

Original Research Article

Field Screening of Okra Genotypes against *Okra enation leaf curl virus* Disease

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ABSTRACT

Okra enation leaf curl virus (OELCV) belongs to family *Geminiviridae* and genus *Begomovirus*. The virus is transmitted by the vector whitefly (*Bemisia tabaci*) and can cause significant yield loss in okra depending upon the age of the plant at the time of infection. Thirty two diverse okra genotypes (including commercial hybrids, varieties and entries) were raised in randomized block design with three replications, during the *kharif* season 2018 at the Horticultural Instructional Cum Research Farm, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). First appearance of disease was observed after forty five days of sowing. Okra genotypes 2018/OKHYVRES-2 and 2018/OKHYVRES-3 did not express any disease symptoms and were found to be immune against OELCV disease. Sixteen okra entries (including IET, AVT1, IET Hybrid) showed highly resistant reaction, two IET okra entries were resistant against OELCV. Local control (susceptible) and commercial cultivar NOL-303(Julie) was observed highly susceptible towards OELCV disease.

Keywords

Okra, Percent Disease Index, Whitefly, *Okra enation curl virus* disease

Introduction

Okra (*Abelmoschus esculentus* L.) also popularly called as Bhindi belong to family Malvaceae. It is extensively cultivated, during *kharif*, *zaid* (summer) and *rabi* also. The crop is suitable for kitchen garden crops as well as on large high-tech commercial farms. It is an economically important vegetable crop grown in tropical and subtropical season and warm temperate regions of the world. Among the leading producing state, Andhra Pradesh ranks first with a production of around (1184.2)

thousand tons (Indian Horticulture Database 2011). It is good source of nutritional value, vitamin A (0.18mg/100g), C (47mg/100g), Calcium (84mg/100g), Iron (1.20mg/100g) (Soberwell *et al.*, 2018) and is also rich in protein, minerals and iodine and fibre (Benchasri *et al.*, 2012).

Okra enation leaf curl virus (OELCV) belongs family *Geminiviridae* and genus *Begomovirus* is an emerging serious disease of Okra in India. *Okra enation leaf curl virus* disease was first time observed from Karnataka in 1980s (Yadav *et al.*, 2018).

Infection of OELCV disease at early stages of crop growth may cause severe yield loss in okra. The disease is transmitted by insect vector whitefly (*Bemisia tabaci*) infected plants remain stunted, either do not produce fruits or produce few deformed and small fruits unfit for marketing and consumption, specific symptoms include veins thickening, cup shaped leaf curling, reduction of the leaf area, deformed internodes, twisting of leaf petioles often develops enations on the underside of the leaves. The disease can cause significant yield losses, ranging from 30 to 100%, depending upon the age of the plant at the time of infection (Singh 1996).

Materials and Methods

An experiment was conducted at Horticultural Instruction cum Research Farm, College of Agriculture, Raipur (Chhattisgarh) in *kharif* 2018, the crop (thirty two genotypes/ varieties/hybrids of okra) was raised in a randomized block design (RBD) to record the *Okra enation leaf curl* (OELCV) disease. The observations on percent disease index of okra enation leaf curl virus disease were recorded at fortnightly interval. All the entries were sown in plot size of (3 x 2.7 m²) and row to row spacing (60cm) and plant to plant spacing (30cm) was followed. Percent disease index was recorded for each genotypes/ varieties/hybrids at 15 days interval up to 90 days after sowing. The rating of *Okra enation leaf curl virus* disease was recorded for 5 randomly selected plant of each genotypes/varieties/hybrids by disease rating scale of 0-6 as suggested by Akhtar *et al* (2010).

Percent disease Index was calculated by the formula:-

Percent Disease Index =

$$\frac{\text{Sum of numerical disease rating}}{\text{Number of plants observed} \times \text{maximum disease rating}} \times 100$$

A sum of thirty two genotypes/ varieties/hybrids of okra (10 commercial varieties/ hybrids including one susceptible check and 22 okra entries) were evaluated against *Okra enation leaf curl* disease under natural epiphytotic conditions to identify the reaction of the different okra genotypes against *Okra enation leaf curl* disease. Ten commercial varieties/ hybrids of okra *viz.* OH-597, Avantika Gold, F₁-Savitri, Devi Shakti-F₁, Deepika, Bhindi Mosco green, JG-11, Bhindi F₁-901, F₁- Kalindri and NOL-303(Julie), Local control (susceptible) were procured from market. However remaining (genotypes) twenty two of okra entries (*viz.*, IET, AVT-I, IET Hybrid) obtained from IIVR, Varanasi.

