types as *Til.* Black seeded types are mostly used in Havan/Poojas and other rituals. In all, 25 samples represented diversity from Narsinghpur, 1 from the adjoining district of Sehore, 32 from Hosangabad and 62 from Raisen district in Narmada valley of Madhya Pradesh. Besides, some very good single plant selections were made for plant types and other devisable traits. Some of the samples were collected from old stocks of the farmers, which are likely to be of primitive type.

In the surveyed area sesame cultivation is done for various uses other than the oil extraction such for making the *Laddoo* (a vernacular sweet dish) on special occasion of *Sankranti* (day of worship of lord Shiva, on 14th January every year) particularly in the Pachmarhi. In most of the surveyed area of Narmada valley (on both the sides of holy Narmada river) sesame is grown only as mixed crop with arhar, jowar and sometimes with soybean. Only very few fields of pure crop, were observed during the course of exploration. Previously sesame was grown by each and every farming family of this area for its oil and other proposes but now a days it has been mostly replaced by soybean.

The surveyed areas are mostly inhabited by *Gonds, Korkus* tribals and *Kirars, Gurjars, Raghuwanshis* and other migrants from Northern India who were growing sesame as an oilseed crop from the ancient times for their regular and occasional domestic requirements. The crop is grown during July as a pure *kharif* crop or mixed with the other *kharif* crops. Sowing starts with the onset of monsoon or depending upon the availability of moisture and/or irrigation facilities. Sesame is also grown in *rabi*/summer season in this area. The summer types are distinct types and vernacularly known as *maghai tili* because it is grown in the month of *Magh* or the *Magha* according to the old Hindu calendar (sowing is done mostly from January 2000 to February 2001.

Research efforts are required to be strengthened for the re-establishment of this high quality oil crop (sesame), otherwise it will be completely replaced from the farmers fields. Now a days the farmers talk about sesame that "*Tili to billa gayi*" which means sesame has been completely eradicated from the area.

References

Joshi AB (1961) *Sesamum*, A monograph, Indian Central Oilseeds Committee, Hyderabad.

Weiss WA (1971) Castor, Sesame, Safflower, Leonard Hill, London, 311-525.

Bedigrain D and JR Harlan (1986) Evidence for cultivation of sesame in the ancient world. *Econ. Bot.* **40:** 137-154.

Nayar NM and KL Mehta (1968) Sesame: its uses, botany, cytogenetics and origin. *Econ. Bot.* **24:** 20-31.

Viruses Intercepted in Exotic Germplasm during 1991-2000 in Quarantine

RK Khetarpal, Shamsher Singh, DB Parakh, AK Maurya and V Celia Chalam
Division of Plant Quarantine, National Bureau of Plant Genetic Resources, New Delhi-110012

Key Words: Germplasm, Legume, Quarantine, Interceptions, Seed-transmitted viruses

National Bureau of Plant Genetic Resources is a nodal agency for quarantine processing of exotic germplasm and transgenic planting material introduced in the country for research purposes by both public and private sector organizations. During the decade 1991-2000, about 6692 exotic legume and 425 flowering plants/planting material were grown in post-entry quarantine nursery and greenhouses for screening against exotic viruses or strains thereof. The objective was to minimize the risk of introduction of destructive viruses and its strains into the country and release samples to the indentor from disease-free plants. A check-list of economically important seed-transmitted viruses associated with legumes and those yet not reported from India have been prepared (Kumar *et al.* 1994) and updated. Thus, based on the literature available, detection methods are employed to test the material for quarantine clearance.

Methods employed for testing legume and planting material included (i) visual inspection (ii) grow-out test of seeds and seedlings or rooted planting material grown in pots (iii) infectivity tests of suspected viruses on known hosts (iv) serological tests such as Enzyme Linked

Immunosorbent Assay (ELISA) and Dot Immunobinding Assay (DIBA) (Hadidi *et al.* 1998; Khetarpal *et al.* 1994; Parakh *et al.* 1994 and (v) electron microscopy.

The details of legume and other material received and grown is presented in Table 1. The harvest from disease-free plants after growing was released to the indentors.

The introduced germplasm grown under quarantine included seeds of adzuki bean, cowpea, faba bean, French bean, mungbean, pea, *Phaseolus* spp., savi bean, soybean, urdbean and wild *Vigna* spp. and seedlings of flowering plants *viz.-Chrysanthemum* and *Lilium* (Table 1).

The economically important seed transmitted viruses that were intercepted and not yet reported from India are cowpea mottle carmovirus in cowpea imported from the Philippines and broad bean stain comovirus in broad bean from Bulgaria. Among other interceptions are the viruses that possess a number of virulent strains such as soybean mosaic potyvirus (SMV) in soybean from Brazil, Hungary, Nigeria, Taiwan and USA, pea seed-borne mosaic potyvirus (PSbMV) in pea from Australia, CIS (Russia), Columbia, Germany and The Netherlands, and in broad bean from Bulgaria, cowpea aphid-borne mosaic potyvirus (CAbMV) in cowpea from USA, bean yellow mosaic potyvirus (BYMV) in broadbean from Bulgaria and in *Phaseolus* spp. from Colombia and bean common mosaic potyvirus (BCMV) in beans from Columbia, CIS (Russia), Hungary, USA and Taiwan (Table 2).

