

## ***Abelmoschus manihot* — A Source of Resistance to Bhendi Yellow Vein Mosaic**

Yellow Vein Mosaic is a serious virus disease of bhendi (*Abelmoschus esculentus* (L.) Moench), reported to occur all over the plains as well in the lower hills of India. Chelliah and Sellammal Murugesan (1975) reported that infection by this virus in 30 days old bhendi crop resulted in 88 per cent loss in yield. In India, the disease was first reported by Kulkarni (1924) and the viral nature of the disease was established by Uppal *et al.* (1940) who also named it as Yellow Vein Mosaic. The symptomatology and host range was described by Capoor and Varma (1950) and the transmission of this virus by the white fly, *Bemisia tabaci* Gen., was also established by these workers. Varma (1952, 1955) later studied the virus-vector relationship.

In attempting to identify resistant sources for the disease, Nariani and Seth (1958) reported the results of artificial tests with *Abelmoschus* spp. Their studies revealed that *A. manihot* var. *pungens* and *A. crinitus* could not be infected by the virus and proved to be highly resistant. Further studies by Singh *et al.* (1962) revealed that *A. manihot* var. *pungens* could not be made use of in resistance breeding with *A. esculentus* owing to the higher sterility of the hybrids. Hence the transfer of high resistance possessed by these species to cultivated bhendi remained unsolved for long time. The ruling bhendi variety 'Pusa Sawani' reported to be field resistant to the disease and a symptomless carrier of

the virus (Singh *et al.*, *loc cit*) also proved to be highly susceptible in Southern plains. With this background, further attempts were made to identify resistant sources and to exploit them in breeding resistant bhendi varieties to yellow vein mosaic and the results are reported in this paper.

During 1971, an African species of *Abelmoschus* was introduced from Ghana to Tamil Nadu Agricultural University, Coimbatore through the Division of Plant Introduction, New Delhi. The species was later identified by the Central National Herbarium, Howrah, as *A. manihot* (Linn.) Medicus. In 1973, another form of *A. manihot* was introduced from Japan which was in conformity with the description of *A. manihot* var. *adontodactylus* Bakh. These two sources along with the bhendi variety, Pusa Sawani were used in the present investigation.

Screening for resistance was carried out in the glass house as well as in the field under severe disease pressure. The plants were raised in pots and 40 days after sowing, each plant was grafted with an yellow vein infected scion of a bhendi cultivar, using side grafting technique. Under Coimbatore conditions, the intensity of yellow vein mosaic incidence was severe under natural field conditions from March to May. In view of this, the test plants were raised in the field in replicated rows during these months surrounded by a highly susceptible



bhendi cultivar to provide adequate virus source to the vector. A disease rating scale was used and the plants were rated as follows.

The results revealed that the two accessions of *A. manihot* received from Africa and Japan proved to be highly

resistant to the disease, as could be classified from the resulting symptoms after infection. However, if the scion of such infected plants was grafted again on a susceptible bhendi cultivar, the later developed disease symptoms in the African accession indicating that it serves as 'Symptomless carrier'.

Symptoms	Grade	Rating scale
No visible symptoms characteristic of the disease.	Highly Resistant	1
Very mild symptoms—basal half of the primary veins green; mild yellowing of anterior half of primary veins, secondary veins and veinlets. Infection is also seen late in the season under field conditions.	Resistant	2
Veins and veinlets turn completely yellow—interveinal area green and normal.	Moderately Resistant	3
Pronounced yellowing of veins and veinlets; 50% of the leaf lamina turned yellow; fruits exhibit slight yellowing.	Susceptible	4
Petiole, veins, veinlets and interveinal area turn yellow in colour; leaves start drying from the margin. Fruit turn yellow in colour.	Highly susceptible	5

The disease reaction in the test accessions by side grafting and epiphytotic conditions in the fields was as follows:

Species	Inoculation by grafting			Infection under epiphytotic condition		
	No. of plants inoculated	No. of plants infected	Mean disease rating	No. of plants observed	No. of plants infected	Mean disease rating
<i>A. esculentus</i> (L.) Moench (Pusa Sawani)	25	25	4.7	50	50	5.0
<i>A. manihot</i> (L.) Medicus (African source)	25	—	1.0	50	—	1.0
<i>A. manihot</i> var. <i>adontodactylus</i> Bakh. (Japanese Source)	25	—	1.0	50	—	1.0



In the absence of adequate degree of resistance to the disease in any of the bhendi cultivars tested, attempts were made to exploit the high resistance in *A. manihot* by interspecific hybridization using the bhendi cultivars. The viability of  $F_1$  seeds was quite normal although there was 90 per cent sterility in the subsequent generation. The study is being continued and the progenies of these crosses have been advanced to  $F_4$  and backcross  $F_3$  generations. This is possibly the first report on the high scope of exploiting the high resistance in *A. manihot* to Yellow Vein Mosaic, with the ultimate aim of developing a resistant bhendi cultivar.

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#### REFERENCES

- CAPOOR, S. P. and P. M. VARMA. 1950. Yellow Vein Mosaic of *Hibiscus esculentus* L. *Indian J. agric. Sci.* **20** : 217—30.
- CHELLIAH, S. and SELLAMMAL MURUGESAN. 1975. Estimation of loss due to yellow vein mosaic disease in bhendi. *Annamalai Univ. Agrl. Res. Annu.* **6 & 7** (In press).
- KULKARNI, G. S. 1924. Mosaic and other related diseases of crops in the Bombay Presidency. *Proc. 11th Science Cong. B.* **42** : 3.
- NARIANI, T. K. and M. L. SETH. 1958. Reaction of *Abelmoschus* and *Hibiscus* species to yellow vein mosaic virus. *Indian Phytopath.* **11** : 137—40.
- SINGH, A. B., B. S. JOSHI., P. KHANNA and P. S. GUPTA. 1962. Breeding for field resistance to yellow vein mosaic in bhendi. *Indian J. Genet. & Pl. Breed.* **22** : 137—44.
- UPPAL, B. N., P. M. VARMA and S. P. CAPOOR. 1940. Yellow Vein Mosaic of bhendi. *Curr. Sci.* **9** : 227—8.
- VARMA, P. M. 1952. Studies on the relationship of bhendi yellow mosaic virus and its vector, the white fly (*Bemisia tabaci*). *Indian J. agric. Sci.* **25** : 75—91.
- VARMA, P. M. 1955. Persistence of yellow vein mosaic virus of *Abelmoschus esculentus* (L.) Moench in its vector, *Bemisia tabaci*. *Indian J. agric. Sci.* **25** : 293—302.