

Usually, liquid or slurry treatment, which is less hazardous for the operator, is preferred to dust treatment. Liquid or slurry treatment gives a better coverage of the seeds, and the required dosage can be applied more precisely. At ICARDA a simple machine suitable for the application of liquid and slurry is being used. Seed samples of 20 g to 4 kg can be treated. The machine consists of a stainless steel bowl that comes in three sizes, a motor that ensures even mixing, a container with an automatic dosage pipette for the treatment chemicals, and a frame. This piece of equipment is commercially available from Messrs. Hege, Hohebuch, 7112 Waldenburg, West Germany.

The normal slurry treatment, although superior to dust treatment, may not be suitable for the eradication of some pathogens. At ICARDA it was found that soaking the seeds in fungicide or antibiotic solution is more effective than conventional treatment. Soaking pea seeds for one hour in a 500 ppm streptomycin solution is very effective in controlling *Pseudomonas syringae* pv. *pisi* (Diekmann, 1984). The seeds must be redried carefully in order to maintain seed viability. This procedure, although time-consuming, is currently being used to free valuable germplasm from *Pseudomonas syringae* pv. *pisi* before dispatch to countries where this pathogen is considered a quarantine object.

### Conclusion

The exchange of genetic material is necessary for crop improvement. However, it entails the risk of spreading pests and pathogens or their races to unaffected areas. This risk can be minimized by applying seed health measures, such as (1) field inspection for pathogens or pests that are seed-transmitted, (2) laboratory seed health testing, and (3) seed treatment. A combination of these measures would effectively reduce the risk of pathogen dissemination. It should be acknowledged that there cannot be a 100% safety against the introduction of pathogens. In order to further control the spread of pests and pathogens with germplasm, increased cooperation between quarantine services and suppliers of germplasm is desirable. Lists of seed-borne pests and pathogens in any particular country should be available for use by quarantine services. The use of a Plant Germplasm Health Certificate as suggested by the FAO/IBPGR Task Force on safe germplasm transfer (Hewitt and Chiarappa, 1977) would provide additional information on the results of tests and on any other measures, e.g. field inspections or multiplication by meristem culture, which have been conducted in the country of origin.

The risk of introducing pests and pathogens or their races must be seriously considered along with the benefit of broadening the genetic base of crop plants. For the assessment of this risk it should be realized that mere dissemination of a pathogen does not necessarily mean transmission of a disease. An outbreak of a disease requires successful infection, which depends largely on favourable environmental conditions. Since the environmental conditions in recipient countries are not always known, ICARDA has adopted reasonable and effective precautionary measures to ensure that pathogen-tested germplasm is distributed from, and accepted at its research station.

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1304

## Germplasm Exchange and Plant Quarantine Systems at ICRISAT

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### Introduction

The germplasm is considered as a part of human biological heritage without whose free exchange and availability, present day farm productivity would not have been possible (Jain, 1982). Therefore, collection, evaluation, utilization, conservation and exchange of genetic resources assume considerable significance, especially in view of the rapid degradation and exploitation of the available biodiversity all over the world (Mehra and Arora, 1982; Mengesha, 1984; Paroda and Arora, 1986; Paroda, 1989). Considerable efforts are being made worldwide to conserve the genetic resources of important crop plants. Free exchange of diverse germplasm is essential. Genetic manipulation is advancing at a fast pace and the progress may even be more accelerated by the application of genetic engineering techniques in the future (Law, 1986).

The role played by the Consultative Group on International Agricultural Research (CGIAR) in the collection and conservation of germplasm is commendable. Through the catalytic role and direction action of the International Board for Plant Genetic Resources (IBPGR), endangered germplasm of many crops has been collected and conserved in many gene banks (IBPGR, 1990). The International Agricultural Research Centers (IARCs) strategically located in regions of rich crop diversity are in a unique position to collect, conserve, and evaluate germplasm and make it readily available to all scientists throughout the world. Several national programmes have also made substantial efforts to collect and conserve their indigenous plant genetic resources. Although enormous genetic wealth is being preserved by national, regional, and international organizations, its potential and usefulness largely depends on its health, viability, and free exchange among the users of the material.

In India, the National Bureau of Plant Genetic Resources (NBPGR) is the primary organization which is responsible, *inter alia*, for the exchange of germplasm of agri-horticultural crops between India and other countries (Joshi *et al.*, 1989). NBPGR maintains exchange links with about 70 countries including IARCs.

