International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2020; 8(6): 1639-1642

Received: 14-07-2020
Accepted: 26-08-2020

L Pugalendhi
Department of Vegetable Science, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

H Usha Nandhini Devi
Department of Vegetable Science, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

M Karthikeyan
Department of Vegetable Science, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Corresponding Author:
L Pugalendhi
Department of Vegetable Science, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Screening of chilli (*Capsicum annuum* L.) genotypes for leaf curl virus disease

L Pugalendhi, H Usha Nandhini Devi and M Karthikeyan

Abstract
Viruses are common plant diseases that cause production and quality loss in the chilli crop. The major reasons responsible for low productivity in chilli include adverse climate, poor quality seeds, diseases, and high incidence of pests. Among the diseases, Chilli leaf curl complex disease is one of the destructive diseases of chilli, which is mainly transferred by chilli whitefly (*Bemisia tabaci*) causing considerable yield loss. Effective control of leaf curl disease using chemicals is difficult and uneconomical and also the chemical residues may affect the health of the consumer. Therefore, use of tolerant genotypes/varieties is the simplest and more convenient method of virus control. Hence, developing high yielding genotypes tolerant to major viruses is of paramount importance. The present investigation was carried out to evaluate the chilli genotype resistance for leaf curl virus disease during 2019. A total of 59 genotypes were evaluated for leaf curl virus in two seasons and the field experiment was carried out in randomized block design with two replications. All the genotypes used in experiment were studied for yield, quality along with tolerance to the leaf curl disease. Lesser incidence of leaf curl virus was recorded in the genotypes PLR-1, CA-141 and F-5 with 12.97, 14.54 and 15.45% respectively. Among the genotypes evaluated during both the seasons, the genotypes CA-7, CA-116 and F-410 were found to be promising based on yield with moderate resistance to leaf curl viral disease. Therefore, these lines can be used in further breeding programmes.

Keywords: Chilli, yield loss, genotypes, resistance, leaf curl virus

Introduction

Plant viruses are important pathogens causing economic losses whose severity places them only second after fungi in the ranking of most damaging plant pathogens, worldwide (Baker *et al*., 1997; Strange & Scott, 2005) [2, 17]. For several crops, virus pathogens constitute real limiting factors, lasting for extended periods of time in many territories. Furthermore, the continuous appearance of emerging and re-emerging plant viruses keeps viruses among the most serious concerns of farmers and plant scientists, nowadays. One of the features that makes viruses a serious threat in modern agriculture is the efficient system followed by most of them for spreading, relying on vector organisms for transmission (Brunt *et al*., 1996; Hull, 2002) [4, 6]. A wide range of viral, fungal, bacterial, nematode, and phytoplasma diseases affect the chilli crop. Chilli leaf curl disease is one of them, and it has become a severe concern across India. The leaf curl disease is characterized by leaf curling, mosaic, ring spot, curling, yellowing, puckering, vein clearing and vein swelling and these symptoms result in heavy losses. In severely affected plant, leaf size and number of branches are drastically reduced resulting a bushy appearance which in turn leads to bear minimum number of flowers and few fruits (Peiris 1953; Joshi and Dubey 1976) [15, 8]. Chilli leaf curl was first observed in India by Vasudeva (1954) [18]. Leaf curl virus in chilli has also been reported in India (Mishra *et al*., 1963; Muniyappa and Veeresh, 1984 and Ravi, 1991) [11, 12, 16]. Leaf curl complex have been reported to be caused by thrips, mites, and whiteflies. Previously, several researchers studied viral illnesses on chilli, and because to their destructive nature, yield loss owing to leaf curl complex ranged from 25 to 80 per cent (Pandurange Gouda, 1979, Bidari, 1982 and Ilyas, 1996) [14, 3, 7].

The reason for decline in productivity is due to cultivation of chilli under rainfed condition, which is threatened by its vulnerability to wide spectrum of diseases and pests and lack of superior varieties and hybrids.

