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INTERCEPTION OF *PERONOSPORA MANSHURICA* (NAUM.) SYD., IN SOYBEAN GERMPLASM INTRODUCED FROM 1978-97

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During qurantine clearance of 11,082 samples of soybean germplasm received from 1978-1997, downy mildew (*Peronospora manshurica*) (Naum.) Syd. was intercepted in 1535 samples from 15 countries including Malaysia and Indonesia, the countries from where the disease is not yet reported. Country-wise details on the introduction of germplasm and interception of downy mildew is presented. The interception of *P. manshurica* has great significance in view of the fact that the pathogen is not yet reported from India, is highly destructive in nature, oospores can survive for longer periods, existence of a large number of physiological races and zero tolerance limit prescribed for quarantine purposes.

Key words: Quarantine, Interception, *Peronospora manshurica* Soybean gemrplasm

Government of India in late seventies started importing soybean seed to meet the increasing demand of oil and protein to feed the growing population. A number of pathogens of quarantine significance has been intercepted on exotic germplasm from time to time (Mukewar *et al.*, 1980; Agarwal *et al.*, 1990). The fungal pathogen of highest significance for the country is the downy mildew fungus, *Peronospora manshurica* (Naum.) Syd. The danger due to *P. manshurica* becomes greater due to the existance of a large number of physiological races.

MATERIALS AND METHODS

During last 20 years (1978-1997) a total of 11,802 seed samples of soybean were received for quarantine clearance (Table 1). It is noticed that highest imports (5932) i.e. 53.52 per cent were received from USA followed by 2233 from Taiwan 20.14 per cent), while from rest of the countries a limited number of samples were introduced. Seed samples were first examined under a stereoscopic binocular microscope for the presence of crust of oospores of *Peronospora manshurica* on seed surface. Seed samples found treated with chemicals or *Rhizobium* cultures or suspected to carry traces of crust were subjected to washing test. Microscopic slides were prepared from the crust obtained from the seed surface or from the pellet in washing test and examined under the compound microscope.

RESULTS AND DISCUSSION

Seed samples when examined under the stereoscopic binocular microscope, some of them showed dull, milky white to light brown crusts on seed surface. Such crusts when observed under compound microscope, revealed masses of hayline to light brown, thick and smooth-walled oospores measuring 32-42.5 µm in diameter. The oospore measurements and other characters agree with those of *Peronospora manshurica* (Naum.) Syd. (CMI, 1981).

Table 1. Interception of *Peronospora manshurica* in introduced germplasm of soybean

Country	Number of samples introduced (number found infected)											
	1978 to 1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	197	Total
Belgium	-	3(1)	-	-	-	-	-	-	-	-	-	3(1)
Brazil	9(5)	-	-	42	-	3(3)	-	-	-	6	-	60(8)
Indonesia	-	-	-	-	-	-	11(1)	-	-	32	-	43(1)
Israel	-	9(2)	-	-	-	-	-	-	-	-	-	9(2)
Italy	19(1)	2	-	-	-	-	-	-	-	-	-	21(1)
Japan	23(2)	-	-	-	-	-	-	-	1	-	-	24(2)
Malaysia	6(6)	-	-	-	-	-	-	-	-	-	-	6(6)
North Korea	1(1)	-	-	-	-	-	-	-	45 (12)	-	-	46 (13)
Poland	12(2)	-	-	-	-	-	-	-	-	-	-	12(2)
Russia	-	-	-	-	-	-	-	13(5)	-	-	17	30(5)
South Korea	11(5)	-	-	-	-	-	-	-	-	-	-	11(5)
Taiwan	1627 (142)	95	197 (7)	21(1)	27(1)	-	48(8)	49(2)	87(4)	62	20	2233 (167)
U.S.A.	5054 (1288)	38(2)	19	82 (11)	7(1)	110 (3)	77	6(2)	-	537 (9)	2	5932 (1316)
U.S.S.R.	62(1)	-	-	28(2)	-	-	-	-	-	-	-	90(3)
Zimbabwe	206(3)	-	-	-	-	-	-	-	-	-		206 (3)
Other countries*	2203	-	54	1	3	47	-	24	-	24	-	2356
Total	9233 (1456)	147 (5)	270 (7)	274 (16)	37(2)	160 (6)	136 (9)	92(9)	87(4)	707 (21)	39	11082 (1535)

*A total of 2356 seed samples received from other countries, viz. Argentina, Australia, China, Colombia, France, Nepal, Philippines, Switzerland, Thailand and West Germany did not reveal presence of *P. manshurica*.

Washing test carried out for seeds treated with chemicals, *Rhizobium* cultures or suspected to carry traces of crusts also revealed the presence of a few oospores typical of the fungus.

Out of 11,082 seed samples introduced, 1535 sampels (13.85 per cent) were found to carry *P. manshurica*. Country-wise details of samples introduced and found to carry *P. manshurica* are presented in Table 1. Analysis of data showed that 85.73 per cent of total infected samples were from U.S.A. alone and 10.87 per cent from Taiwan; while the rest i.e. 3.4 per cent infected samples were introduced from 13 other countries. It is due to the fact that USA and Taiwan contributed highest in the seed imports (Table 1).

Exchange of seed and other planting materials of various crops at international level has been greatly helpful in crop improvement programmes. However, this has also resulted in the introduction of many serious pests and pathogens into areas where they were not known before. Among various pathogens of quarantine significance intercepted on introduced soybean seeds, downy mildew caused by the fungus *Peronospora manshurica* is the most important one, as this devastating fungus is not yet reported from the country.It has also been intercpted on seeds imported from Malaysia and Indonesia where it is not reported as well (Agarwal and Khetarpal, 1985; Anitha *et al.*, 1993).

The existence of a large number of physiological races and longer periods of viability of oospores aggravate the problem. Thirty three physiological races of *P. manshurica* have been reported from USA alone (Dunleavy, 1997; Lim *et al.*, 1984). In Poland, Marcinkowska (1987) reported 11 races and later in 1991 he added 7 more races (34-40). Li *et al.* (1992) further added 3 new races.

The oospores of *P. manshurica* could retain viability upto 8 years (Pathak *et al.*, 1978). Neergaard (1997) prescribed zero tolerance for such pathogens from quarantine view point.

The interception of *Peronospora manshurica*, the downy mildew fungus in 1535 seed sample of soybean out of 11,082 samples introduced from 15 countries emphasizes the need for utmost care and vigilance by the quarantine personnel in processing of imported soybean materials. Indiscriminate iuntroduction of seeds of such infected germplasm can pose a serious threat to our soybean improvement programme.

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