In the area of genetic resources, ICRISAT's mandate crops include: sorghum (*Sorghum bicolor*), pearl millet (*Pennisetum glaucum*), pigeonpea (*Cajanus cajan*), chickpea (*Cicer arietinum*), groundnut (*Arachis hypogaea*) along with six minor millets: finger millet (*Eleusine coracana*), foxtail millet (*Setaria italica*), proso millet (*Panicum miliaceum*), little millet (*Panicum sumatrense*), barnyard millet (*Echinochloa crusgalli*), and kodo millet (*Paspalum scrobiculatum*).

The major activities of ICRISAT's Genetic Resources Unit are to:

- i) collect, assemble, and conserve the germplasm of its mandate crops and their wild relatives;
- ii) characterize, evaluate, and document the germplasm;
- iii) maintain and rejuvenate the germplasm without altering the original genotype or population; and
- iv) distribute and exchange healthy germplasm for present and future utilization.

The numbers of germplasm accessions assembled by ICRISAT from various countries and samples distributed to 147 countries are summarized in Table 1. For each of the ICRISAT mandate crops, these accessions represent the largest collection of germplasm assembled at any one place. However, considering the extent of the area devoted to these crops worldwide, the present collections are still too small.

Table 1. Details of germplasm assembly and distribution from Genetic Resources Unit, ICRISAT

Crop	Assembly		Distribution			
	Accessions	No. of Countries	ICRISAT*	India	Abroad	No. of Countries
Sorghum	31 817	87	215 649	86 396	108 855	93
Pearl millet	21 772	44	24 827	44 852	29 540	69
Pigeonpea	11 482	54	57 058	30 011	12 929	97
Chickpea	15 941	42	98 358	41 202	45 765	76
Groundnut	12 712	89	39 890	30 616	25 693	83
Minor millets	6 610	24	-	17 901	12 294	33
Total	100 334		435 782	250 978	235 076	

\* For use in ICRISAT crop improvement programme

ICRISAT is serving as a world depository of genetic resources of its mandate crops. Several thousand accessions of the mandate crops including the six minor millets are conserved in medium-term (+4°C and about 20% relative humidity) cold

storage facilities for exchange purposes (Mengesha, 1984). About 500 g seed of each accession is dried to about 5-8% moisture content before it is stored. The type of storage chambers used at ICRISAT and the general standards and system of germplasm technology and conservation have been described elsewhere (Mengesha *et al.*, 1989). Long-term cold storage (-20°C) chambers have also been installed and are now operational as a part of ICRISAT gene bank. Germination tests conducted in September 1990 on conserved seeds showed over 92% viability after nine years of storage. All the seeds are rejuvenated before their germination drops below 85%, or before the seed quantity reaches a critical low level.

So far 100,334 accessions of various ICRISAT crops are being conserved (Mengesha, 1988). A small portion of the conserved germplasm has so far been effectively utilized in various plant breeding programmes especially as donors of certain desirable traits like resistance to biotic and abiotic stress factors. Much broader application and impacts are envisaged with the realization and imaginative manipulation of the yet unknown and potentially useful genetic traits of the majority of the conserved and introduced germplasm.

#### **Role of quarantine in exchange of germplasm at ICRISAT**

The success of international germplasm exchange and utilization largely depends on its timely transfer and ease of mobility. Unfortunately, however, there are many hurdles that a germplasm sample has to pass through before it can reach its destination. From the plant quarantine point of view, it is true that there is some risk in the transfer of unchecked germplasm from one region to another (Kahn, 1977). Likewise, it may be stated that the aim of germplasm collection and exchange is to conserve and introduce useful germplasm without endangering the new habitat. Therefore, there is something in common between quarantine and genetic resources - both are necessary and useful.

While exchanging germplasm for utilization in crop improvement programmes, the samples have to pass through the National Plant Quarantine system which ensures that only healthy seeds are exported. A safe and rapid transfer of germplasm is vital for a sound crop improvement programme. A great many exotic crops are flourishing in many areas of the world as a result of international transfer and exchange of germplasm. Import of small, experimental quantities of seeds with appropriate safeguards based on sound biological principles can often be an answer to improve the genetic base of crops. Much larger quantities of commercial seed often enter a country with even greater quarantine risk but often with minimal or cursory inspection. Yet, germplasm is the basic raw material for future development of commercial seed and to overimpose undue restrictions on its movement appears to be counter-productive.

