Biological Forum – An International Journal **15(8): 206-210(2023)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Occurrence of Chilli Leaf Curl Disease (ChiLCD) in southern Districts of Tamil Nadu

Muthamil Kumaran J.[1], Rajinimala N.[2*], Theradimani M.[3], Elanchezhyan K.[4], M.I. Manivannan M.I. [5], Ebenezar E. G. [6] and Sheela J.[6]

[1]PG Scholar, Department of Plant Pathology,
Agricultural College and Research Institute, Killikulam (Tamilnadu), India.
[2]Rice Research Station, Tamil Nadu Agricultural University, Ambasamudram – 627401(Tamilnadu), India.*
[3]Dean, Agricultural College and Research Institute, Killikulam (Tamilnadu), India.
[4]Department of Entomology, Tamil Nadu Agricultural University,
Agricultural College and Research Institute, Killikulam (Tamilnadu), India.
[5]Department of Horticulture, Tamil Nadu Agricultural University,
Agricultural College and Research Institute, Killikulam (Tamilnadu), India.
[6]Department of Plant Pathology, Tamil Nadu Agricultural University,
Agricultural College and Research Institute, Killikulam (Tamilnadu), India.

(Corresponding author: Rajinimala. N.[*])
(Received: 03 June 2023; Revised: 29 June 2023; Accepted: 18 July 2023; Published: 15 August 2023)
(Published by Research Trend)

ABSTRACT: An extensive survey was carried out to record the incidence and severity of Chilli Leaf Curl Disease (ChiLCD) in the southern districts of Tamil Nadu. During the survey, the infected chilli plants were shown different symptoms *viz.*, upward curling of leaves, crinkling of leaves, reduced leaf surface, shortening of internodes, bushy appearance of plants and stunted plant growth. Chilli plants showing the above symptoms were collected from Kasilingapuram, Koonarkulam, Peikulam, Pudhur pandiyapuram, Solapuram, Ettayapuram villages of Thoothukudi district, Vallioor, Panangudi, Thalavaipuram, Radhapuram, Kalakudi, Kavalkinaru villages of Tirunelveli district, Athiyuthu, Pavoor chathiram, Keezhapavur villages of Tenkasi district, Peraiyur, Kamuthi, Keelasirupothu, Sadaiyaneri, Mudhukulathur, Idhampadal villages of Ramanathapuram district. Among the surveyed area, ChiLCD incidence was recorded from 16.00 - 85.50 per cent and disease severity was recorded from 10.90 - 60.30 per cent. The highest disease incidence (85.50 %) and disease severity (60.3 %) was recorded in Kalakudi village of Tirunelveli District. The lowest disease incidence (16.00%) and disease severity (10.90%) was recorded in Peikulam village of Thoothukudi District.

Keywords: Chilli, ChiLCD, Begomovirus.

INTRODUCTION

Chilli (*Capsicum annum*) is the important vegetable crop in the World belongs to the family Solanaceae. Chilli is rich in vitamins especially vitamin A and C. India is being the World's largest producer, consumer and exporter of chilli and has the largest area of 0.85 Mha and production of 1.95 MT followed by China. In Tamil Nadu, chilli crop is grown over an area of 49,293 hectares, with a yield of 22,239 tonnes (Spice board, 2023). Chilli is infected by various plant pathogens like fungi, bacteria, and virus. Among them, viruses are most destructive one. Till now 65 chilli infecting viruses were reported from throughout the World (Nigam *et al.*, 2015). Among them, Begomoviruses are the emerging problem in cultivation of chilli crop (Varma and Malathi 2003). Begomovirus has the two genomic components *viz*., DNA – A & DNA –B. DNA A is responsible for replication and movement. DNA B is essential for symptom expression (Kheyr-Pour *et al.*, 1991, Chakraborty *et al.*, 2003). Some begomovirus contain DNA-β which is associated satellite virus. It helps the begomovirus replication and which is also essential for symptom expression (Briddon and Stanley 2006). Begomovirus is replicated by the rolling circle amplification mechanism (Hanley-Bowdoin, 1999, Fondong, 2013). Senanayake *et al.* (2007) first reported the Chilli Leaf Curl Disease from India. ChiLCD is transmitted by the Whitefly, *Bemisia tabaci* (Gennadius) in persistant, non-propagative manner (Senanayake *et al.*, 2012). In India, due to the availability of adverse climatic condition whitefly is prevailing throughout the year. ChiLCD causes the yield loss up to 100 percent (Malathi *et al.*, 2017).

