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Short communication

Identification of new resistant sources for yellow vein mosaic virus disease of Okra (*Abelmoschus esculentus* L.)

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Okra production got major setback due to the severe incidence of yellow vein mosaic disease caused by Gemini virus in India. The existing commercial varieties/ hybrids are vulnerable to yellow vein mosaic disease. It has been observed that, degree of resistance varies from locality to locality and season to season. The different virus strains and vector strains plays an important role in expression of disease. The available commercial varieties/hybrids are highly susceptible to the YVMV. The infested plants bears whitish yellow fruits, which are not fit for marketing and therefore, farmers suffers from economic losses. Efforts made by number of scientists for identification of resistant sources (Prabhu *et.al.*, 2007). However, so far, reported sources do not show consistent performance under different agro climatic conditions. Therefore, present investigation was undertaken to identify resistant/tolerant sources against yellow vein mosaic disease in okra.

The field screening was carried out during Kharif and Summer seasons of 2004-2007 at Research and Development Center of NARD Foundation, Bhadgaon – Jalgoan (MS). About 35 stable newly developed okra lines were included for studies. The highly susceptible variety Pusa Sawani was used as spreader variety (check) and it was sown along the border row and also intermittently at every 10 rows. All the entries were screened against yellow vein mosaic virus under field condition for four consecutive years (2004-2007). The disease incidence was recorded at fifteen days interval upto final harvesting based on following severity grade assigned i.e. 0% = Absent (1), 1-5%=Mild (2), 6-10%=Moderate (3), 11-25%=Severe (4), and >25=Highly severe (5) as recommended by Batra and Singh (2000). The experiment was laid out in a randomized block design (RBD) with two replications. Highly susceptible Pusa Sawani was grown in augmentation pattern for providing uniform YVMV infections. Recommended agronomical practices were followed to raise good crop. The reaction to YVMV was assigned according to Prabhu et al (2007). The observations were recorded during respective seasons i.e. Kharif and summer. Numbers of infected plants were counted at 15 days interval and percent incidence was calculated.

The promising genotypes were also screened for confirmation to yellow vein mosaic infection using recommended two techniques like graft inoculation and vector transmission.

Graft inoculation was carried out in the polyhouse at Nirmal Research Agricultural Research and Development Foundation. Infected plants were used for the collection of inoculum of virus infected plants. Twenty one days old plants from the germplasm were graft inoculated. About 2 cm. scion obtained from YVMV infected plants (Samarjeeva and Rathnayaka, 2004) were used for grafting. Four weeks after grafting, disease symptoms were observed and infected plants recorded to workout disease percentage.

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Ten plants from each genotype were used for vector transmission experiment. For the culture of white files, twenty infected plants were maintained in insect proof net house. White files were reared by collecting 200 insects from the Brinjal field, which was maintained in an insect proof net cage. White files released when plants were three-weeks-old and subsequently observations were recorded after four weeks onwards at every alternate day.

Data presented in Table 1 indicated that disease incidence was ranged from 0 to 98.92 per cent. In general, the disease incidence was more in summer than kharif season. The per cent disease during kharif (Av. four seasons) ranged from 0 to 58.64 per cent and in summer it varied from 0 to 98.92 per cent. It was also observed that NOL-285 (0.0%) was found highly resistant which remained free from YVMV in all eight seasons. Its performance was consistent. While NOL-303 (9.94%) and NOL-145 (10.29%) were showed moderate

Table 1: Percent incidence of YVMV (2004-2007) in okra under field conditions (mean of three years (2004-07) in percent

