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PATHOGENIC FUNGI INTERCEPTED IN INTRODUCED GERMPLASM

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During 1986-1990, a total of 2,31,740 introduced germplasm samples of seeds and other planting materials were examined for quarantine clearance. A number of economically important fungal pathogens were intercepted which include Peronospora manshurica *(Naum) Syd. and* Fusarium nivale *(Fr.) Ces., which are yet not reported from India;* Drechslera maydis *(Nsik.) Subram. & Jain,* Phoma betae *Frank and* Puccinia carthami *Corda which are known to possess a large number/ more virulent races;* Botrytis cinerea *Pers. ex Pers.;* Fusarium solani *(Mart.) Sacc. and* Dreschslera sorokiniana *(Sacc.) Subram. & Jain, having a wide host range. A number of pathogenic fungi were also recorded on seeds of non-host crops.*

Several pests and pathogens have got introduced and established in India from time to time along with imported germplasm. A number of destructive pathogens were intercepted in the introduced germplasm, some of which being new to India, viz., *Fusarium nivale, Peronospora manshurica* and *Uromyces betae* (Usha Dev *et al.*, 1989; Mukewar *et al.*, 1980 and Agarwal *et al.*, 1984). Pathogenic fungi intercepted on introduced planting material during 1986-1990 are reported and economic significance of certain important pathogens is discussed in this paper.

MATERIALS AND METHODS

During 1986-1990, a total of 2,31,740 introduced germplasm including 33,022 treated samples were received for quarantine clearance. Treated seeds were raised in the International Post-Entry Quarantine Nursery (IPEQN) and only healthy germplasm was released. All the untreated seeds and planting materials were examined visually and then

under stereobinocular microscope. The washing test was conducted for the detection of hazardous fungal pathogens which may be carried as surface contaminants. Apparently unhealthy looking seeds were incubated on standard moist blotters in plastic petriplates. Number of seeds placed on moist blotter varied as per the size of the seed sample. Observations for the associated pathogenic fungi were recorded on the eighth day. Observations on treated samples in IPEQN are reported separately.

RESULTS AND DISCUSSION

During visual examination, sclerotia of *Claviceps purpurea,* the ergot fungus were found mixed with seeds of *Agropyron* spp., wheat and oat. Observation of seeds under stereobinocular microscope revealed the presence of crusts of oospores of downy mildew fungus, *Peronospora manshurica* on soybean; teliospores of *Neovossia indica* (Karnal Bunt); *Tilletia caries* and *T. foetida* (Hill bunt) on wheat from a number of countries (Table 1).

Peronospora manshurica, a destructive pathogen with wide geographical distribution is not yet recorded from India. In USA alone, 32 races of this pathogen are known (Sinclair, 1982). The oospores of this fungus could retain viability for years, (Pathak *et al.,* 1978) and from quarantine view point, there is a zero tolerance for such pathogens (Neergaard, 1977). Teliospores of *Puccinia carthami* (=*Puccinia caleitrape* var. centaurae), (safflower rust) were detected in seeds received from Canada, Ethiopia and USA. This pathogen caused severe epiphytotics in USA in 1949 and 1950 (Thomas, 1952). The pathogen is known to have a number of races and has been recorded on *Carthamus tinctorius* L. and *C. oxycantha* M. Bieb. in India (Prasada and Chotia 1950). *Neovossia indica* detected in seeds of wheat from Mexico, Nepal, Pakistan and U.K., is a serious pathogen and European and Mediterranean Plant Protection Organization (EPPO) has declared it to be a pathogen of high quarantine importance (Anon. 1979); and recently USA has also listed it as a high risk pathogen. Sugarbeet rust, *Uromyces betae* which was detected in seed washing in samples from Denmark, Netherland, Hungary, Sweden, USSR and USA, is a widespread pathogen in Europe, Africa, Asia, Australia, North and South America and has not been reported so far from India. The pathogen can cause epidemics in new areas (Emdal and Foldo, 1979).

