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Evaluation of okra germplasm for their reaction to whitefly, *Bemisia tabaci* and Okra yellow vein mosaic virus (OYVMV)

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Abstract
Field screening studies for the whitefly and OYVMV resistance were conducted with 25 okra germplasm accessions during summer season of 2015 and 2016 at National Bureau of Plant Genetic Resources (NBPGR) Regional Station, Rajendranagar, Hyderabad. Lowest mean population of whiteflies was recorded in PSRJ-12952 (2.24), IC344598 (2.49) and RJR-124 (2.99), while PSRJ-13040 and RJR-193 recorded the highest number of whiteflies with a mean population of 10.79 and 9.67 whiteflies per 3 leaves. Among the okra accessions screened, one wild accession IC344598 and two cultivated accessions *viz.*, PSRJ-12952 and RJR-124 did not show any signs of OYVMV infection throughout the crop period and exhibited immune reaction (0%) and recorded maximum yield. Okra accessions, PSRJ-13040 and RJR-193 exhibited a highly susceptible reaction, recording 84.16 and 83.33 per cent OYVMV incidence, respectively and also recorded lowest yield.

Keywords: Okra germplasm, whitefly, yellow vein mosaic disease, screening

Introduction
Okra (*Abelmoschus esculentus* L.), commonly known as bhendi, belongs to the family Malvaceae, is one of the important vegetable crops cultivated throughout India [10]. The production and quality of okra fruits are affected by an array of sucking and fruit boring pests from sowing until harvest. The key sucking pests of okra are whiteflies, aphids, jassids, thrips and mites [3]. Among the sucking pests, whitefly, *Bemisia tabaci* Gennadius causes economic damage to okra by feeding on phloem sap, there by contaminating leaves and fruits with honey dew that causes sooty mould formation [11]. Besides causing direct damage, it also transmits an economically important viral disease caused by *Okra yellow vein mosaic virus* (OYVMV), resulting in significant yield losses especially when it occurs in the early stages of crop growth [16, 9]. As compared to healthy plants, diseased plants showed a reduction of 24.9% in plant height, 15.5% decrease in root length, and 32.1% in number of fruits per plant, whereas stem girth was reduced by 16.3% [19].

OYVMV belongs to the genus *Begomovirus* of the family Geminiviridae. Geminiviruses make up a large diverse family of plant viruses and cause heavy crop losses worldwide [24]. Besides this, the rainy season crop in the subtropical regions and spring summer crop in tropical regions of India are highly vulnerable to the attack of OYVMV disease [17]. A roving survey conducted in the okra growing areas of Karnataka, Andhra Pradesh, Tamil Nadu, Kerala, Maharashtra, Haryana, Uttar Pradesh, Delhi, Chandigarh and Rajasthan revealed that the disease incidence caused by OYVMV ranged from 23.00 to 67.78 per cent [25]. The disease is characterized by different degrees of chlorosis and yellowing of veins and veinlets, smaller leaves, fewer and smaller fruits and stunting [26].

Efforts were made by number of scientists for identification of resistant sources against OYVMV [13, 7, 15]. Several OYVMV resistant okra varieties have been released, but none of them had retained resistance for long [23]. Wild species of okra have stable and reliable sources of resistance to OYVMV. These include primarily *A. manihot, A. angulosus, A. crinitus, A. vitifolius, A. tuberculatus, A. panduraeformis, A. pungens* and *A. tetraphyllus* [21]. Therefore, the ideal way of controlling this viral disease in okra would be to develop the resistant cultivars against the virus as well as the vector. Hence, the present study was undertaken to screen okra accessions to identify resistant sources against whitefly vector and YVMV disease incidence.

Materials and methods

The present field experiment was conducted during the summer 2015 and 2016 at National Bureau of Plant Genetic Resources (NBPGR) Regional Station, Rajendranagar, Hyderabad. Twenty-five okra germplasm accessions consisting of 10 wild accessions, 13 cultivated accessions and 2 commercial varieties as susceptible (Pusa Sawani) and resistant check (Parbhani Kranti) were screened to find out the resistance sources against whitefly and OYVMV. Of these, 10 accessions were procured from NBPGR Regional Station, Akola, Maharashtra, 13 accessions from NBPGR Regional Station, Hyderabad and the susceptible and resistant checks were procured from Nuziveedu Seeds Pvt Ltd (NSL), Hyderabad. Each germplasm accession was raised in 2 rows of 6 m each with a spacing of 60 × 30 cm and 3 replications were maintained for each treatment. The crop was raised as per the recommended package of practices except taking plant protection measures.