Among the pests, the spread of chilli whitefly (*Bemisia tabaci*) is higher in infestation and also acts as a vector for viral diseases wherein Chilli leaf curl virus is a major threat to chilli production (Khan *et al.* 2006; Venkatesh *et al*., 1998) [9, 19]. Use of resistant varieties is the simplest and more convenient method of pest and virus control. Hence, development of high yielding hybrids resistant to major pests and viruses is of paramount importance. Use of pesticides and other cultural methods to control pests and diseases of chilli would involve high cost and is uneconomical to the farmers apart from causing health hazards to human. Hence, this study aimed to screen the high yielding genotypes with good quality and resistance to the pest and diseases.

Materials and Methods

The study was conducted at College Orchard, Department of Vegetable Science, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore 2019. Fifty nine chilli genotypes collected from different states, national and international institutes were utilized for the study. The Leaf curl disease infestation was estimated using the formula

$$\text{Disease incidence (\%)} = \frac{\text{Number of infected plants per plot}}{\text{Number of plants (diseased+healthy) per plot}} \text{ X } 100$$

Scoring was done into five categories by adopting Niles (1980) method [13].

Results and Discussion

All the genotypes exhibited significant differences for the leaf curl infestation. In the first season, the genotypes PLR-1, CA-141 and F-5 showed minimum leaf curl infestation of 12.97%, 14.54% and 15.45% respectively whereas the genotypes Paranthaman local and Ramnad local exhibited 64.9% and 61.17% respectively and were considered as susceptible to leaf curl disease. (Table.No.1 and Figure. 1).

The results show that the Leaf Curl Virus incidence is higher in summer season. Therefore, the severity of incidence was higher in the second season compared to first season. Results were in accordance with Latha and Hunumanthraya (2018) [10] and they observed that four genotypes *viz*., DCC-109, DCC-3, DCC-185, and DCC-89 were found to be moderately resistant whereas the genotypes, DCC-187 and DCC-127 were found to be susceptible and two genotypes *viz*., DCC66 and Byadgi Kaddi were reported to be highly susceptible to leaf curl virus.

Awasthi and Kumar (2011) [1] reported that out of 48 chilli genotypes evaluated, Surajmukhi, Japani loungi and Pusa Jwala were found to show lesser incidence with 13.80%, 13.96% and 10.77% respectively. Moderately resistant reaction was exhibited by seven genotypes. The disease incidence ranged between 25.1 and 50 per cent and 14 genotypes was rated as highly resistant to viral diseases. In a survey of chilli leaf curl complex disease in Eastern part of Uttar Pradesh conducted by Chaubey and Mishra (2018) [5], the highest leaf curl incidence was observed in Sewra (67.39%) followed by Hasuimukundpur and Etwara with 65.22% and 64.07% respectively in 2014, whereas in 2015, it was found higher in Sewra (61.44%) and Hasuimukundpur (59.79%).

Table 1: Pooled mean data of Leaf curl virus infestation (%) during both the seasons

Sl. No.	Genotypes	LCV(%) 30 DAT	LCV(%) 60 DAT	LCV(%) 90 DAT	Mean
1	Aparna	25.26	59.94	76.54	53.91
2	Bird Eye Chilli	28.10	66.68	85.15	59.98
3	CA-104	15.34	36.39	46.47	32.73
4	CA-116	12.98	30.80	39.33	27.70
5	CA-141	10.56	14.52	18.54	14.54
6	CA-166	12.68	17.57	22.43	17.56
7	CA-173	14.65	34.77	44.40	31.27
8	CA-176	13.61	32.30	41.24	29.05
9	CA-41	13.24	31.41	40.11	28.25
10	CA-45	11.93	28.30	36.14	25.46
11	CA-620	22.55	53.51	68.33	48.13
12	CA-7	12.42	29.48	37.64	26.51
13	CP-960	24.82	58.90	75.21	52.98
14	Ramnad Local	28.66	68.01	86.85	61.17
15	Elephant Chilli	21.34	50.64	64.67	45.55
16	F-1	12.39	29.41	37.55	26.45
17	F-101	16.25	22.34	28.53	22.37
18	F-102	12.68	14.79	18.88	15.45
19	F-2	13.94	33.09	42.25	29.76
20	F-3	15.53	36.85	47.05	33.14
21	F-4	12.61	29.92	38.20	26.91
22	F-410	22.84	54.21	69.22	48.76
23	F-5	11.20	15.06	19.23	15.16
24	F-507	10.68	13.66	17.44	13.93
25	F-6	12.64	16.75	21.39	16.93
26	F-701	14.04	33.31	42.53	29.96
27	F-702	17.68	21.85	22.28	20.60
28	F-706	11.84	21.90	27.97	20.57
29	F-707	17.60	41.76	53.33	37.56
30	G-3	19.86	47.13	60.18	42.39