Sr. No.	Genotypes	incidence YVMV %		YVMV (over all mean %)	Severity Grade	OYVMV Reaction
		Kharif	Summer			
1	NOL-364	7.06	26.8	16.93	4	S
2	NOL-362	18.34	39.53	28.93	5	HS
3	NOL-356	15.01	30.64	22.82	4	S
4	NOL-354	15.44	58	36.72	5	HS
5	NOL-346	23.15	48.81	35.98	5	HS
6	NOL-342	8.68	47.82	28.25	5	HS
7	NOL-321	44.94	58.53	51.73	5	HS
8	**NOL-303**	1.55	18.33	9.94	3	M
9	NOL-302	9.91	30.12	20.02	4	S
10	NOL-300	11.18	38.06	24.62	4	S
11	**NOL-285**	0	0	0	1	R
12	NOL-284	21.02	52.12	36.57	5	HS
13	NOL-281	12.78	25.94	19.36	4	S
14	NOL-277	50.83	79.33	65.08	5	HS
15	NOL-262	5.41	38.72	22.07	4	S
16	NOL-260	4.08	30.43	17.25	4	S
17	NOL-258	19.81	52.47	36.14	5	HS
18	NOL-249	15	43.16	29.08	5	HS
19	NOL-234	6.02	38.13	22.07	5	HS
20	NOL-231	7.99	27.25	17.62	4	S
21	NOL-222	17.3	37.31	27.3	5	HS
22	NOL-215	14.47	32.69	23.58	4	S
23	NOL-212	30.2	22.32	26.26	5	HS
24	NOL-188	6.41	45.8	26.11	5	HS
25	NOL-178	10.98	41.27	26.13	5	HS
26	NOL-170	7.33	43.44	25.38	5	HS
27	NOL-162	40.18	34.15	37.17	5	HS
28	NOL-52-1	20.92	44.45	32.68	5	HS
29	NOL-101	32.96	38.43	35.7	5	HS
30	**NOL-145**	6.19	14.39	10.29	3	M
31	NOL-152	16.86	44.62	30.74	5	HS
32	NOL-156	9.34	34.41	21.87	4	S
33	NOL-157	6.42	42.06	24.24	4	S
34	NOL-159	7.98	43.16	25.57	5	HS
35	NOL-2-1	3.04	28.56	15.8	4	S
36	Parbhani Kranti (C)	55.24	98.92	77.08	5	HS
37	Pusa Sawani (C)	58.64	63.41	61.02	5	HS
38	P-7 (C)	31.24	68.22	49.73	5	HS
39	VRO-4 (C)	36.18	75.27	55.72	5	HS

Table 2: Per cent of disease free yellow vein mosaic virus (YVMV) population under different screening techniques.

Genotype	Percentage		
	Field screening	Grafting	Vector transmission
NOL-364	83.07	70.00	61.00
NOL-303	90.06	75.00	70.00
NOL-285	100.00	100.00	100.00
NOL-260	82.75	65.00	61.00
NOL-231	82.35	31.00	37.00
NOL-52-1	67.32	47.00	28.00
NOL-145	90.71	27.00	38.00
NOL-2-1	84.20	30.00	51.00
Parbhani Kranti	22.92	15.00	20.00
Pusa Sawani	38.98	17.00	23.00

reaction. On other hand, NOL-2-1 (15.8%), NOL-364 (16.93%) and NOL-260 (17.25%) showed severe reaction. While, NOL-277 (65.08%), NOL-321 (51.73%) and NOL-354 (36.72%) showed highly susceptible reaction against yellow vein mosaic virus. A report of Batra and Singh (2000) and Prabhu et al (2008) also revealed that incidence of YVMV varied cultivar to cultivar which supports our findings.

Data presented in Table 1 also revealed that the severity of YVMV varies from season to season and year to year especially in respect of most of the genotypes which do not exhibit stable resistance. It was also observed that wide range of disease intensity and variation differed from location to location. It has been observed that genotype showing almost no incidence in one year exhibited disease incidence in another year in same season. The varying level of disease severity could be attributed to the climatic conditions especially temperature and humidity and which directly influenced on the vector (white fly) population (Samarjeewa and Rathnayaka, 2004).

The different screening techniques employed for confirmation of resistance i.e. graft inoculation and virus transmission method, the genotype NOL-285 exhibited completely resistance to YVMV. This genotype proved its ability to resist YVMV disease and could be incorporated in crop improvement programme. Somewhat variation in observation of field screening and under different condition showed that YVMV resistant was not stable for some genotypes as also stated by Samarajeewa and Rathnayale (2004). But interestingly, NOL-303, NOL-364 showed significant disease reaction under grafting & vector transmission technique (Table 2).

In present investigation it was observed that percent yellow vein mosaic virus incidence was higher in summer than that of Kharif at consecutive years. Therefore, there is prominent variation due to environmental conditions. Prabhu et al (2007) also reported that that YVMV in okra had significant co relation with temperature, white fly population, relative humidity which supports our finding.

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