The unidentified viruses in other legume crops are presented in Table 2. The plants showing typical viral symptoms were subjected to infectivity test, ELISA and electron microscopy to confirm the presence of viruses. The ELISA readings were quantified at 405 nm absorbance on a Dynatech or Biotech microplate reader. Samples having the absorbance value twice or more than twice

Table 1. Legume crops processed during 1991-2000 in quarantine for seed-transmitted viruses

Crop	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Asparagus bean	-	-	-	-	-	-	-	-	-	01
Crotolaria spp.	27	-	-	-	-	-	-	-	-	-
Dolichos spp.	08	-	02	-	-	-	-	-	-	-
Glycine spp.	113	131	102	09	99	520	220	222	177	1251
Lablab purpureus	-	04	-	-	-	-	-	-	-	-
Lathyrus spp.	43	133	-	45	01	48	34	-	-	-
Medicago spp.	-	-	-	-	-	-	07	-	-	-
Phaseolus spp.	242	28	47	-	82	222	78	12	-	09
P. lunatus	-	02	-	-	-	-	-	-	-	-
Pisum sativum	269	117	26	37	45	90	24	-	12	15
Psophocarpus tetragonolobus	16	04	-	-	-	04	-	-	-	-
Trifolium spp.	-	-	-	-	-	-	18	-	-	-
Wild *Vigna* spp.	-	39	-	23	-	38	-	-	-	-
V. aconitifolia	08	15	-	-	-	04	04	-	-	-
V. angularis	02	42	42	-	-	-	03	-	-	-
V. catjang	-	02	-	-	-	-	-	-	-	-
V. mungo	-	01	01	-	-	04	06	-	-	-
V. radiata	142	20	10	03	02	240	15	34	-	06
V. umbellata	-	01	-	-	-	04	08	-	-	-
V. unguiculata	62	31	69	42	17	241	34	-	-	124
Vicia spp.	163	180	62	60	60	76	08	-	36	-
Vicia faba	-	-	-	-	-	04	-	-	43	65
Other material										
Chrysanthemum spp.	-	-	-	-	-	-	-	-	271	-
Lilium spp.	-	-	-	-	-	-	-	-	154	-

Table 2. Viruses intercepted during post-entry quarantine isolation growing (1991-2000)

Crop	Interception	Source
Adzuki bean	Unidentified filamentous virus	Germany
Cowpea	Cowpea-aphid borne mosaic potyvirus	USA
	Cowpea mottle carmovirus*	Philippines
	Unidentified filamentous virus	USA
Faba bean	Pea seed borne mosaic potyvirus	Bulgaria
	Bean yellow mosaic potyvirus	Bulgaria
	Broad bean stain comovirus*	Bulgaria
French bean	Bean common mosaic potyvirus	Columbia, CIS, Hungary, USA
Lilium spp.	Carla-virus particles	Israel
Mung bean	Unidentified isometric virus	Germany, Indonesia, AVRDC (Taiwan)
	Bean common mosaic potyvirus	AVRDC (Taiwan)
Pea	Pea seed borne mosaic potyvirus	Australia, Bulgaria, Columbia, Germany, Holland, Syria
Phaseolus acutifolius	Unidentified filamentous virus	USA
Savi bean	Unidentified filamentous virus	France
Soybean	Soybean mosaic potyvirus	Brazil, Hungary, Nigeria, Taiwan, Thailand, USA

* Viruses not reported from India

the average values of the healthy control were considered as positive (infected) in ELISA.

During the quarantine processing, seeds showing mottling symptoms on seed coat in case of soybean and split seed coat symptoms in case of pea were removed as they were suspected to carry SMV and PSbMV, respectively. In the grow-out test, apparently infected seedlings were uprooted and destroyed or transplanted in isolation, thereby removing the potential source of virus infection.

The inadvertent introduction of viral diseases intercepted in imported seeds and planting material could thus be eliminated by deploying a combination of above mentioned virological techniques.

The post-entry quarantine growing facilitated in identifying the infected plants in a given accession, thus contributing in release of disease-free harvest of the same accession to the indentors. It may be noted that only the infected plants of an accession were rejected and never all the plants of an accession were found to be infected.

References

Hadidi A, RK Khetarpal and H Koganezawa (eds.) (1998) *Plant Virus Disease Control.* American Phytopathological Society (APS Press), St. Paul, Minnesota, USA, 684 p.

Khetarpal RK, DB Parakh, Shamsher Singh, Ram Nath, RK Jain and A Varma (1994) Bean Common Mosaic Virus detected by DAC-ELISA in exotic *Phaselous vulgaris* L. *Indian J. Virol.* **10:** 13-16.

Kumar CA, RK Khetarpal, DB Parakh, Shamsher Singh and Ram Nath (1994) *Check-List on Seed Transmitted Viruses: Leguminous Hosts. Tech. Bull. NBPGR*, New Delhi.

Parakh DB, RK Khetarpal, Shamsher Singh and Ram Nath (1994) Post-entry quarantine detection of soybean mosaic virus by ELISA in soybean germplasm. *Indian J. Virol.* **10:** 17-21.