31	CA-13/2	10.89	15.60	26.81	17.53
32	Jayanthi	10.76	25.54	32.61	19.81
33	Jeynthi	12.35	14.97	32.12	15.48
34	KMD/PY 1	22.65	53.75	68.64	48.35
35	LCA-206	12.98	18.72	23.90	18.53
36	LCA-235	22.90	54.34	69.39	48.88
37	LCA-625	24.67	58.53	74.74	52.65
38	M-10	22.54	53.48	68.29	48.10
39	M-101	26.49	62.86	80.27	56.54
40	M-102	15.46	36.68	46.84	32.99
41	M-103	21.36	50.69	64.73	45.59
42	M-105	14.84	17.89	22.85	18.53
43	M-106	29.20	69.29	88.48	62.32
44	M-412	24.41	57.93	73.97	52.10
45	M-413	10.94	25.96	33.15	23.35
46	M-415	23.36	55.43	70.78	49.86
47	M 501	11.09	26.32	33.61	23.67
48	M-704	12.61	29.92	38.21	26.91
49	M-707	21.91	51.99	66.39	46.76
50	M-708	13.69	32.48	41.47	29.21
51	M-714	23.84	56.56	72.22	50.87
52	M-8	13.84	19.05	24.32	19.07
53	MP-1	12.92	30.67	39.16	27.58
54	Paranthaman Local	30.44	72.23	92.23	64.97
55	PLR-1	11.65	11.97	15.29	12.97
56	Sankarankovil Local	28.06	66.58	85.02	59.89
57	TA/CA/10	23.12	54.87	70.06	49.35
58	TA/CA/17	11.69	27.73	35.41	24.94
59	Erode Local	27.40	65.01	83.02	58.48

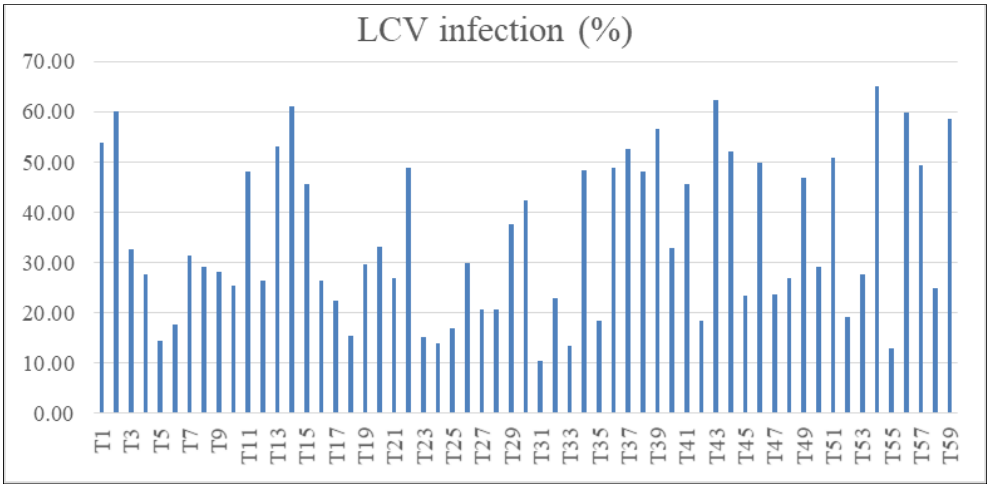

Fig 1: The mean data of LCV infection (%) for first season

Where, T1, T2, T3, T4…T59 – are genotypes of first season as mentioned respectively in the Table No.1.