The performance of okra germplasm accessions against whitefly was recorded by counting the number of whiteflies from five randomly selected and tagged plants in each replication including susceptible and resistant checks. OYVMV infestation was recorded based on the disease symptoms of OYVMV and damage score (0-6 scale) was used for grading the per cent disease incidence [2]. The germplasm accessions were categorized based on the damage score. The damage score was calculated based on the mean per cent disease incidence recorded at vegetative and flowering stage [20]. Based on the severity of OYVMV incidence, the germplasm accessions were grouped into different categories based on 0-6 scale (0 = immune (No plants showing any symptoms); 1 = Highly resistant (1-10% plants exhibiting symptoms); 2 = Moderately resistant (11-25% plants exhibiting symptoms); 3 = Tolerant (26-50% plants exhibiting symptoms); 4 = Moderately susceptible (51-60% plants exhibiting symptoms); 5 = Susceptible (61-70% plants exhibiting symptoms); 6 = Highly susceptible (71-100% plants exhibiting symptoms). The various yield parameters such as number of fruits, fruit weight was recorded in five selected plants of each replication of the treatment.

Statistical analysis

The data recorded from different okra germplasm on the population counts of whitefly, percent disease incidence (PDI) of BYVMV were analyzed statistically by using factorial RBD concept. The effect of whitefly and OYVMV incidence on yield parameters like fruits per plant and yield were studied statistically by using the simple randomized block design (RBD).

Results and Discussion

Screening of okra germplasm under field conditions was taken up against the whitefly and OYVMV to identify the resistant donors for utilization in breeding programme.

Reaction of okra germplasm against whitefly

The results obtained from the pooled data on the evaluation of okra germplasm accessions against whiteflies during summer 2015 and 2016 are presented in Table 1.

Table 1: Screening of okra germplasm against whitefly under field conditions during summer 2015 and 2016 (pooled data)

Okra germplasm	Whitefly population per 3 leaves										
	Standard weeks										
	14	15	16	17	18	19	20	21	22	23	Mean
Wild accessions											
IC141020	3.33	5.66	6.16	7.00	8.66	6.66	4.50	3.16	1.49	0.50	4.71
IC433597	2.83	4.50	5.49	7.00	7.00	5.50	4.66	3.33	2.66	1.33	4.43
EC305672	3.83	4.00	5.66	8.66	6.16	3.83	3.66	3.50	2.66	1.50	4.34
IC433438	2.50	4.66	4.16	4.83	5.50	4.50	4.33	3.00	1.16	0.66	3.33
IC433667	3.66	5.66	4.83	7.50	7.66	8.00	4.50	3.83	2.00	1.66	4.93
EC305619	5.83	10.99	8.50	8.99	13.16	11.49	5.16	4.16	4.00	2.66	7.49
EC305736	6.00	9.33	5.00	8.66	11.49	12.16	4.66	4.33	3.33	2.50	6.74
NIC9402	2.00	3.33	3.99	7.16	5.50	8.33	4.33	3.66	1.83	1.16	4.12
IC344598	0.99	1.83	2.00	4.50	5.33	4.00	2.16	2.16	1.16	0.83	2.49
IC 90402	4.33	4.33	4.16	7.00	11.16	7.50	5.33	3.66	3.83	1.99	5.32
Cultivated accessions											
PSRJ-13040	8.16	10.99	10.16	12.66	16.33	14.49	11.16	10.16	7.83	5.99	10.79
PSR-J12952	1.83	1.83	2.33	3.83	4.66	2.66	2.00	0.99	0.99	0.33	2.24
RJR-265	5.50	4.83	5.49	9.33	9.99	10.50	6.66	6.16	6.33	4.5	6.92
RJR-193	8.00	9.99	9.83	12.16	14.83	11.99	9.99	8.66	6.16	5.16	9.67
RJR-124	1.83	3.50	3.16	5.33	4.99	3.50	2.83	2.33	1.66	0.83	2.99
RJR-479	5.66	7.49	7.50	9.66	9.66	10.50	9.50	6.33	4.83	3.5	7.46
RJR-279	5.66	5.00	5.66	8.49	6.33	8.00	5.83	5.00	5.83	3.66	5.94
RJR-405	4.65	4.83	6.66	7.83	8.33	9.16	7.00	4.66	3.83	3.66	6.06
RJR-587	7.33	8.5	7.99	9.66	14.16	11.16	7.66	7.16	5.83	4.16	8.36
RJR-670	5.33	6.33	5.83	6.99	11.66	8.16	7.16	5.49	5.66	2.83	6.54
RJR-110	3.95	5.50	4.66	9.16	8.49	7.50	4.66	4.00	3.66	2.49	5.40
RJR-45	5.16	7.16	5.66	8.66	12.50	9.83	5.16	3.16	4.49	2.16	6.39
NSJ-401	3.00	4.99	4.00	6.49	4.50	5.50	5.83	3.00	2.66	1.66	4.16
Pusa Sawani*	6.33	6.00	7.49	9.50	11.66	7.50	5.83	5.00	4.83	3.15	6.72
Parbhani Kranti**	3.33	3.50	3.66	4.66	5.66	4.49	3.33	2.66	3.49	1.66	4.64
Mean	4.44	5.60	5.79	7.87	8.93	7.87	5.51	4.38	3.68	2.42	-