Results and Discussion

First appearance of the disease was observed forty five days after sowing. Among IET hybrids of two okra entries *viz.*, 2018/OKHYVRES-2, and 2018/OKHYVRES-3 did not show any disease symptoms and were free from OELCV disease for entire crop period. Sixteen entries (including IET, AVT1, IET Hybrid) *viz.*, 2018/OKYVRES-1, 2018/OKYVRES-3, 2018/OKYVRES-5, 2018/OKYVRES-8, 2017/OKYVRES-1, 2017/OKYVRES-2, 2017/OKYVRES-3, 2017/OKYVRES-4, 2017/OKYVRES-6, 2017/OKYVRES-7, 2017/OKYVRES-8, 2017/OKYVRES-9, 2017/OKYVRES-10, 2018/OKHYVRES-4, 2018/OKHYVRES-5, 2018/OKHYVRES-6 showed highly resistant disease reaction to OELCV disease with the percent disease index (6.05, 3.66, 2.32, 5.31, 0.11, 0.16, 0.23, 0.11, 0.16, 0.11, 0.19, 0.23, 0.42, 6.67, 2.51, 3.06) percent respectively at 90 DAS. Two entries 2018/OKYVRES-7 and 2018/OKHYVRES-1 were found resistant to the okra enation leaf curl virus disease with the percent disease index (10.74, 18.77). Four genotypes (including two commercial cultivars and two

IET entries of okra) viz. Deepika, BhindiMoscoGreen 2018/OKYVRES-4, 2018/OKYVRES-6 respectively were found moderately resistant with percent disease index (27.83, 23.66, 26.66, 29.65). Four commercial varieties/hybrids OH-597, Dev Shakti F₁, Bhindi F₁901, F₁Kalindri were observed moderately susceptible against OELCV disease of okra with per cent disease index of (30.93, 34.98, 36.45, 38.13) respectively. Two commercial cultivars Avantika Gold and F₁Savitri showed susceptible reaction with the percent disease index (42.42, 43.14). The remaining of two commercial cultivars Local susceptible check and NOL-303(Julie) observed highly susceptible with the percent disease index (59.85, 52.83) at 90 days after sowing (Table 2).

Exploitation of host plant resistance can be an effective, economical, ecologically safe and durable approach to disease management strategies. The screening of the genotypes is a

step forward for resistant breeding and as well as to determine the susceptibility of various genotypes in a given environmental scenario. *Okra enation leaf curl virus* disease is becoming serious threat to okra cultivation. Thus, an attempt was made to screen thirty two okra entries/commercial varieties / hybrids against *Okra enation leaf curl virus* (OELCV) disease in natural epiphytotic conditions. Among the thirty two okra genotypes, two IET hybrid entries were found immune. Sixteen okra entries (including IET, AVT1, IET Hybrid) were found highly resistant against OELCV. Two IET entries were found resistant to the *Okra enation leaf curl virus* disease. Two commercial cultivars and two IET entries of okra were found moderately resistant. Four commercial varieties/hybrids were found moderately susceptible against OELCV disease of okra. Two commercial varieties/ hybrids observed susceptible and two including local susceptible check were highly susceptible against OELCV disease.

Table.1 Disease rating scale for classifying reaction of okra to OELCV disease

Sr. no.	Symptoms	Scale	Disease grades	Disease Response
1.	Complete absence of symptoms	0	0	Immune
2.	Thickening of few small scattered veins or only presence of leaf enations on one or few leaves of a plant observed after careful observations	0.1-10	1	Highly Resistant
3.	Thickening of a small group of veins, no leaf curling, no reduction in size and fruit setting	10.1-20	2	Resistant
4.	Thickening of all veins, minor leaf curling and deformity of internodes with minor reduction in leaf size but no reduction in fruit setting	20.1-30	3	Moderately Resistant
5.	Severe veins thickening, moderate leaf curling followed by minor deformity of internodes and minor reduction in leaf size and fruit setting	30.1-40	4	Moderately Susceptible
6.	Severe veins thickening, moderate leaf curling and deformity of internodes with moderate reduction in leaf size and fruit setting followed by moderate stunting	40.1-50	5	Susceptible
7.	Severe vein thickening, leaf curling, reduction in leaf size, deformed internodes and stunting of the plant with no few fruit setting	>50	6	Highly Susceptible