Conclusion

The genotypes PLR-1, CA-141 and F-5 showed lesser incidence of leaf curl virus with 12.97, 14.54 and 15.45% respectively. Therefore, these lines can be used in further breeding programmes to develop high yielding genotypes with resistance to leaf curl virus.

References

1. Awasthi L, Kumar P. Response of chilli genotypes/cultivars against viral diseases. Indian Phytopathology 2011.
2. Baker B, Zambryski P, Staskawicz B, Dinesh-Kumar SP. Signaling in plant-microbe interactions. Science 1997;276:726-33.
3. Bidari VB. Distribution and epidemiology of chilli viruses in Karnataka. *Ph. D. Thesis*, Univ. Agric. Sci., Bangalore, Karnataka (India) 1982.
4. Brunt AA, Crabtree MJ, Dallwitz AJ, Watson L. *Viruses of plants*. Cambridge, UK: CAB International 1996.
5. Chaubey A, Mishra R. Environmental factors influencing the population of whitefly and leaf curl disease incidence in chilli. Journal of Environmental Biology 2018;39(2):216-220.
6. Hull R. Matthews' Plant Virology, Fourth Edition. London: Academic Press 2002.
7. Ilyas AK, Khan M. Studies on mosaic complex of chilli (*Capsicum annuum* L.). M. Sc. (Agri.) Thesis, Univ. Agric. Sci., Karnataka (India) 1996.
8. Joshi RD, Dubey LN. Efficiency of certain insecticides in controlling leaf curl disease in chillies. Sci Cult 1976;42:273-275.

9. Khan MS, Raj SK, Singh R. First report of Tomato leaf curl New Delhi virus infecting chilli in India. Plant Pathol 2006;55:289.
10. Latha S, Hunumanthraya L. Screening of chilli genotypes against chilli thrips (*Scirtothrips dorsalis* Hood) and yellow mite [*Polyphagotarsonemus latus* (Banks)] 2018.
11. Mishra MD, Raychaudhuri SP, Jha-Sshrafi. Virus causing leaf curl of chilli (*Capsicum annuum* L.). Indian J Microbiol 1963;3:73-76.
12. Muniyappa V, Veeresh GK. Plant virus diseases transmitted by whiteflies in Karnataka. Proc. of Indian Acd. Sci., (Anim. Sci.) 1984;93:397-406.
13. Niles G. Breeding cotton for resistance to insect pests. Breeding plants resistant to insects 1980, 337-369.
14. Pandurange Gowda KT. Studies on chilli (*Capsicum annuum Limn*.) mosaic viruses occurring in some parts of Kolar district. M. Sc. (Agri.) Thesis, Univ. Agric. Sci., Bangalore, Karnataka (India) 1979.
15. Peiris JWL. Chilli leaf curl complex. Tropical Agriculturist 1953;109:201-202.
16. Ravi KS. Studies on pepper vein banding virus and other components of murda syndrome in chilli. Ph.D. Thesis, Univ. Agric. Sci., Bangalore, Karnataka (India) 1991.
17. Strange RN, Scott PR. Plant disease: a threat to global food security. Annual Review of Phytopathology 2005;43:83-116.
18. Vasudeva RS. Report of the division of mycology and plant pathology. Sci Rept Agric Res Inst, New Delhi 1954, 1952-53, 79-89.
19. Venkatesh KM, Munniyappa V, Ravi KS, Krishnaprasad PR. Management of Chilli Leaf Curl Complex. In: Advances in IPM for Horticulture Crops, Reddy, P.P., N.K.K. Kumar and A Verghese (Eds.). Department of Agricultural Entomology, University of Agricultural Science, Bangalore, India 1998, 111-117.