intercepted from washings of potato tubers imported from USA (Mathur *et al.,* 1978) and *Polenchus minutus* from palm plants imported from UK (Lal and Mathur, 1995). Interception of nematodes even from small quantities (a few grams of seed or a few days old rooted plants/bulbs etc) suggest that import of seeds/planting material in bulk for propagation need to be reviewed and suitably amended to prevent the introduction and spread of exotic nematodes.

All the interceptions listed are from the plant material accompanied with phytosanitary certificates from the quarantine authorities of countries of their export. Therefore there is an imperative need to strengthen quarantine facilities, rules and regulations to meet the growing challenge.

It is concluded that due to cumbersome nature of the nematodes and detection techniques involved, imports of plants and seeds of hosts from countries where the nematodes of quarantine importance occur, should be restricted to areas registered as the 'particular nematode free areas'. Stem cuttings should be preferred (for exchange) as compared to rooted cuttings or vegetative propagules. The exchange of tissue cultured planting materials is not always safe as the nematode contamination could also proliferate on cultured plant parts and may get exchanged.

Interception of plant parasitic nematodes and specially the one having wide host range and several races, in the imported consignments, emphasize the need to conduct a thorough and critical examination of all material under exchange. Adequate provisions are required for dealing with nematodes in plant quarantine regulations of each country of the region. Regulatory nematology laboratories need to be established for detection, identification and generating data on nematode distribution. Need of facilities required for treatment of infested material should be taken with urgency.

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Fusarium solani (Mart.) Sacc. Intercepted in Introduced Germplasm during Last Twenty-five Years

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Key Words: *Fusarium solani*, Interception, Quarantine

The international collaboration and free exchange of germplasm for utilization in crop improvement has played a key role in achieving self-sufficiency in the food production. However, this exchange has been responsible for spread of many seed-borne pathogens to newer areas. In order to prevent the entry of new

races or virulent isolates along with seeds and vegetative propagules, a systematic examination of the introduced material constitutes an essential component of plant quarantine.

The National Bureau of Plant Genetic Resources, New Delhi received about 60,000 samples in the form of true seeds, vegetative propagules or tissue culture plants of various crops each year for quarantine clearance. All the samples were first subjected to visual examination and then to blotter test for the detection of seed-borne fungi. As a result of critical examination, a large number of pathogenic species belonging to *Puccinia, Tilletia, Fusarium, Colletotrichum, Drechslera* etc. were intercepted (Khetarpal *et al.*, 2001).

The genus *Fusarium,* commonly known as wilt fungi causes severe crop losses in cereals, pulses, vegetables, ornamentals, plantation crops, etc. Various species of *Fusarium* viz., *F. nivale, F. oxysporum, F. solani, F. culmorum, F. moniliforme* and *F. avenaceum* were intercepted on various crops (Agarwal *et al.,* 2001).

Fusarium solani (Mart.) Sacc., the causal organism of damping-off, foot rot and stem canker has a very wide host range, affecting crops belonging to 65 families. The fungus can be carried within the seed, root, stem, tubers, corms, rhizomes and bark. Richardson (1990) has reported the fungus to be seed-borne in 45 crops.

F. solani was intercepted on 93 crops from 43 countries as listed in Table 1. It was detected as seed-borne on 65 new crops for the first time. Among the South Asian countries, the fungus was intercepted on seeds of *Corchorus* spp., *Cucurbita* spp., *Hibiscus cannabinus* and *Solanum melongena* from Bangladesh; *Quinoa* sp. and *Solanum* spp. from Nepal and *Annona* spp. cuttings and *S. melongena* from Sri Lanka.

F. solani causes substantial economic losses in various crops worldwide. Foot-rot syndrome in legumes has been reported as a major limiting factor to crop production causing substantial yield losses in pea and bean crops in Europe and North America. Sudden death syndrome (SDS) of soybean, an important disease in the southern USA is now becoming more prevalent and severe in northern states also (Scherm and Yang, 1996). Lima and Lopes (1998) reported different levels of aggressiveness between isolates of *F. solani* that attack potato in Brazil. Recent molecular studies also have revealed high levels of diversity within the fungus (CABI, 2003).