Factors	S.Em±	C.D at 5%
Germplasm (A)	0.16	0.51
Standard weeks (B)	0.38	1.22
Factor (A X B)	0.97	3.06

*Susceptible check **Resistant check

Of the 25 okra germplasm accessions screened, the lowest mean population of whiteflies was recorded in PSRJ-12952 (2.24), IC344598 (2.49), RJR-124 (2.99) and IC433438 (3.33) and were on par with each other. The germplasm accessions, PSRJ-13040 and RJR-193 recorded the highest number of whiteflies with a mean population of 10.79 and 9.67 whiteflies per 3 leaves as compared to the susceptible check, Pusa Sawani (6.72). Thus PSRJ-13040 and RJR-193 were regarded as highly preferred accessions by whiteflies.

The whitefly population counts recorded during different standard weeks indicated that though the population was less during the initial stages *i.e*. during 14th (4.44) and 15th (5.60) std. weeks, they reached to peak population level during 18th std. week (8.93) and recorded lowest population of 2.42 whiteflies per 3 leaves at the end of the crop growth period *i.e* during 23rd std. week.

From the present results, it is evident that the whitefly population showed differential preference to okra germplasm and both the germplasm as well as crop age significantly influenced the whitefly population. It was observed that two cultivated accessions *viz.*, PSRJ-12952, RJR-124 and most of the wild okra accessions were less preferred by whiteflies compared to the other cultivated accessions. The present findings are in agreement with another study on okra germplasm reaction to whitefly population [12] which revealed that the wild accessions, *viz*., *A. moschatus* and *A. angulosus* were found to have minimum mean whitefly population per leaf, while maximum population per leaf in cultivated *A. esculentus* cultivars. Similar results were reported by a trail conducted on the okra germplasm reaction to whiteflies [8] which noted that wild okra germplasm accessions *viz.*, IC331217, IC332453 and IC342075 and cultivars *viz.*, Manisha-211 and Arka Anamika were negligibly preferred over other genotypes/cultivars by whiteflies. The lowest whitefly population was recorded in Parbhani Kranti and Namdhari, (0.15/ plant) followed by Arka Anamika (0.21/ plant), respectively [22].

Reaction of okra germplasm against OYVMV

The results obtained from the pooled data on the evaluation of germplasm accessions against OYVMV during summer 2015 and 2016 are presented in Table 2.

Table 2: Screening of okra germplasm against OYVMV under field conditions during summer, 2015 and 2016