#### **Quarantine system in India**

In India, the import and export of plants and plant materials are regulated by the rules and regulations framed under Destructive Insects and Pests (DIP) Act of 1914. Subsequently the Act was revised eight times by the Government of India (GOI). The main objective of the Act is to prevent the introduction into, and the transport from one state to another within India of any insect, fungus, and other pest which is or may be destructive to crops (DPPQS, 1976; Joshi, 1975; Joshi *et al.*, 1989).

Originally, all seeds were not included in the DIP Act. Later in 1984 GOI passed the Plants, Fruits, and Seeds Order, which came into effect in 1985. Under this order 17 crops are included, and the conditions for their import are stipulated. The main features of this order are as follows:

1. To bring seed under the purview of DIP Act.
2. To regulate importation of seeds only through valid import permit issued either by the Plant Protection Adviser to the GOI or by the Director, NBPGR, in respect of import of seed and plant material for research purpose made by any institute of the Indian Council of Agricultural Research, Agricultural Universities, and ICRISAT (DPAC, 1985; DPAC, 1987; NBPGR, 1987).
3. To permit entry of seed consignments only if they are accompanied by an official phytosanitary certificate (PSC) issued by the quarantine authority of the exporting country.
4. Stipulating post-entry isolation growing of specified crops at the approved locations.
5. No consignment wherein hay or straw or any material of plant origin used for packing shall be imported.
6. Import of soil earth, compost, sand, plant debris, etc. along with plants, seeds shall not be permitted. The NBPGR is now the authorized agency in India that controls, serves, and regulates the plant quarantine requirements of ICRISAT.

#### **Quarantine system at ICRISAT**

GOI has authorized ICRISAT unrestricted movement of seeds and genetic material of its mandate crops into and out of India as required for collaborative work in any part of the world consistent with the appropriate quarantine regulations prevailing in the country.

GOI took a number of steps to facilitate smooth clearance of germplasm as well as to check introduction of exotic pests or diseases of quarantine importance. In 1973, it declared the Central Plant Protection Training Institute (CPPTI), Rajendranagar, Hyderabad, as the quarantine authority to clear ICRISAT's seed material of its mandate crops. In 1978, ICRISAT was permitted to set up an Export

Certification Quarantine Laboratory at its campus under the overall authority of CPPTI. Recently in 1986, the GOI authorized NBPGR as the sole plant quarantine authority to clear ICRISAT's mandate crops as well (NBPGR, 1986). NBPGR has set up a Regional Station at Hyderabad, which carries out the quarantine clearance for ICRISAT material. Excellent collaboration exists between ICRISAT and NBPGR.

Table 2. Seed treatment schedules for quarantine clearance of ICRISAT mandate crops.

Crop	Treatment	Remarks (if any)
Sorghum	a. Thiram or captan at 2.5 g kg <sup>-1</sup>	Prophylactic measure against seed rot or mould
	b. Carboxin at 1.5 g kg <sup>-1</sup>	Against smut disease
	c. Metalaxyl at 4 g kg <sup>-1</sup>	Against downy mildew
Chickpea	a. Mixture of benomyl and thiram (3:2) at 4.5 g kg <sup>-1</sup>	Against wilt disease
	b. Thiabendazole at 3 g kg <sup>-1</sup>	Against Ascochyta blight
Pigeonpea	Mixture of benomyl and thiram (3:2) at 4.5 g kg <sup>-1</sup>	Against wilt diseases
Groundnut	Thiram at 3 g kg <sup>-1</sup> of seed	Against fungal pathogen
Pearl millet	a. The seeds are soaked in 0.1% mercuric chloride for 10 min and then thoroughly washed in running water for 5 min.	Against downy mildew
	b. After washing, the seeds are transferred immediately into a water bath set at 55°C for 12 min.	
	c. Immediately after the hot water treatment, the seeds are transferred to water at room temperature for 2 min cooling after which it is transferred to incubator at 35°C for 12 h and then at 40°C for an additional 12 h.	
	d. After cooling the seeds are treated with the fungicide metalaxyl (Ridomil 50% WP) at 3 g kg <sup>-1</sup> seed in 1000 ml of 1% aqueous methyl cellulose solution. The seeds are soaked in the fungicide suspension for 4-6 h. The treated seeds are dried under shade/sunlight and can be used for sowing up to a period of 4 months.	