Observation of seeds incubated on moist blotter revealed large number of economically significant pathogens (Table 1). The snowmould fungus *Fusarium nivale* was detected in wheat seed from Mexico and U.K.; it is a serious pathogen of cereals and grasses and is so far not recorded from India. It is reported to cause total loss of winter wheat

Table 1. Pathogenic fungi recorded on introduced seed and other planting material (1986-1990)

Fungi intercepted	Crop(s)	Source(s)
Alternaria brassicae (Berk.) Sacc.	*Brassica* sp.	Bangladesh, Sweden, Ethiopia, Taiwan, USA
A. crassa (Sacc.) Rands	* *Solanum melongena*	Bangladesh
A. padwickii (Ganguly) M.B. Ellis	* *Coriandrum sativum*	Hungary
A. zinniae M.B. Ellis	* *Setaria* sp.	Korea
Botrytis cinerea Pers. ex Pers.	*Brassica* sp.	U.K.
	* *Eronymus* sp.	Germany
	* *Lycopersicon esculentum*	USA
	Helianthus annuus	USA
	Glycine max	Taiwan
	Pisum sativum	Sweden
	* *Psophocarpus tetragonolobus*	Papua New Guinea
	Trifolium spp.	Czechoslovakia
	Triticum spp.	U.K.
Claviceps purpurea (Fr. ex Fr.) Tul.	*Agropyron* spp.	USA
	Avena sativa	USA
	Triticum spp.	Hungary, Italy, USA
Colletotrichum acutatum Simmonds	* *Hibiscus* spp.	Bangladesh
	* *Capsicum* spp.	Taiwan
	* *Solanum melongena*	Bangladesh
C. gloeosporioides Penz.	* *Acacia* spp.	Australia
	Capsicum spp.	Bangladesh, Indonesia, Italy, Taiwan
	* *Cucurbita* spp.	Japan
	* *Corchorus* spp.	Bangladesh
	Hibiscus spp.	Bangladesh
	* *Leucaena leucocephala*	U.K., USA
	* *Melilotus alba*	USA
	* *Sesbania* spp.	Philippines
	Stylosanthes spp.	Australia, USA
C. graminicola (Ces.) Wils.	*Corchorus* spp.	Bangladesh
Drechslera graminea (Rabenh. ex Schlecht.) Shoemaker	*Avena sativa*	USSR
	Hordeum vulgare	Egypt, Zimbabwe

Contd.

Table 1. Contd.

Fungi intercepted	Crop(s)	Source(s)
D. maydis (Nisikado) Subram. & Jain	* *Eleusine* spp.	Bhutan, Nepal
	Setaria spp.	Korea
	Sorghum vulgare	USA
	* *Stylosanthes* spp.	Australia, USA
D. oryzae (Van Breda de Haan) Subram. & Jain	* *Eleusine* spp.	Bhutan
	Oryza sativa	Nigeria, USA
D. sacchari (Butler) Subram. & Jain	* *Panicum* spp.	USA
	* *Setaria* spp.	Australia
D. sorghicola (Lef. & Shrew.) Richardson & Fraser	* *Setaria* spp.	Korea
	Sorghum vulgare	USA
D. sorokiniana (Sacc.) Subram. & Jain	*Avena sativa*	Hungary, USA, USSR
	* *Capsicum* spp.	Hungary
	* *Lycopersicon esculentum*	Taiwan
	* *Medicago* spp.	Nigeria
	Phaseolus aureus	Iran
	* *Panicum* spp.	USA
	Solanum melongena	Bangladesh
	Sorghum vulgare	USA
Fusarium culmorum (W.G. Smith) Sacc.	*Avena sativa*	USA
	* *Caesalpinia* spp.	U.K.
	* *Vigna unguiculata*	Australia
F. nivale (Fr.) Ces.	*Triticum* spp.	Mexico, U.K.
F. oxysporum Schlecht. ex Fr.	*Vigna unguiculata*	USA
F. solani (Mart.) Sacc.	* *Acacia* spp.	Australia, U.K.
	Allium cepa	Egypt
	* *Allizzia coribaea*	U.K.
	Beta vulgaris	USA
	Capsicum spp.	Bulgaria, Hungary, Taiwan, USA
	* *Callendra lalothyosus*	Nigeria
	* *Corchorus* spp.	Bangladesh
	Coriandrum sativum	Hungary

Contd

Table 1. Contd.

