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# Resistance to Peanut Mottle Virus in *Arachis* spp.[1]

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ABSTRACT

Seven wild rhizomatous peanut introductions [PI 262794, PI 262818, AM 3867, 'Florigraze' (PI 421707), PI 172223, 'Arbrook' (PI 262817), and 'Arblick' (PI 262839)] from the Plant Materials Center, Americus, Ga. were not infected with peanut mottle virus (PMV) by mechanical inoculation, aphid inoculation, or by natural infection when field planted near infected *Arachis hypogaea* L. These accessions are the only known sources of resistance to PMV in *Arachis*.

Key Words: groundnut, *A. hypogaea, A. glabrata,* epidemiology, plant introductions, *Aphis craccivora,* aphid inoculation.

The infection of peanuts (*Arachis hypogaea* L.) with peanut mottle virus (PMV) is a worldwide problem (1, 2, 6, 8, 16). In the southeastern United States, PMV causes economic losses (8, 10, 13) in peanuts that are second only to losses from Cercospora leafspots caused by *Cercospora arachidicola* Hori and *Cercosporidium personatum* (Berk. and Curt.) Deight. The primary virus source is seed transmission in peanuts (8) with subsequent spread to other plants by aphid vectors. Although epidemiological studies (3) have shown that the use of virus-free seed could reduce virus incidence, this practice has not been implemented in commercial peanut production.

One practical method of control is the use of resistant cultivars, but previous studies (9) could not identify a usable source of resistance in 465 Plant Introductions (P. I.) of *A. hypogaea*. Kuhn et. al. (11) reported tolerance in two PI peanut lines to PMV. This tolerance is based on little or no yield loss even though the plants are susceptible to systemic infection. Kousalya et al. (7) reported wild peanut species, including *A. glabrata* Benth., were not susceptible to a mosaic virus; however, based on their description (symptom expression in peanuts) this virus probably is not PMV.

In 1979 the authors toured the Plant Materials Center, Americus, GA where different *Arachis* spp. are propagated and maintained. We noted that certain accessions did not exhibit symptoms of virus infection compared to other *Arachis* spp. growing in proximity with typical PMV symptoms.

The purpose of this study was to evaluate selected lines of *Arachis* spp. for resistance to PMV.

## Materials and Methods

Selected wild rhizomatous peanut accessions; PI 262794, PI 262818, AM 3867, PI 421707, PI 172224, PI 262817, and PI 262839 were acquired from the Plant Materials Center, Americus, Georgia and increased by vegetative propagation in a greenhouse at Experiment, Georgia. Accession PI 262794 and PI 421707 are *A. glabrata,* PI 172224 is *Kerstingiella geocarpa* Harms, PI 262818, PI 262817 and PI 262839 are listed as *Arachis* sp. The accession AM 3867 was obtained from a roadside planting in Treutlen Co., GA. Plants of this accession resemble *A. glabrata.*

Two virus isolates were used in inoculation studies. One isolate was from a peanut growing in Mitchell, Co., GA and the other isolate was from white lupine (*Lupinus alba* L.) in Tift Co., GA. Both isolates were considered to be the mild strain (12) of PMV which is the most common in peanut plants grown in Georgia. These isolates were maintained in 'Little Marvel' pea (*Pisum sativum* L.).

Mechanical inoculations of the *Arachis* spp. and the cultivar 'Argentine' (*A. hypogaea*) were performed by triturating approximately 1 gm of PMV-infected pea leaf tissue in 1.0 ml of 0.025 M potassium phosphate buffer, pH 7.2. This crude sap was rubbed on silicon dioxide (600 mesh) dusted leaves of the recipient host using gauze pads. Each accession was inoculated with one isolate of the virus and then one week later inoculated with the second isolate.

The aphid inoculation of the *Arachis* spp. and 'Argentine' was with the vector *Aphis craccivora* Koch (14). Aphid inoculations were performed by placing a single aphid on a PMV infected 'Argentine' leaflet. After permitting a 1 min probe (observed under a binocular microscope) the aphid was transferred to the recipient host for one hour. The recipient hosts were maintained in the greenhouse for three weeks and then assayed for PMV infection by indexing on 'Topcrop' bean (*Phaseolus vulgaris* L.).

All PMV indexes were performed by mechanical inoculations to Topcrop bean as described by Kuhn (8).

## Results

Initial indexes from various plant introductions or *Arachis* spp. being propagated at Americus, GA, indicated that some entries may be resistant to PMV. The results of preliminary leaf sample index (number infected/number indexed) for the entries were: PI 262794 -0/10, PI 262818 -0/10, AM 3867 -0/21, 'Florigraze' (PI 421707) -0/24, PI 172224 -0/1, 'Arbrook' (PI 262817) -2/34, and 'Arblick' (PI 262839) -2/38.

Over 100 individual plants were vegetatively propagated in our greenhouse from each entry. A minimum of 33 and a maximum of 98 plants of each entry were mechanically inoculated with PMV. Indexing from these doubly inoculated plants indicated that none of the 434 plants were infected compared to 27 of 27 *A. hypogaea* 'Argentine' control plants becoming infected.

Inoculation of each entry using the vector *A. craccivora* resulted in 0 of 15 individual entry plants compared to 5 of 22 Argentine control plants becoming infected.

A minimum of seven and a maximum of 24 plants of each entry were randomly transplanted in a 0.2 ha. field of seeded *A. hypogaea* 'Florunner'. During the 3 mo. growing season the percentage of PMV infected plants increased from 1 to 43% of the seeded peanuts but none of the 90 transplanted entries became infected.

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## Discussion

Original leaf sample indexes from field increase material indicated that a small percentage of Arbrook and Arblick entries were infected with PMV. It is possible that volunteer peanuts or other peanut lines contaminated the large field planting from which the leaf samples were acquired for indexing.

Detailed studies on plants of the seven entries that were vegetatively propagated in the greenhouse confirmed that all entries carry resistance to PMV that approaches immunity. Virus could not be recovered from any entry after mechanical inoculation, vector inoculation, and field exposure where PMV was naturally spreading to other peanuts.

Most of the entries in this study may be *A. glabrata.* Reports (4, 15) have indicated successful crosses between *A. hypogaea and A. glabrata* but these could not be confirmed by other workers (5); however, efforts to hybridize these two species are in progress and the development of gene flow between these species is expected in the future.

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