### Quarantine procedures for import of germplasm

All the germplasm or seed certified by the national quarantine services of the exporting country, and accompanied by a phytosanitary certificate, is received at NBPGR. It is fumigated at normal atmospheric pressure with aluminium phosphide (dosage: 3 g m<sup>-3</sup> for 5 days). The seeds are then closely examined for foreign matter including smut sori, ergot sclerotia, weed seeds, nematode cysts, and soil clumps. The seeds are then subjected to various seed health testing procedures like washing and sedimentation test, blotter/agar plate tests, and X-ray radiography for detection of latent infestation (Nirula, 1979; Pathak and Joshi, 1984). The seed samples of sorghum, pearl millet, chickpea, pigeonpea, and minor millets are then treated with approved pesticides before release. The treatment schedule followed for ICRISAT mandate crops is given in Table 2 (Varma and Ravi, 1984).

Groundnut is grown for six weeks in an insect-proof screenhouse and thoroughly checked for symptoms of the following exotic virus diseases: peanut mottle, peanut stunt, marginal chlorosis, peanut stripe, and ring spot. Healthy seedlings are then released for planting in the post-entry quarantine isolation area (PEQIA) at ICRISAT centre. For the last two years, enzyme-linked immunosorbent assay (ELISA) test has been used in ICRISAT for detection of viruses (Bharathan *et al.*, 1984; Prasada *et al.*, 1988).

The cuttings of wild species of *Arachis* originating from South and North America are subjected to intermediate plant quarantine in a non-groundnut growing country. In this regard there is a long-standing agreement between ICRISAT and the University of Reading in UK to grow and examine groundnut cutting specimens at Reading before the healthy plants are airlifted to India for further quarantine examination and final entry into the country. The material is then released to ICRISAT for planting in quarantine nethouse, where plants are grown, well established, and thoroughly checked before they are transplanted in PEQIA.

### Additional requirements for import

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

**Sorghum:** Seed samples to be certified as collected from fields free from bacterial leaf stripe (*Pseudomonas andropogonis*), bacterial leaf streak (*Xanthomonas campestris* pv. *holcicola*), and southern leaf blight (*Drechslera maydis*).

Pearl millet:	Seeds should be certified as collected from crop free from downy mildew infection ( <i>Sclerospora graminicola</i> ).
Chickpea:	Seed samples to be certified as collected from plants free from blight ( <i>Ascochyta rabiae</i> ) and virus diseases.
Pigeonpea:	No specific requirement.
Groundnut:	Seeds to be certified as collected from fields free from peanut mottle, peanut stunt, marginal chlorosis, peanut stripe virus, rust ( <i>Puccinia arachidis</i> ), and scab ( <i>Sphaceloma arachidis</i> ).

### Postentry quarantine isolation area

Postentry Quarantine Isolation Area (PEQIA) is about 50 ha located in the southeast corner of ICRISAT farm. About 6 ha of it is under cropping. This area is 200 m away from the nearest crops fields. All seed materials released by NBPGR except chickpea are required to be grown for one generation in the PEQIA at ICRISAT Center. The crops are raised under close, joint supervision of the staff of NBPGR and ICRISAT. They inspect crops biweekly from sowing to harvest. Plants showing symptoms of exotic diseases are promptly rogued and incinerated. Seeds harvested from healthy plants are released to ICRISAT scientists.

During 1973-89, 77,164 seed samples of sorghum, 25,140 of pearl millet, 28,861 of chickpea, 8,716 of pigeonpea, 14,870 of groundnut, 6,174 of minor millets, totalling 160,925, and 5,000 groundnut cuttings, were imported by ICRISAT from 95 countries.

### Interceptions

The national plant quarantine authorities have intercepted some important insects and pathogens of plant quarantine significance. A list of the interceptions made during 1975-1987 is given in Table 3 (Wadhi, 1980; Pathak and Joshi, 1984; NBPGR, 1987).

### Quarantine procedures for seed export

The quarantine regulations for the export of seed material are based on the 1951 International Plant Protection Convention and are modified from time to time according to specific requirement of the importing country. However, it is obligatory for the seed consignors in all countries to ensure that the seed is examined and cleared by the concerned national plant quarantine authorities and is accompanied by a PSC. The seed export from ICRISAT started in 1974. In 1978, GOI approved the establishment of an Export Certification Quarantine Laboratory at ICRISAT with all infrastructure facilities i.e. vacuum, and atmospheric fumigation chambers, radiographic equipment, incubation room, and rooms for inspection, seed treatment, packaging, cold store, and well qualified staff for the expeditious movement of germplasm to other countries under the overall authority of the national plant quarantine service.