Okra germplasm		Per cent disease incidence					
		Days after sowing (DAS)					
		Summer 2015		Summer 2016		Summer 2015 and 2016	
		45 DAS	60 DAS	45 DAS	60 DAS	45 DAS	60 DAS
Wild accessions	IC141020	0.00	0.00	0.00	16.66	0.00	8.33
	IC433597	0.00	0.00	0.00	15.00	0.00	7.50
	EC305672	12.00	28.00	46.00	88.33	29.00	58.16
	IC433438	0.00	0.00	0.00	18.00	0.00	9.33
	IC433667	0.00	0.00	0.00	18.33	0.00	9.16
	EC305619	12.33	36.66	50.66	83.33	31.49	59.99
	EC305736	14.00	28.33	54.33	86.66	34.16	57.49
	NIC9402	0.00	0.00	0.00	11.66	0.00	5.83
	IC344598	0.00	0.00	0.00	0.00	0.00	0.00
	IC 90402	11.66	23.66	53.33	81.66	32.49	52.66
Cultivated accessions	PSRJ-13040	36.00	68.33	88.33	100.00	62.16	84.16
	PSR-J12952	0.00	0.00	0.00	0.00	0.00	0.00
	RJR-265	18.33	48.33	74.66	98.33	46.49	73.33
	RJR-193	30.66	66.66	85.00	100.00	57.83	83.33
	RJR-124	0.00	0.00	0.00	0.00	0.00	0.00
	RJR-479	14.66	38.33	70.66	80.66	42.49	59.49
	RJR-279	20.33	38.66	76.00	92.33	48.16	65.49
	RJR-405	15.33	28.33	72.33	90.00	43.83	59.16
	RJR-587	14.00	35.00	75.33	91.00	44.66	63.00
	RJR-670	12.33	23.33	66.33	90.66	39.33	56.99
	RJR-110	12.66	21.66	64.66	89.00	38.66	55.33
	RJR-45	12.33	25.00	60.33	85.00	36.33	55.00
	NSJ-401	0.00	11.66	0.00	53.33	0.00	37.49
Check Varieties	Pusa Sawani*	25.00	51.66	85.33	98.66	55.16	75.16
	Parbhani Kranti**	16.66	33.33	70.33	90.33	43.49	61.83
	Mean	11.13	23.87	43.73	63.17	27.43	43.52
	S. Em.±	0.48	0.54	0.36	0.25	0.57	0.46
	C.D. at 5%	1.57	1.69	1.19	0.81	1.76	1.49

*Susceptible check **Resistant check

Screening studies indicated that at 45 DAS, six wild accessions *viz.*, IC141020, IC433597, IC433438, IC433667, NIC9402 and IC344598 and three cultivated accessions *viz.*, NSJ-401, PSRJ-12952, RJR-124 did not show any signs of OYVMV infection and exhibited 0% incidence. Highest per cent disease incidence was recorded in PSRJ-13040 followed by RJR-193, which were at par with the susceptible check.

Observations taken at 60 DAS revealed that out of 25 okra germplasm accessions, one wild accession IC344598 and two cultivated accessions *viz.*, PSRJ-12952, RJR-124, which did not show any signs of OYVMV infection at 45 DAS, continued to show superior performance and were completely free from OYVMV incidence. Highest per cent disease incidence was recorded in PSRJ-13040 (84.16) followed by RJR-193 (83.33) while the PDI recorded in resistant and susceptible check was 61.83 and 75.16, respectively.

Based on the mean per cent disease incidence recorded at 60 DAS from the pooled data of germplasm evaluation against OYVMV during 2015 and 2016 (Table 3), the accessions were classified into six categories *viz.*, immune (0 PDI), highly resistant (1-10 PDI), moderately resistant (11-25 PDI), tolerant (26-50 PDI), moderately susceptible (51-60 PDI), susceptible (61-70 PDI) and highly susceptible (71-100 PDI). One wild accession, IC344598 and two cultivated accessions *viz.*, PSRJ-12952, RJR-124 did not show any signs of OYVMV infection throughout the crop period and exhibited immune reaction (0%). Five wild accessions *viz.*, NIC9402, IC433597, IC141020, IC433667 and IC433438 exhibited highly resistant reaction. NSJ-401 (cultivated accession) registered the tolerant reaction with 37.49% OYVMV incidence. Nine accessions IC90402, RJR-45, RJR-110, RJR-670, EC305736, EC305672, RJR-405, RJR-479 and EC305619 exhibited moderately susceptible reaction to OYVMV with an incidence range of 52.66-59.99 per cent. The resistant check, Parbhani Kranti exhibited a susceptible reaction (61.83%) along with three other cultivated accessions *viz.*, RJR-587 (63.00%), RJR 279 (65.49%), and RJR-265 (67.16%), which indicates the breakdown of the resistance. The other okra accessions, PSRJ 13040 (84.16%) and RJR-193 (83.33%) showed a highly susceptible reaction to OYVMV along with the susceptible check, Pusa Sawani (75.16%). Study conducted by [6] found Pusa Sawani as highly susceptible and Parbhani Kranti as resistant to YVMV infection, which were used as the susceptible and resistant check, respectively.