Fungi intercepted	Crop(s)	Source(s)
	Cucumis melo	USA
	* *Daucus carota*	USA
	Datura alba	Hungary
	Dolichos spp.	USA
	* *Enterolobium cyclocarpus*	USA
	* *Ecballium elaterium*	Japan
	* *Geranium* spp.	Holland
	Gossypium spp.	Australia
	* *Guazuma ulmifolia*	U.K
	* *Helianthus annuus*	Italy
	* *Lagenaria* spp.	U.K.
	* *Lavandula vega*	Bulgaria
	* *Leucaena* spp.	U.K.
	Lycopersicon esculentum	Taiwan, USA
	* *Medicago* spp.	Argentina, Australia, USA
	* *Mentha* spp.	USA, Vietnam
	* *Ocimum* spp.	Germany
	* *Paspalum vaginatum*	West Australia
Fusarium solani (Mart.) Sacc.	*Pisum sativum*	Netherland, Sweden
	* *Pistacia* spp.	Australia
	* *Quinoa* spp.	Nepal
	Setaria spp.	Argentina
	* *Solanum melongena*	Bangladesh
	* *S. tuberosum*	Bangladesh
	* *Samanea samen*	U.K.
	* *Tagetes* spp.	Netherland
	Trifolium spp.	Australia
	Vigna unguiculata	USA
	Zea mays	USA
Neovossia indica (Mitra) Mundkur	*Triticum aestivum*	Mexico, Nepal, U.K., Pakistan
Peronospora manshurica (Naum.) Syd.	*Glycine max*	Brazil, Belgium, Italy, Japan, S. Korea, Poland, Nigeria, Taiwan, Thailand, Zimbabwe
Phoma betae Frank	*Beta vulgaris*	Germany, Hungary, Sweden, USA
Phoma lingam (Tode ex Fr.) Desm.	*Brassica* spp.	Canada, U.K.

Contd.

Table 1. Contd.

Fungi intercepted	Crop(s)	Source(s)
Puccinia carthami Schw.	*Carthamus tinctorius*	Canada, Ethiopia, USA
P. helianthi Schw.	*Helianthus annuus*	Australia, Argentina, Bulgaria, Canada, Hungary, Italy, Spain, USA
Stenocarpella macrospora	*Zea mays*	USA
Tilletia caries (DC.) Tul.	*Triticum* spp.	Australia, Iran
T. foetida (Wallr.) Liro.	*Triticum* spp.	Poland, Syria, USA
Uromyces betae Kickx.	*Beta vulgaris*	Denmark, Netherland, Hungary, Sweden, USSR, USA
Ustilaginoides virens (coothe) tak	*Oryza sativa*	Philippines, S. Korea

*Fungi not yet recorded as seed-borne in respective crops (Richardson, 1990)

and rye in parts of USSR, Japan, Canada and Central Europe (Blomquist 1970, Jamalainen, 1970). Fungicide resistant strains are also reported in *F. nivale* (Olvang, 1984). The grey mould fungus *Botrytis cinerea* was detected on wheat, winged bean and *Eronymus* spp. *B. cinerea* has a wide host range. It has caused heavy losses to chickpea crop in states of Bihar, Haryana, Punjab and U.P. (Lambat *et al.*, 1985), though it is considered as a common saprophyte in European countries.

A large number of or more virulent races are known to exist in certain economically important pathogens such as *Drechslera maydis, D. sorokiniana, Fusarium oxysporum, Phoma betae, Tilletia caries* and *T. foetida* which were also intercepted on various crops. *Fusarium solani* and *D. sorokiniana* that are known to possess a wide host range were recorded on planting materials of a variety of crops. A number of economically significant pathogens were recorded on seeds of non-host crops, such as, *Alternaria crassa* on *Solanum melongena, A. padwickii* on *Coriandrum sativum, A. zinniae* on *Setaria* spp. and *D. maydis* on *Stylosanthes* spp., (Richardson, 1990). Such association, often overlooked, can also bring in certain dangerous pathogens. The repeated interception of pathogens

not known to occur in India or those that possess physiological races or have a wide host range, stress the need to conduct critical seed health test during quarantine processing of exotic germplasm materials.

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