The procedures for seed inspection and fumigation treatments are for imported material prescribed by the national plant quarantine agency

### Phytosanitary requirements of the importing countries

Most germplasm importing countries have their own specific quarantine rules and regulations which ICRISAT respects and follows strictly. The quarantine rules and regulations of all countries that are available at ICRISAT are used as specific guidelines for germplasm exchanges. The rules and regulations are updated from time to time through information obtained from the Food and Agriculture Organization of

Table 3. Pests intercepted by NBPGR from plant materials imported during 1975-1987.

Pests	Host	Country
<b>Insect pests</b>		
<i>Acanthoscelides obtectus</i>	<i>Cajanus cajan</i>	Brazil
<i>Specularius erythraeus</i>	<i>Cajanus cajan</i>	Brazil
<i>Bruchidius</i> sp.	<i>Cajanus cajan</i>	Senegal
<i>Callosobruchus analis</i>	<i>Cajanus cajan</i>	Thailand
<i>Callosobruchus chinensis</i>	<i>Cajanus cajan</i>	Afghanistan
<i>Callosobruchus maculans</i>	<i>Cajanus cajan</i>	Iraq
<i>Corcyra cephalonica</i>	<i>Arachis hypogaea</i>	USA
<i>Ephestia cautella</i>	<i>Arachis hypogaea</i>	Canada
<i>Oryzaephilus surinamensis</i>	<i>Pennisetum glaucum</i>	Sudan
<i>Gonocephalum</i> sp.	<i>Sorghum bicolor</i>	USA
<i>Sitophilus ziamais</i>	<i>Sorghum bicolor</i>	Zimbabwe
<b>Pathogens</b>		
<i>Drechslera maydis</i>	<i>Sorghum bicolor</i>	USA
<i>Drechslera sorghicola</i>	<i>Sorghum</i> sp.	Australia
<i>Fusarium moniliforme</i>	<i>Sorghum</i> sp.	Australia
<i>Perenosclerospora sorghi</i>	<i>Sorghum</i> sp.	Zimbabwe
<i>Colletotrichum graminicola</i>	<i>Sorghum</i> sp.	Italy
<i>Fusarium solani</i>	<i>Sorghum</i> sp.	Kenya
<i>Xanthomonas campestris</i> pv. <i>holcicola</i>	<i>Sorghum</i> sp.	Yemen Arab Rep.
<i>Pseudomonas andropogoni</i>	<i>Sorghum</i> sp.	Yemen Arab Rep.
<i>Gloeocercospora sorghi</i>	<i>Sorghum bicolor</i>	Italy
<i>Drechslera sorghicola</i>	<i>Pennisetum glaucum</i>	Mali
<i>Drechslera maydis</i>	<i>Pennisetum glaucum</i>	USA
<i>Tolyposporium penicillariae</i>	<i>Pennisetum glaucum</i>	Italy
<i>Claviceps</i> sp.	<i>Pennisetum glaucum</i>	Zimbabwe
<i>Fusarium solani</i>	<i>Pennisetum glaucum</i>	USA
<b>Nematodes</b>		
<i>Ditylenchus angustus</i> (?)	<i>Arachis hypogaea</i>	USA
<i>Aphelenchoides besseyi</i>	<i>Setaria italica</i>	Bangladesh

the United Nations (FAO), European and Mediterranean Plant Protection Organization (EPPO), United States Department of Agriculture (USDA), and other agencies.

## ■ Total exports from ICRISAT

During 1974-1989, 368,980 germplasm and breeders' seed samples of sorghum, 131,326 of pearl millet, 184,548 of chickpea, 48,162 of pigeonpea, 59,357 of groundnut, and 12,047 of minor millets, totalling 804,420 were exported from ICRISAT to 147 countries. So far, there has been no report of introduction of any pest or disease through exchange of ICRISAT germplasm.