Table 3: Reaction of okra germplasm against OYVMV under field conditions during summer, 2015 and 2016

Okra germplasm		**Summer 2015 and 2016**			
		PDI (%) 60 DAS	**Disease Severity Range (%)**	**Grade**	**Reaction**
Wild accessions	IC141020	8.33	1-10	1	Highly resistant (HR)
	IC433597	7.50	1-10	1	Highly resistant (HR)
	EC305672	58.16	51-60	4	Moderately susceptible (MS)
	IC433438	9.33	1-10	1	Highly resistant (HR)
	IC433667	9.16	1-10	1	Highly resistant (HR)
	EC305619	59.99	51-60	4	Moderately susceptible (MS)
	EC305736	57.49	51-60	4	Moderately susceptible (MS)
	NIC9402	5.83	1-10	1	Highly resistant (HR)
	IC344598	0.00	0	0	Immune (I)
	IC 90402	52.66	51-60	4	Moderately susceptible (MS)
Cultivated accessions	PSRJ-13040	84.16	71-100	6	Highly susceptible (HS)
	PSRJ-12952	0.00	0	0	Immune (I)
	RJR-265	67.16	61-70	5	susceptible (S)
	RJR-193	83.33	71-100	6	Highly susceptible (HS)
	RJR-124	0.00	0	0	Immune (I)
	RJR-479	59.49	51-60	4	Moderately susceptible (MS)
	RJR 279	65.49	61-70	5	susceptible (S)
	RJR-405	59.16	51-60	4	Moderately susceptible (MS)
	RJR-587	63.00	61-70	5	susceptible (S)
	RJR-670	56.99	51-60	4	Moderately susceptible (MS)
	RJR-110	55.33	51-60	4	Moderately susceptible (MS)
	RJR-45	55.00	51-60	4	Moderately susceptible (MS)
	NSJ-401	37.49	26-50	3	Tolerant (T)
Check varieties	Pusa Sawani*	75.16	71-100	6	Highly susceptible (HS)
	Parbhani Kranti**	61.83	61-70	5	susceptible (S)
	S. Em.±	0.46	-	-	-
	C.D. at 5%	1.49	-	-	-

*Susceptible check **Resistant check

From the present results it is evident that all the cultivated accessions were more susceptible to OYVMV except PSRJ-12952 and RJR-124, which showed immune reaction to OYVMV. Among the 10 wild accessions screened, one accession, IC344598 exhibited immune reaction, and five 'Highly Resistant' and the remaining were found 'Moderately Susceptible'. The present results are in conformity with the findings of the study [27] that reported most of the accessions of *A. esculentus* and all the five accessions of *A. tuberculatus* were highly susceptible to the yellow vein mosaic disease, while the wild accessions including three accessions of *A. tetraphyllus*, three accessions of *A. ficulneus* and one accession each of *A. manihot* ssp *manihot, Hibiscus panduraeformis* and *H. vitifolius* were observed to be completely free from the disease. Wild okra accessions *viz. A. manihot, A. angulosus, A. crinitus, A. vitifolius, A. tuberculatus, A. panduraeformis, A. pungens* and *A. tetraphyllus* were resistant to YVMV [21]. However, study conducted on okra accessions for its resistance on OYVMV [15] reported that the cultivated accessions VRO 109, VRO 104, VROB 178, 307 10-1 and No. 315 were completely free from OYVMV disease, while the wild species, *viz*., *A. enbeepeegeerense* (IC582757), *A. moschatus* (NIC5952), *A. manihot* (Jpn/N-2176), *A. tuberculatus* (IC90340 and IIVR-Tube-1) were found resistant. Similarly, study conducted on the okra germplasm reaction to OYVMV [4] identified 7 resistant and 19 moderately resistant accessions from all the wild taxa. Among those accessions, seven accessions of *A. caillei* and two accessions from *A. moschatus* have shown moderately resistant reaction and four accessions of *A. tetraphyllus* have shown resistant reaction.

Effect of whitefly population and OYVMV incidence on okra yield

Results obtained from the pooled yield of okra during summer 2015 and 2016 clearly indicated that there was a decrease in the yield as the increase of whitefly population and OYVMV incidence (Table 4). Significantly higher number of fruits was recorded by the immune wild accession IC344598 (39.66 fruits/plant) followed by IC433438 (37.10 fruits/plant). The highly susceptible accession, PSRJ-13040 recorded significantly lowest fruits per plant (5.87 fruits/plant) followed by RJR-193 (6.54 fruits/plant). Maximum yield was recorded by the cultivated immune accessions PSRJ-12952 (9733 kg/ha) and RJR-124 (9448 kg/ha) followed by the wild immune accession IC344598. Significantly lowest yield was recorded by the highly susceptible accessions PSRJ -13040 (2511 kg/ha) and RJR-193(2569 kg/ha).

