

INHERITANCE OF RESISTANCE TO YELLOW VEIN MOSAIC VIRUS IN OKRA (*ABELMOSCHUS ESCULENTUS* (L.) MOENCH)

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ABSTRACT

The inheritance of resistance to yellow vein mosaic virus (YVMV) in okra was studied in crosses involving three resistant parents (Arka anamika, Punjab padmini and Arka abhay) and three susceptible parents (Pusa sawani, Local and Pusa makhmali). The parents, F₁, F₂, BC₁ and BC₂ generations were grown along with Pusa makhmali as spreader rows. Artificial inoculation under field conditions with okra YVMV was done through the bud grafting. The inheritance pattern studies by χ^2 test suggested that resistance to YVMV was controlled by two complementary dominant genes in susceptible \times susceptible (S \times S) and susceptible \times resistant (S \times R) crosses whereas in resistant \times resistant (R \times R) crosses by two duplicate dominant genes.

Key words: *Abelmoschus esculentus*, yellow vein mosaic, resistance, inheritance

Yellow vein mosaic is a serious disease of okra. It was first reported in Bombay as early as 1924 [1]. Handa [2] established okra YVMV to be a Gemini virus. In the Indian subcontinent the virus is now wide spread in the sub-tropical regions in the rainy season crop and in tropical regions in the spring summer crop [3]. The disease is spread by an insect vector (*Bemisia tabaci* Genn.) and through bud graftings [4]. The disease cannot be controlled satisfactorily by insecticide application, antibiotics and antiviral chemicals.

For developing high yielding YVMV resistant varieties of okra, it is essential to identify the sources of resistance and study the inheritance of resistance. Only a few reports are available on the inheritance of YVMV resistance in okra.

MATERIAL AND METHODS

The present study comprised of six parental lines of which three namely Arka anamika, Punjab padmini and Arka abhay are resistant and three viz. Pusa sawani,

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Local and Pusa makhmali are susceptible to yellow vein mosaic. These selected lines were crossed during summer 1993 in a diallel fashion to obtain 15 straight single crosses. During rabi 1993, these 15 F₁'s were back crossed to both female and male parents to obtain 15 BC₁ and 15 BC₂ generations and simultaneously the F₁'s were selfed to obtain F₂'s.

The seeds of F₁, F₂, back crosses (BC₁ and BC₂) along with the respective parent of all crosses were sown separately in a randomised block design with three replications in Kharif, 1994 for evaluated under epiphytotic conditions. Bud graft technique with Pusa makhmali as donar was adopted under field conditions throughout the study for screening large numbers of plants to confirm the reaction to yellow vein mosaic. The buds procured from yellow vein mosaic infected Pusa makhmali (exhibited 100% infection) were grafted on parental lines and their F₁'s and on the plants in the segregating generations (F₂, BC₁ and BC₂) for confirming their reaction to yellow vein mosaic. The disease reaction was recorded on all the plants. Observations on disease reaction were taken after bud grafting inoculation when the susceptible varieties had 100% infection. The virus rating 0 was considered resistant and from 1 to 5, all susceptible [5]. Observations recorded in the segregating generations were subjected χ^2 test for goodness of fit.

RESULTS AND DISCUSSION

Of the 15 crosses the segregation pattern of the nine crosses with the parental combinations involving S \times R and R \times R crosses fitted into 9 (Resistant) : 7 (Susceptible) ratio which was confirmed by their corresponding test cross and also by the non-significant χ^2 values of the deviations and heterogeneity tests, while three S \times S crosses (susceptible reaction) fitted in to 7 (resistant) : 9 (susceptible) ratio which was confirmed by their corresponding test crosses and also by the non-significant χ^2 values of the deviation and heterogeneity tests indicating involvement of two complementary dominant genes for inheritance of YVMV resistance.

The segregation pattern of three crosses viz., Arka anamika \times Punjab padmini, Arka anamika \times Arka abhay showed good fit to 15:1 ratio which was confirmed by their corresponding test cross and also by the non-significant χ^2 values for the deviation and heterogeneity tests.

Segregation pattern for disease reaction in F₂ generation of 3 crosses (S \times S combinations) and segregation pattern of nine crosses (S \times R combination) suggested the existence of two genes, resistant was found to be governed by two complimentary dominant genes when S \times S and S \times R combinations are involved. The present findings were in conformity with the results of Sharma and Dhillon [5] and Thakur [6] who proposed that resistant to YVMV disease in *Abelmoschus esculentus*: *Abelmoschus*

Table 1. Chisquare test for different genetic ratios in crosses involving YVMV disease resistant and susceptible parents of okra

Cross	Genetic ratio of R ₂ plants				Genetic ratio of Test cross plants		
	Code	Genetic ratio	X ²	P-range	Genetic ratio	χ ²	P-range
Pusa sawani × Local	S × S	7:9	1.64	0.3-0.2	3:1	1.79	0.2-0.1
Pusa sawani × Pusa makhmali	S × S	7:9	1.76	0.2-0.1	3:1	0.73	0.5-0.3
Local × Pusa makhmali	S × S	7:9	0.69	0.8-0.7	3:1	0.76	0.5-0.3
Pusa sawani × Arka anamika	S × R	9:7	0.55	0.5-0.3	3:1	2.24	0.2-0.1
Pusa sawani × Punjab padmini	S × R	9:7	0.84	0.5-0.3	3:1	1.71	0.2-0.1
Pusa sawani × Arka abhay	S × R	9:7	0.38	0.7-0.5	3:1	0.04	0.9-0.8
Local × Arka anamika	S × R	9:7	1.08	0.3-0.2	3:1	1.24	0.3-0.2
Local × Punjab padmini	S × R	9:7	0.64	0.5-0.3	3:1	2.52	0.2-0.1
Local × Arka abhay	S × R	9:7	0.61	0.5-0.3	3:1	1.05	0.5-0.3
Pusa makhmali × Arka anamika	S × R	9:7	1.08	0.3-0.2	3:1	1.05	0.5-0.3
Pusa makhmali × Punjab padmini	S × R	9:7	0.64	0.5-0.3	3:1	1.01	0.5-0.3
Pusa makhmali × Arka abhay	S × R	9:7	0.98	0.5-0.3	3:1	0.36	0.7-0.5
Arka anamika × Punjab padmini	R × R	15:1	2.03	0.2-0.1	3:1	0.50	0.8-0.7
Arka anamika × Arka abhay	R × R	15:1	0.53	0.5-0.3	3:1	0.66	0.9-0.8
Punjab padmini × Arka abhay	R × R	15:1	1.46	0.3-0.2	3:1	0.64	0.5-0.3

S = Susceptible; R = Resistant; P = Probability

Table 2. Partitioning of total chi-square into deviation and heterogeneity components for crosses showing different genetic ratios

Source	Expected genetic ratio in								
	F ₂						Test Cross		
	9:7			15:1			3:1		
d.f.	Frequ-ency	Proba-bility	d.f.	X ²	Proba-bility	d.f.	X ²	Proba-bility	
Deviation	1	0.023	0.90-0.80	1	0.362	0.70-0.50	1	0.376	0.70-0.50
Heterogeneity	11	10.857	0.50-0.30	2	3.665	0.20-0.10	14	14.124	0.50-0.30
Total	12	10.880	-	3	4.027	-	15	14.500	-

Manihot was conditioned by two complimentary dominant genes. Sadasiva [7] reported that YVMV resistance in okra is imparted only when at least one of the genes is in homozygous condition.

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