## Future perspectives and suggestions

For safe exchange of germplasm we suggest:

- a) More extensive use of enzyme-linked immunosorbent assay (ELISA) technique in the detection of viruses and bacterial pathogens.
- b) Exploration of tissue culture technique wherever possible in exchange of germplasm.
- c) Adoption of new disease indexing techniques.
- d) Updating the treatment schedules, procedures under different environmental conditions.
- e) Compilation of information on pests, diseases, and weeds of plant quarantine importance and outbreaks on a regional and global basis.
- f) Avoidance of bulk import of seeds to facilitate thorough inspection.
- g) Development of collaborative research work among genetic resource, pathology, entomology and plant quarantine scientists on seed-borne diseases, seed health, and treatment schedules of ICRISAT mandate crops.
- h) Joint preparation of a plant quarantine manual by ICRISAT and NARS for the guidance of all countries involved in germplasm exchange.
- i) Safeguard against introduction of exotic pests and pathogens. Germplasm of some crops may require closer observation for one or more seasons, hence well equipped glass or screen houses for quarantine isolation and screening of such material are required.
- j) Create awareness among the public and planners about the importance of germplasm and use of plant quarantine for international germplasm exchange for higher and sustainable crop production.

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## Seed Movement and Quarantine Measures in Selected Near East Countries

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### Introduction

Over the last few years, seed movement and germplasm exchange has increased spectacularly in international trade and agricultural development.

Size of individual seed consignments vary from shiploads of food grains, or tons of planting seed, down to a few grams for research or gardens (Neergaard, 1980). At the same time, accelerated worldwide movement of genetic material for breeding and scientific use have considerably increased the international spread of crop pests, diseases and weeds. Increased international movement of seed and germplasm constitutes real hazards for crop production (Karpati, 1981, 1983). Numerous destructive pests and diseases have been spread, with disastrous losses in hitherto uninfested areas, because effective quarantine precautions were not taken (Reddy, 1970; Neergaard, 1979).

Needed in international movement of seed is a special policy which requires specific essential provisions.

This paper describes current seed movement and quarantine measures in selected Near East countries, with emphasis on Egypt.

### Interception and introduction of seed-borne diseases

Some examples of successful interception of seed-borne pathogens in seed movement in the Near East serve to illustrate the importance of quarantine measures.

Leppik (1962) reported that downy mildew (*Plasmopara halstedii*) of sunflower (*Helianthus annuus*) evidently a new pathogenic race from eastern Europe, was found on plants grown from seed received from Turkey and Pakistan.

A destructive leaf spot (*Cercospora traversiava*) on fenugreek (*Trigonella foenum-graecum*), known in some eastern European countries and now common in the Near East, was found on seed samples from the Near East (Neergaard, 1979).

In 1952, USA intercepted *Tilletia pancicii* on *Hordeum* sp. from Turkey, and *Neovossia indica* on wheat seed from Afghanistan (Locke and Watson, 1955).

Post-entry inspection revealed a number of seed-borne diseases, including pathogenic races of three species of fungi, all new to the USA, including two from Pakistan and two from Turkey (Neergaard, 1979).

Leppik (1964) reported that squash mosaic virus was introduced to the USA by seed from Iran, and disseminated in Iowa by cucumber beetles. After several years of intensive work, the disease was eradicated and disease-free seed produced. Abdelmonem *et al.* (1989) reported that the blast epidemic in 1984 was due to introduction of specific races of *Pyricularia oryzae* with rice seed of cultivar Reihō, introduced from Japan which was released for commercial production in 1984.

Tobacco blue mould (*Peronospora tabacina*) was endemic in Australia and America until 1958, when it was reported in England. In a few years, it spread to all tobacco-growing areas of Europe and parts of North Africa and the Near East (Karpati, 1983).

Heavy chickpea losses in India in 1981 were due to introduction of a virulent biotype of *Ascochyta rabiei* from the Middle East.

### Safe movement and quarantine legislation

Egypt exports berseem clover seed (*Trifolium alexandrinum*) to Pakistan and Saudi Arabia, and seedlings of ornamentals and fruits to Saudi Arabia, Emirates, Oman, Qatar, Bahrain, Libya and the Arabian Islands.

Plant quarantine laws and regulations are based on national and international legal obligations. They have evolved in various parts of the world over the last century.

Following the International Plant Protection Convention established by FAO on December 6, 1951, Egypt's Law 53 of 1966 provides guidelines and safeguards with respect to plant introduction, import and export quarantine procedures. Egyptian phytosanitary legislation is regulated by a series of orders issued under this law. They include lists of prohibited plant pests and diseases, prohibited plants, provisions for releasing consignments for export or import, and many other aspects under the jurisdiction of the Ministry of Agriculture (Anonymous, 1967). These regulations are amended as conditions require.