Interception of *F. solani* in 93 crop species from various parts of the world is very significant from quarantine view point as even a low incidence of seed-

Table 1. *Fusarium solani* intercepted in introduced germplasm during last twenty-five years

Crop	Source
Abutilon sp.*	USA
Acacia spp.*	Australia
Aegilops sp.*	Germany, USA
Aeschynomone sp.*	Australia
Agaves spp.*	USA
Allium sp.	Egypt, Germany
Aloe sp.*	Australia
Amaranthus sp.*	Taiwan
Annona spp.*	Australia, Sri Lanka
*Berberis vulgaris**	France
Beta vulgaris	Canada, Denmark, Germany, Hungary, Iran, Poland, Sweden, USA
Brassica spp.*	Canada, China, Denmark, France, Sweden, Taiwan, UK
Calliandra sp.*	Nigeria
Capsicum spp.	Costa Rica, Czechoslovakia, France, Israel, Italy, Hungary, Nigeria, Romania, Taiwan, UK, USA, USSR
*Carica papaya**	Australia, Venezuela
*Carthamus tinctorius**	Germany, Singapore, Turkey, USA
Casuarina spp.*	Australia
Centrosema spp.*	Australia
Cicer arietinum	USA
Corchorus spp.*	Bangladesh
Crescentia sp.*	UK
Crotolaria juncea	USA
Cucumis melo	USA
Cucurbita spp.	Bangladesh, Mauritius, USA
Cuphea sp.*	USA
*Datura alba**	Hungary
*Daucus carota**	USA
*Digitalis viridiflora**	Italy
Digitaria sp.*	USA
*Ecballium elaterium**	Japan
*Elaeis guineensis**	Zambia
Eleusine spp.*	UK, Zambia, Zimbabwe
*Enterolobium cyclocarpum**	USA
Eucalyptus sp.*	Australia
*Flemingia congesta**	Nigeria
Gliricidia sp.*	UK
Glycine max	Poland, Taiwan, USA, USSR
Gossypium spp.	Australia, USSR
Grossularia sp.*	USSR
*Guizotia abyssimia**	Australia
*Helianthus annuus**	Australia, Bulgaria, Canada, Germany, Italy, USA
Hibiscus cannabinus	Bangladesh, Brazil, UK, USSR
Hordeum spp.	Italy
*Ipomoea batatas**	Taiwan, USA
Jasminum sp.*	UK
Lathyrus sp.*	Syria
*Lavandula vega**	Bulgaria
Lagenaria sp.*	UK
Lens culinaris	Syria, UK
Lesquerella sp.*	USA
*Leucaena leucocephala**	UK

(Table 1 Contd.

Crop	Source

Table 1. (Contd.)

Crop	Source
*Limnanthes alba**	USA
*Lotus tenuis**	USA
*Luffa acutangula**	UK
Lycopersicon esculentum	Taiwan, USA
*Macrotyloma uniflorum**	Ethiopia
Manihot sp.*	Brazil
*Manisuris sellona**	USA
Medicago spp.*	Australia, Hungary, USA
Medicus sp.*	USA
Melilotus alba	Taiwan, USSR
*Mentha arvensis**	France, Vietnam
Ocimum spp. *	Germany
*Oryza sativa**	Philippines
Panicum spp.*	USSR
*Paspalum veginatum**	Australia
Pennisetum typhoides	Zimbabwe
Phaseolus aconitifolius	Taiwan, USA
*Piper nigrum**	Indonesia
Pistacia sp. *	Holland
Pisum sativum	France, Netherlands, Sweden, USA
*Plantago maritime**	USSR
Prunus spp. *	Italy, Turkey
Pyrus spp.*	USA
*Psophocarpus tetragonolobus**	Canada
Quinoa sp.*	Nepal
Rosa spp. *	Netherlands
*Rumex acetosa**	France
Sesamum spp.	Israel, Thailand
Setaria sp.*	USSR
*Spinacea oleracea**	USSR
Solanum melongena	Bangladesh, Japan, Sri Lanka, USA
S. tuberosum	Peru
Solanum spp.	Nepal
Sorghum spp.	USA
Stylosanthes spp.*	Brazil, Australia, USA
Trifolium spp.	Australia, USA
Triticum spp.	Italy, Sweden, USA
Vigna spp.	Taiwan, Thailand
V. unguiculata	Australia, Brazil, Italy, Nigeria, Taiwan, USA
Vitis spp.*	South Africa
Zea mays	South Africa, USA
Zucchini sp.*	Israel

* Not reported earlier as seed-borne (Richardson, 1990)

transmission of a soil-borne pathogen can be a potential threat to agriculture if infected seed is sown in uninfected area.

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Insect-Pests Intercepted in Introduced Planting Material during Quarantine Processing from 2000-04

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The import of exotic planting material, either in bulk or as small samples meant for research in various crop improvement programmes is a potential and inadvertent source of introducing exotic pests into new areas which may severely damage the crop production and economy of a nation. There are glaring examples of various pests and diseases introduced along with imports, which have resulted in enormous crop losses (Khetarpal *et al.*, 2001).

National Bureau of Plant Genetic Resources is the nodal agency to undertake the quarantine processing of germplasm and transgenic material introduced into