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Identification of Peanut Stripe Virus Resistance in Wild Arachis Germplasm[1, 2]

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ABSTRACT

Fifty four wild *Arachis* germplasm accessions were evaluated for resistance to peanut stripe virus (PStV) by mechanical, aphid, and graft inoculations. Three weeks after inoculation, inoculated and subsequently produced leaflets of each entry were tested for PStV presence by enzyme-linked immunosorbent assay (ELISA). Peanut accessions in the section *Arachis*, *A. cardenasii* [ICG 11558 (PI 475998)] could not be infected by mechanical, aphid, and graft transmission tests, while *A. chacoense* [ICG 4983 (PI 276235)], *A. cardenasii* [ICG 11562 (PI 476012) and ICG 12168 (PI 476013)] and accessions of section Erectoides, A. sp. [ICG 11560 (PI 476004) and ICG 8215 (PI 468170)] and *A. paraguariensis* [ICG 8973 (PI 468176)], were infected by grafting, but not by aphid and mechanical inoculations.

Key Words: *Arachis* germplasm, resistance, peanut stripe virus, direct antigen coating - enzyme-linked immunosorbent assay, sap inoculation, aphid inoculation, graft inoculation.

Peanut stripe virus (PStV) is wide spread in the People's Republic of China, Indonesia, Thailand, Malaysia, and in the Philippines (2). In the USA PStV appears to be confined to institutional productions (2). In India PStV was first detected in 1987 on peanut genotypes entered in the All India Coordinated Research Project on Oilseeds (AICORPO) trials grown at several research stations (7). Surveys carried out subsequently showed the PStV was confined to experimental plots maintained by the research institutes but not on crops raised by farmers (8). The potential economic yield losses to peanut due to PStV infection have not yet been determined in India. Though Demski *et al.* (3) reported a yield loss of 21-23 percent in the USA, in field tests no significant yield loss was reported by Lynch *et al.* (6).

None of over 8000 *A. hypogaea* accessions maintained at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) were found to be resistant to PStV (5). Resistance to PStV was earlier reported in taxonomic sections of *Arachis* and Rhizomatosae (1). In this paper, additional sources of resistance to PStV are reported

Materials and Methods

Seeds of 54 test entries obtained from the germplasm unit of ICRISAT were pre-treated with thiram and were sown in plastic pots filled with sterilized soil. The plants were maintained in a screen house. A PStV isolate collected from Raichur, Karnataka state, India, maintained in *A. hypogaea* cv. TMV-2, was used for sap, aphid, and graft inoculations. Two-week-old test plants were sap inoculated with extracts from TMV-2 leaflets showing initial symptoms. Symptoms were recorded three weeks after inoculation. Both inoculated and subsequently formed leaflets from each entry were tested for PStV by direct antigen coating (DAC) enzyme-linked immunosorbent assay (ELISA) as described by Hobbs *et al.* (4). Test tissues were ground at a ratio of 1:50 (w/v) in an antigen buffer (carbonate buffer containing 0.01 M sodium diethyl dithiocarbamate). Crude antiserum diluted to 1:5000 was used. Rabbit Fc-specific immunoglobulins were added at a dilution of 1:1500. Absorbance values (405 nm) were determined with a Titertek Multiscan ELISA reader. Sap inculations and tests for PStV presence were repeated at least three times for accessions which could not be infected by a single sap inoculation.

Aphis craccivora colonies maintained on cowpea, *Vigna unguiculata* cv. C-152, were fasted for 6 h and then allowed an acquisition access of 10 min. Ten exposed aphids were released onto each of two week-old test plants and allowed an inoculation access period of 18 h. Later, plants were sprayed with 0.05% dimethoate to kill the aphids.

Cleft and petiole grafts with the scions obtained from the PStV-infected plants were used in graft inoculation tests, All aphid-and graft-inoculated test plants were assayed for PStV presence by DAC-ELISA.

Results and Discussion

Of the 54 accessions tested, seven accessions, four in the section *Arachis* (*A. cardenasii* [ICG 11558 (PI 475998), ICG 11562 (PI 476012), ICG (PI 476013)], *A. chacoense* [ICG 4983 (PI 276235)], and 3 in the section Erectoides A. sp. [ICG 11560 (PI 476004), ICG 8215 (PI 468170)] *A. paraguariensis* [ICG 8973 (PI 468176)] could not be infected with PStV despite repeated sap inoculations (Table 1). None of the seven accessions became infected with PStV by aphid inoculations. However, by graft inoculation, six of these seven accessions became infected. *A. cardenasii* accession

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Table 1. Wild *Arachis* germplasm accessions tested for resistance to peanut stripe virus during 1988-89.

Accessions	Sap inoculation[1]			Aphid inoculation[4]			Graft inoculation[5]		
	No. of plants inoculated	No. of plants infected[2]	ELISA[3] readings	No. of plants inoculated	No. of plants infected[2]	ELISA[3] readings	No. of plants inoculated	No. of plants infected[2]	ELISA[3] readings
ICG 4983	7	None	0.01	9	None	0.00	8	2	1.44
ICG 8215	10	None	0.02	7	None	0.01	7	3	1.51
ICG 8973	15	None	0.00	16	None	0.01	15	10	1.44
ICG 11558	9	None	0.01	10	None	0.00	8	None	0.01
ICG 11560	6	None	0.03	8	None	0.02	8	3	1.40
ICG 11562	10	None	0.01	9	None	0.01	9	4	1.46
ICG 12168	10	None	0.00	9	None	0.01	8	3	1.45
JL-24 (Control)	10	10	1.53	10	8	1.42	5	5	1.47
TMV-2 (Control)	10	10	1.51	10	8	1.45	5	5	1.41

1 Observations recorded after three successive sap inoculations.

2 Judged by typical symptoms.

3 Absorbance values at 405 nm. Represents average from all inoculated plants, after deducting from values for comparable uninoculated plant controls.

4 After ten minutes acquisition access ten insects were transferred onto each plant and allowed 18 h inoculation access period.

5 By cleft and petiole grafting.

ICG 11558 was not infected either by sap, aphid, or graft inoculation. Based on these results we consider ICG 11558 as immune to PStV and ICG 4983, ICG 8215, ICG 8973, ICG 11560, ICG 11562 and ICG 12168 as resistant to PStV. Culver *et al.* (1) reported PStV resistance in four accessions in the section *Arachis* (PI 46815141, PI 468142, PI 468144, PI 486345) and in three accessions in the section Rhizomatosae (PI 468174, PI 468363, PI 468366). All the resistant genotypes of the section Arachis are cross compatible with *A. hypogaea*, which would facilitate development of peanut cultivars with resistance to PStV. We are currently in the process of testing several interspecific hybrids derived from resistant genotypes.

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