material. These are held in quarantine until the quarantine officials are fully satisfied that material in question is free from exotic pests/diseases, and that it will be ordered to be destroyed should any disease/pest may be present or suspected to be present that offers a quarantine risk.

Another problem connected with the quarantine examination of the imported material concerns the pre-export chemical seed dressing by some organizations/countries as a prophylactic measure. Such heavily chemical coated seed can hardly be recognized as to which plant it comes from. Furthermore, the external symptoms produced by the presence of pathogens or pests are completely masked. In fact, even in some cases soil clods (which may carry nematodes) and weed seeds when present in the seed consignment also receive chemical as well as dye coating for which they look very similar to the seed under import. In such cases routine examination in the laboratory is not possible, hence require to be grown in PEQ nurseries/insect-proof net houses or glass houses. Some of the pathogens detected from imported treated seeds are listed in Table 2.

Table 2. Pathogens detected from imported seed, that were given pre-exported treatment, after washing with acetone and incubated*

Seed	Origin	Pre-export treatment	Pathogens detected
Maize	Pakistan	Vitavax	<i>Drechsleras maydis</i>
	USA	NS	<i>Drechslera maydis</i>
Sorghum	USA	NS	<i>Drechslera maydis</i>
Soybean	USA	NS	<i>Colletotrichum dematium</i> , <i>Phomopsis phaseolorum</i> , <i>Cercospora kikuchii</i> <i>Verticillium</i> spp.
Barley	Canada	NS	<i>Drechslera sorokiniana</i>

NS - Not specified

* Experiment conducted at Plant Quarantine Division of N.B.P.G.R., Pusa Campus, New Delhi - 110 012

POST ENTRY QUARANTINE SYSTEM IN INDIA

Three types of materials are being imported into India:

- (i) bulk consignments of grains/pulses for consumption,
- (ii) bulk consignments of seeds/planting material for farmers/commercial growers, and
- (iii) germplasm materials for research purpose

Directorate of Plant Protection, Government of India has the responsibility of quarantine clearance of the first-two categories. National Bureau of Plant Genetic Resources has been entrusted for quarantine processing of germplasm materials.

(a) Directorate of Plant Protection

To provide the best planting material to the Indian farmers available in the world and to increase the agricultural productivity, farm income and export earnings, the Government of India liberalised the import of seed/plant material by announcing "New Policy on Seed Development (NPSD) with effect from October, 1988. (Ministry of Agriculture, 1988). The pre and post entry quarantine requirements and inspection parameters of the imported planting materials have been specified in the NPSD. All the imported plants/seeds are required to plant quarantine screening at the port of entry. There are 26 plant quarantine stations in India. Out of these 5 stations viz., Amritsar, Bombay, Calcutta, Madras and New Delhi have been identified under NPSD for import of seed and planting materials. In case of cuttings, saplings, budwoods etc. of flowers and fruits, PEQ is essential. PEQ facilities as prescribed by PPA (Plant Protection Adviser, Government of India) has to be established by the eligible categories of importers (under OGL). Such facility has to be certified by either PPA or by DIA's (Designed Inspection Agency of AAU's) authorized by PPA.

The DIA's certificate indicating that the importer has established the prescribed PEQ facilities then only the imported material is given quarantine clearance by PPA. The period for which the cuttings, saplings, budwoods etc. to be grown in such a facility (PEQ) is prescribed in the import permit issued by the PPA. If PEQ grown material reveal any exotic pest or disease the material in question is destroyed immediately by DIA's under intimation to PPA.

(b) National Bureau of Plant Genetic Resources

NBPGR handles quarantine examination of material for research purposes. After laboratory examination, certain materials specially legumes are grown

in PEQ net/glass houses for the detection of exotic viruses or mycoplasmas. Chemically treated germplasm of wheat, barley and triticale mainly for loose and false smut and soybean against downy mildew are grown in PEQ isolation nurseries. In all the above cases only healthy material is released to the indentors. Germplasm material like potato, sugarcane, tuber crops, plantation crops after initial laboratory examination at NBPGR are forwarded to the respective crop based institute for PEQ growing under the supervision of crop protection scientists. Though some facilities are existing in these institutes, these are to be strengthened in view of the volume of material they handle in PEQ. It is a fact, that quarantine organization of any country cannot fulfill the total requirement of PEQ facilities needed for all material. Therefore, the practical and appropriate approach for our country will be to have a proper linkages between the private importers, research institutes, agricultural universities along with NBPGR. They must share responsibilities to provide basic facilities necessary for PEQ growing of imported material. So that, much needed germplasms and elite materials could be made available to the user scientists/institutes/indentors with proper quarantine safeguard.

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