Table.3 Screening of okra against *Okra enation leaf curl virus* disease

A.	Commercial Variety/hybrids	Percent disease index						Reaction
		15	30	45	60	75	90	
1	OH-597	0.00	0.00	1.90	14.58	23.07	30.93	MS
2	Avantika Gold	0.00	0.00	10.85	19.84	32.67	42.42	S
3	F ₁ Savitri	0.00	0.00	9.13	22.72	34.84	43.14	S
4	Dev Shakti F ₁	0.00	0.00	3.70	18.25	27.37	34.98	MS
5	Deepika	0.00	0.00	6.17	13.80	22.41	27.83	MR
6	BhindiMoscoGreen	0.00	0.00	0.95	13.45	22.37	23.66	MR
7	Bhindi F ₁ 901	0.00	0.00	4.22	11.98	26.61	36.45	MS
8	F ₁ Kalindri	0.00	0.00	2.78	19.90	34.09	38.13	MS
9	NOL-303(Julie)	0.00	0.00	7.51	27.40	40.07	52.83	HS
10	Local control (susceptible)	0.00	0.00	7.09	28.89	46.40	59.85	HS
B	Genotypes (IET entries)							
1	2018/OKYVRES-1	0.00	0.00	3.34	4.41	6.05	6.05	HR
2	2018/OKYVRES-3	0.00	0.00	2.70	2.70	2.86	3.66	HR
3	2018/OKYVRES-4	0.00	0.00	7.10	25.61	25.85	26.66	MR
4	2018/OKYVRES-5	0.00	0.00	1.55	2.32	2.32	2.32	HR
5	2018/OKYVRES-6	0.00	0.00	4.26	10.44	24.36	29.65	MR
6	2018/OKYVRES-7	0.00	0.00	4.92	10.33	10.34	10.74	R
7	2018/OKYVRES-8	0.00	0.00	0.00	1.83	5.25	5.31	HR
C	Genotypes (AVT-I entries)							
1	2017/OKYVRES-1	0.00	0.00	0.05	0.09	0.09	0.11	HR
2	2017/OKYVRES-2	0.00	0.00	0.03	0.11	0.13	0.16	HR
3	2017/OKYVRES-3	0.00	0.00	0.02	0.11	0.23	0.23	HR
4	2017/OKYVRES-4	0.00	0.00	0.01	0.11	0.11	0.11	HR
5	2017/OKYVRES-6	0.00	0.00	0.07	0.08	0.10	0.16	HR
6	2017/OKYVRES-7	0.00	0.00	0.05	0.11	0.11	0.11	HR
7	2017/OKYVRES-8	0.00	0.00	0.08	0.08	0.10	0.19	HR
8	2017/OKYVRES-9	0.00	0.00	0.03	0.09	0.15	0.23	HR
9	2017/OKYVRES-10	0.00	0.00	0.04	0.14	0.35	0.42	HR
D	Genotypes (IET Hybrids A)							
1	2018/OKHYVRES-1	0.00	0.00	9.60	11.56	13.81	18.77	R
2	2018/OKHYVRES-2	0.00	0.00	0.00	0.00	0.00	0.00	I
3	2018/OKHYVRES-3	0.00	0.00	0.00	0.00	0.00	0.00	I
4	2018/OKHYVRES-4	0.00	0.00	0.00	2.52	5.61	6.67	HR
5	2018/OKHYVRES-5	0.00	0.00	0.00	0.00	0.76	2.51	HR
6	2018/OKHYVRES-6	0.00	0.00	0.00	0.00	0.95	1.82	HR

Reference

Akhtar, Athfah., Rhman, Atif., Husain, Meher., Chaudhry, Imran Bashir. 2010. Multidimensional scale of

perceived social support: Psychometric properties in South Asian population. *Journal of Obstetrics and Gynaecology Research*, 36(4): 845- 51.

- Benchasri, S. 2012. Okra (*Abelmoschus esculentes* (L.) Moench) as a valuable vegetable of the world. *Ratar. Povet.* 49: 105–112.
- Guessan, K. P. N. 2001. Occurrence and spread of okra leaf curl virus disease in Cote D'Ivoire. *Agronomie Afriacine*, 13(1):35-43.
- Indian Horticultural Data Base. 2011. National Horticulture Board, Ministry of agriculture, Govt. of India, 85, Institutional area, sector-18, Gurgaon – 122 015 India.
- Singh, S.J. 1996 Assessment of losses in okra due to enation leaf curl virus. *Indian Journal Virology*, 12:51-53.
- Yadav, Yogendra., Maurya, Praveen Kumar., Devi, AyamPushparani., Jamir, Imtinungsang., Bhattacharjee, Tridip., Banerjee, Swadesh., Dutta, Subhramalya., Debnath, Debanjana., Mandale, Asitkumar., Dutta, Subrata., and Chattopadhyay, Arup. 2018. Enation leaf curl virus (ELCV): A real threat in major okra production belts of India. *Journal of Pharmacognosy and Phytochemistry*, 7(2): 3795-3802.