https://doi.org/10.29321/MAJ.10.A03600

Studies on a New Mosaic Disease of *Phaseolus aureus* L.

by

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Introduction : An yellow mosaic of greengram was reported by Nariani (1960) from Delhi. The virus was transmitted by whitefly *(Bemisia tabaci)*. In 1966, a mosaic disease of greengram (*Phaseolus aureus* L.) was collected at Adaiyur in North Arcot District (Tamil Nadu). This disease varied in its symptoms from the one described from Delhi. Hence the disease was studied in detail and the results are presented in this paper.

Materials and Methods : The inoculum was prepared from a collection of the naturally infected greengram plants by crushing the young infected leaves in a pestle and and mortar with the phosphate buffer (pH 7.0) and passing the material through a cheese cloth. The sap inoculation was made by rubbing freshly extracted sap on leaves of healthy seedlings of greengram, previously dusted with carborundam powder. Insect transmission tests were made by using 10 numbers of adult aphids maintained in glass house. The aphids were starved for a period of 2 hours and then allowed to feed on young infected leaves for 30 minutes. Then the aphids were released on 10 healthy test plants and allowed to feed for 24 hours. The aphids were killed after the inoculation feeding and the test plants were kept in insect free glass house for further observation.

Results : *Transmission :* The virus was found to be transmitted easily by sap inoculation and the inoculated plants exhibited symptoms in 10 to 12 days. Three aphid species *viz.*, *Myzus persicae*, *Aphis gossypii* and *Aphis craccivora* failed to transmit the virus.

Symptomatology and Host range : Under field conditions the diseased plants exhibited slight stunting and reduction in the size of internodes. The infected leaves were smaller in size and showed mosaic mottling of light green to pale yellow patches interspersed with dark green areas.

The test plants on inoculation under glass house conditions exhibited the following symptoms. The first symptom observed was a faint clearing of the veins of young leaves which was followed by small chlorotic spots. The spots later coalesced forming light green areas alternating with dark green patches. In severe cases the leaf was reduced in size along with the shortening of the internode and stunting of the plant. Twenty two different host plants

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were tested for infection by the virus. Eight different plant species took infection and the symptoms exhibited by these plants are described below :

Host plants	Symptoms
Vicia faba	Small necrotic lesions on inoculated leaves.
Phascolus vulgaris vars. Yellow & Black	Exhibited lesions of a brownish necrotic type. In the latter, systemic infection was noticed after 15 days following local lesions.
Dolichos biflorus	Necrotic spots and veinal necrosis on the inoculated leaves. Subsequent leaves exhibited yellowing.
Chenopodium murale	Necrosis of the inoculated leaves which gradually wilt followed by abscission. The newly formed leaves exhibited severe mosaic, mottling, distortion and cupping.
Nicotiana companiculata	Chlorotic dots on the young leaves downward curling of leaves and top necrosis resulting in the death of the plant.
Petunia hybrida	Exhibited mild mosaic mottling on the young leaves.
Nicotiana rustica	Necrotic lesions of 2 to 4 m.m. on inoculated leaves. The leaves formed subsequently exhibited slight necrosis followed by top necrosis of the plant.
Chenopodium amaranticolor	Chlorotic local lesions of 1 mm. in size. The lesions turn red surrounded by a chlorotic halo.

The other plant species numbering fourteen *viz.*, *Crotalaria juncea*, *Medicago sativa*, *Cajanus cajan*, *Vigna sinensis*, *Cicer aurietinum*, *Pisum sativum*, *Phaseolus mungo*, *Nicotiana glutinosa*, *Physalis floridana*, *Nicandra physaloides*, *Solanum nigrum*, *Solanum indicum*, *Solanum auriculata* and *Solanum aculeatissimum* were not infected by this virus.

Properties of the virus : The thermal death point, dilution end point and longevity *in virto* of the virus were determined in the usual manner with freshly extracted sap from the leaves of the diseased plants, using *Chenopodium amaranticolor* as indicator plant. The virus was not inactivated even when it was heated for 10 minutes at 90°C. The virus was found to be infective even after dilution of 1 : 1000000. The longevity *in virto* was more than 4 days at 5°C.

Discussion : *Phaseolus aureus* was reported to be infected under field conditions by only one virus *viz.*, Yellow mosaic of greengram (Nariani, 1960). This virus was transmitted by the whitefly, *Bemisia tabaci*. The symptoms described are bright yellow patches interspersed with green areas on the leaves and slight puckering. However, six other viruses *viz.*, yellow mosaic of *Phaseolus lunatus* (Capoor and Varma, 1948), a virus disease of cowpea from Trinidad (Dale, 1949), mosaic disease of *Crotalaria mucronata* (Raychaudhuri and Pathanian, 1950), clover mosaic virus from New Zealand (Fry, 1959), top

necrosis virus of guar (Cooper, 1949) and bean mosaic virus from Delhi (Anon, 1962) were reported to infect *Phaseolus aureus* under artificial conditions. Of these viruses yellow mosaic of *Phaseolus lunatus* is transmitted by whitefly, *Bemisia tabaci* and bean mosaic virus reported from Delhi is transmitted by *Aphis evonymil*. The top necrosis of virus of guar has low thermal death point and dilution end point and infects *Nicotiana glutinosa, Datura stramonium* and cowpea and differs from the present virus described here. The clover mosaic virus of New Zealand differs in having a lower thermal inactivation point and infecting cowpea and pea. The mosaic disease of *Crotalaria mucronata* described from Delhi has a thermal inactivation point between 80° and 85°C and dilution end point between 1:20000 and 1:30000 and infects cowpea, blackgram and *Crotalaria juncea*. The cowpea mosaic virus of Trinidad also differs from this virus having a low thermal inactivation point of 66°C, having a leaf beetle as a vector and infecting cowpea and *Phaseolus mungo*. The virus reported in this paper differs from all the above viruses in having a thermal inactivation point above 90°C, a dilution end point above 1:1000000, not transmissible by aphids and infects a restricted range of hosts. This virus infects *Chenopodium amaranticolor, Vicia faba Nicotiana companiculata* and *Nicotiana rustica* causing local lesions and with necrosis in case of the later two host plants. This virus is tentatively indentified as a strain of tobacco mosaic virus.

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