

INTRODUCTION OF GERMPLASM AND PLANT QUARANTINE PROCEDURES

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ICRISAT'S Plant Quarantine System for Germplasm Exchange

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ABSTRACT

The plant quarantine procedures and techniques adopted by ICRISAT for the exchange of seeds of sorghum, pearl millet, pigeonpea, chickpea, and groundnut are described. For the imported germplasm, the procedures include an intermediate quarantine for groundnut cuttings, fumigation, visual and microscopic examination, seed treatment, testing groundnut seeds by enzyme-linked immunosorbent assay (ELISA), and finally growing the seeds in postentry quarantine isolation area (PEQLA) before release to scientists. Similarly, to export the germplasm, regular inspection of crop by scientists during the growing season, collection of healthy seeds followed by fumigation, visual examination and conducting the ELISA test for groundnut are the essential prerequisites before the germplasm is presented to national plant quarantine authorities for issuance of the phytosanitary certificate. During the last 14 years, a total of 152,678 samples of seed or vegetative material of ICRISAT mandate crops were imported from 8 countries, and 701,547 samples exported to 143 countries through the national plant quarantine authorities.

To improve the efficiency of the plant quarantine system in future, the strategies proposed to be explored include (a) use of serological techniques for detecting seedborne viruses, (b) adoption of new disease indexing techniques, and (c) updating information on treatment schedules, procedures, and compilation of information on pests, diseases, and weeds. Plant quarantine importance with relevance to ICRISAT's mandate crop

INTRODUCTION

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a nonprofit, scientific, research and training institute receiving support from donors through the Consultative Group on International Agricultural Research (CGIAR). The Institute was established by CGIAR in 1972 at Patancheru, near Hyderabad, Andhra Pradesh, India. Its mandate includes the collection, evaluation, maintenance, utilization, and distribution of sorghum, pearl millet, pigeonpea, chickpea and groundnut germplasm.

As per the memorandum of understanding between the Government of India (GOI) and ICRISAT, unrestricted movement of seeds of five mandate crops into and out of India is permitted after observing the national plant quarantine regulations. Further, GOI recognized ICRISAT Plant Quarantine



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Quarantine Unit as an Export Certification Laboratory to work under its close supervision. It authorized the Director of Central Plant Protection Training Institute (CPPTI) located at Rajendranagar, Hyderabad, to act as the Quarantine Authority to clear ICRISAT's seed material of its mandate crops, and the Director, National Bureau of Plant Genetic Resources (NBPGR), New Delhi, for crops that do not form part of ICRISAT's mandate (such as minor millets). In 1975, GOI constituted a committee to review and revise the quarantine arrangements for ICRISAT germplasm to facilitate smooth clearance of germplasm as well as to check introduction of exotic pests/diseases of quarantine importance. In July 1986, GOI authorized the Regional Plant Quarantine Station of NBPGR at Rajendranagar, Hyderabad, as the sole plant quarantine authority, to clear ICRISAT's mandate crops as well. It also instructed the Indian Customs authorities to ensure unrestricted movement of those seeds from the port of entry to NBPGR.

NATIONAL QUARANTINE REGULATIONS

In India, at present, two categories of legislative measures are in operation to control pests, diseases and weeds. They are (a) legislative measures through The Destructive Insects and Pests Act, 1914 (II of 1914), and (b) legislative measures through State Agricultural Pests and Diseases Act.

Under the first category of regulatory measures, GOI took legislative steps as far back as 1914 to prevent entry of pests and diseases into India. The Act was passed by the Governor General of India in Council on 3 Feb 1914 wherein rules governing the import and movement of plants and plant materials, insects, and fungi are framed (3). The second category of the regulatory control deals with the necessary legislation for the control of potentially dangerous and destructive pests, diseases, and obnoxious weeds in India.

The present paper highlights the regulations and quarantine procedures that are followed by ICRISAT for safe exchange of germplasm and the reliability of the present system in minimizing the risk of the introduction of exotic pests/pathogens and weeds.

PLANT QUARANTINE PROCEDURES FOR IMPORTED GERmplasm

All the germplasm material meant for ICRISAT received at NBPGR from other countries, are accompanied by a phytosanitary certificate in the form prescribed by the FAO/International Plant Protection Convention 1951 (also called the 'Rome Certificate'). The seeds of sorghum, pigeonpea, and chickpea are fumigated under vacuum at a pressure of 125mm of mercury, with a methyl bromide dosage of 32gm^{-3} for 4hr; millet and groundnut are fumigated at normal atmospheric pressure with aluminium phosphide dosage of 3gm^{-3} for five days (11).

After fumigation the seeds are subjected to the gravity method to detect exotic nematodes, and visually examined to discard weed seeds, soil clumps, stones, broken/damaged seed, and other impurities. In case of sorghum and pearl millet, the hidden infestation by insects is detected by Ashman Sniffing Detector and for bruchid infestation in pigeonpea and chickpea the seeds are subjected to radiography.

DETECTION OF FUNGAL AND BACTERIAL PATHOGENS

To detect bacteria and fungi on the surface of the seeds, the following procedures and techniques are adopted:

- use of a magnifying glass to separate moldy seeds, smut sori and sclerotia;
- washing/sedimentation methods to isolate fungal spores;
- blotter test, which consists of placing seeds on moist filter paper and keeping those in an incubation chamber for seven days at 25 °C with 12 hr light and dark cycle, to detect seedborne fungi, and
- the use of petri dishes with agar media for detection of specific fungi like *Ascochyta* sp.

DETECTION OF GROUNDNUT VIRUSES

The groundnut seeds are grown for six weeks in an insect-proof screen house and kept under observation for expression of virus disease (peanut mottle, peanut stunt, marginal chlorosis, peanut stripe, and ring spot) symptoms. Plants showing virus-like symptoms are detained and only seedlings looking healthy are released for growing in post-entry quarantine isolation area (PEQIA) at ICRISAT Center. For the last two years, groundnut germplasm lines imported into India are also being tested by enzyme-linked immunosorbent assay (ELISA) technique on dry seed, followed by grow-out and infectivity tests. This procedure is found to be quite satisfactory in tackling peanut mottle virus in this crop (12).

ADDITIONAL REQUIREMENTS FOR IMPORT IN RESPECT OF ICRISAT CROPS

As per the national plant quarantine regulations, specific additional declarations are required to be mentioned in the phytosanitary certificate as a safeguard against specific pests and diseases whose introduction can be considered as high risk to the crops in India. The requirements are as follows:

Sorghum. Seed samples should be certified as collected from fields that were regularly inspected during active-growing season and were found to be free from infection of bacterial leaf stripe (*Pseudomonas andropogonis*) and bacterial leaf streak (*Xanthomonas campestris* pv. *holcicola*). Further, the seeds must be free from southern leaf blight (*Drechslera maydis*).

Pearl millet. Seeds should be certified as collected from crops free from infection of downy mildew (*Sclerotheca graminicola*).