Results from the present investigation revealed that the immune accessions *viz.*, PSRJ-12952, RJR-124 and IC344598 recorded significantly highest fruit yield. This was probably due to less whitefly population and OYVMV incidence in PSRJ-12952, RJR-124 and IC344598 as compared to other accessions, which in turn increased the yield. The results are in agreement with findings of [1], who indicated that least disease incidence and highest yield were recorded in Arka Anamika (0.8% and 23.00 t/ha) as compared to the highest disease incidence and the lowest yield in Pusa Sawani (74.99% and 7.90 t/ha). Similar results were observed by a study [18] that evaluated eight varieties of okra for their comparative resistance to OYVMV and marketable yield over a period of 4 years from 1986-1989. Parbhani Kranti, Punjab Padmini and Punjab-7 were high yielding cultivars which were resistant to virus. Pusa Sawani was highly susceptible to the virus and was lower yielding cultivars. The results of the present investigation also conforms with another such study [14]. It also concluded that the highest yield per hectare was (18.00 tonnes per ha.) found in the OYVMV resistant line OK-292. Highly susceptible line Pusa Sawani (9.95 tonnes per ha) produced the lowest yield. Similarly, okra cultivars screened in a field trial area [5] to determine their responses OYVMV and to evaluate of marketable fruit. The highest marketable fruit were recovered from the resistant cultivar Lucky file 473 at 19.78 and 19.76 tonnes/ha in 2009 and 2010, respectively whereas highly susceptible cultivar OP produced lowest yield (8.96 and 8.54 tonnes/ha). Another study conducted on okra genotypes [8] also noted that the genotypes *viz.*, IC331217, IC332453 and IC342075 and cultivars *viz.*, Manisha-211 and Arka Anamika were negligibly preferred over other genotypes/cultivars by whiteflies and also recorded higher fruit yields.

Table 4: Yield attributes of okra germplasm lines during summer 2015 and 2016

Okra germplasm		Summer 2015 and 2016 (Pooled data)	
		No of fruits/plant	**Yield (Kg ha^{-1})**
Wild accessions	IC141020	35.05	8300
	IC433597	33.62	8159
	EC305672	14.32	7334
	IC433438	37.10	8559
	IC433667	36.08	8379
	EC305619	13.52	7171
	EC305736	11.54	6475
	NIC9402	37.07	8804
	IC344598	39.66	9001
	IC90402	25.39	6048
Cultivated accessions	PSRJ-13040	5.87	2511
	PSRJ-12952	18.48	9733
	RJR-265	9.66	3261
	RJR-193	6.54	2569
	RJR-124	16.05	9448
	RJR-479	8.63	3111
	RJR-279	10.40	4324
	RJR-405	8.58	3354
	RJR-587	10.92	3677
	RJR-670	9.74	3684
	RJR-110	26.06	4566
	RJR-45	11.86	5718
	NSJ-401	31.9	8058
Check varieties	Pusa Sawani*	11.65	4562
	Parbhani Kranti**	14.69	7513
	S. Em.±	1.49	8.42
	C.D. at 5%	4.80	26.18

*Susceptible check **Resistant check

Conclusion
In India, okra crop is highly susceptible to OYVMV disease probably due to warm tropical climate and intensive crop cultivation, which supports survival of whitefly population round the year. Host plant resistance to virus is one of the most practical, economical and environmental friendly strategies for reducing yield loss in okra. In the present study, two of the cultivated accessions *viz.*, RJR-124 and PSRJ-12952 showed immune reaction to OYVMV during both the seasons and moreover they possessed good yield attributes and recorded significantly high yield. Since it is very difficult to transfer the genes of desirable traits of wild accessions in the high yielding varieties, the promising cultivated accessions identified in the present study can be efficiently utilized in the breeding programme. Since the occurrence of OYVMV is severe in certain locations in certain seasons, like in summer, the screening studies need to be done in these hot spot areas. Similarly, attempts should be made to incorporate broad spectrum resistance through gene pyramiding and develop okra varieties with desirable resistance or tolerance to OYVMV followed by maintenance breeding. To confirm the immune reaction, the two immune germplasm accessions identified in the present study need to be screened in the hot spot areas and in greenhouse conditions by subjecting them to infestation with vector population.

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