MATERIALS AND METHODS

Survey. An extensive survey was carried out to determine the prevalence of the Leaf Curl disease of Chilli in Southern Districts of Tamil Nadu. The study was carried out during the years of 2022 - 2023 in 21 villages of four districts *viz.*, Thoothukudi, Tirunelveli, Tenkasi, Ramanathapuram. In Thoothukudi district, survey was conducted in Kasilingapuram and Koonarkulam from Karungulam block, Peikulam from Srivaikundam block, Pudhur pandiyapuram from

Ottapidaram block, Solapuram from Kayathar and Ettayapuram from Kovilpatti block. In Tirunelveli district, survey was conducted in Vallioor, Panangudi, Kavalkinaru and Thalvaipuram from Vallioor block, Radhapuram village from Radhapuram block and Kalakudi village of Manoor block. In Tenkasi district, survey was conducted in Athiyuthu village of Alangulam block and Pavoor Chathiram, Keezhapavur villages of Keezhapavur block. In Ramanathapuram district, survey was conducted in Peraiyur and Kamuthi villages of Kamuthi block, Keelasirupothu, Sadaiyaneri and Mudhukulathur villages of Mudhukulathur block and Idhampadal village of Kadaladi block.

Disease Assessment

Assessment of disease incidence. ChiLCD incidence was appraised by ratio of the number of infected plants with total number of plants observed and value was expressed in percentage (Kumar *et al*., 2016). During survey, each and every field was observed with 25 plants at random and scored as infected and healthy and Percent disease incidence was calculated by using the following formula (Equ.1).

Assessment of disease Severity. Disease severity was calculated based on the 0 - 5 scale followed by Banerjee *et al.,* (1987). Disease severity was calculated from 25 randomly selected plants in each surveyed area.

$$\text{Percent Disease incidence (\%)} = \frac{\text{Total number of infected plants}}{\text{Total number of plants observed}} \times 100 \qquad \text{Equ. (1)}$$

Grade	Description
0	No symptom
1	5% curling and clearing of upper leaves
2	6-25% curling and clearing of leaves and swelling of veins
3	26-50% curling, puckering and yellowing of leaves and swelling of veins
4	51-75% curling, stunted plant growth and blistering of internodes
5	75% curling and deformed small leaves, stunted plant growth with small or no fruit set.

$$\text{Disease severity (\%)} = \frac{\text{Sum of all disease rating score}}{\text{Total number of plants observed} \times \text{Maximum rating score}} \times 100 \qquad \text{Equ. (2)}$$

RESULTS AND DISCUSSION

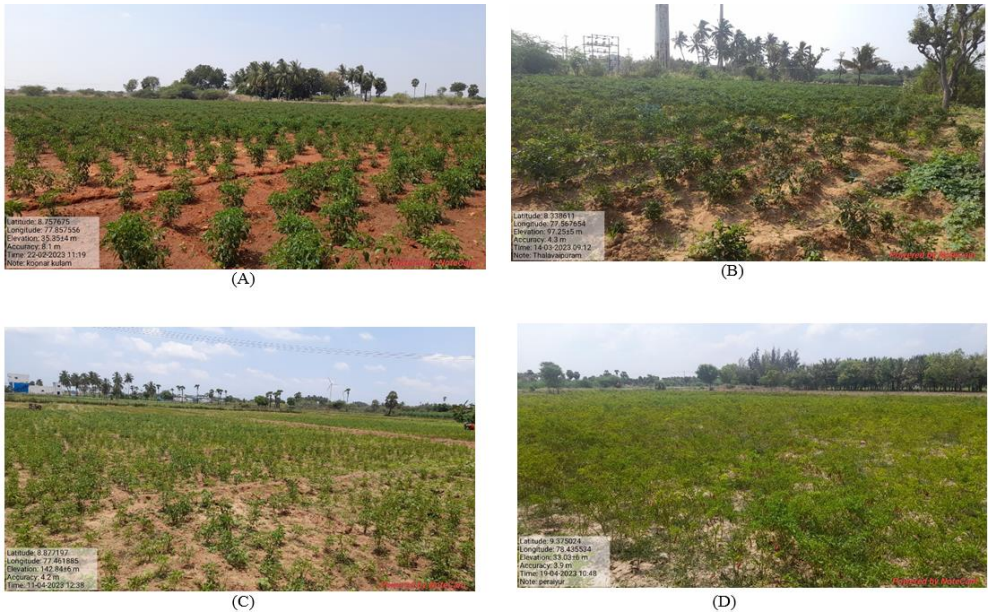
Survey. From the surveyed area, percent disease incidence and severity ranged from 16.00 to 85.50 percent and 10.90 to 60.30 percent respectively were recorded. During the survey, maximum disease incidence of 85.50 per cent and severity of 60.30 per cent were recorded in Kalakudi village followed by Vallioor (80.00%; 58.40% respectively), Panangudi (73.03%; 50.40% respectively). The lowest disease incidence of 16.00 % and severity 10.90% were recorded in Peikulam village (Table 1; Plate 1; Fig. 1; Fig. 2). Similarly in Madhya Pradesh, 88 to 100 percent ChiLCD incidence was recorded (Kumar *et al*., 2016).

Symptomology. During the survey, ChiLCD infected plant showed symptoms *viz.*, upward curling of leaves, crinkling of leaves, puckering of leaf reduced leaf surface, shortening of internodes, bushy appearance of plants and severe stunting of plants (Plate 2). This is in accordance with the symptoms reported by Chattopadhyay *et al.,* (2008).

Table 1: Incidence and Severity of ChiLCD in Southern Tamil Nadu.

Sr. No.	District	Block	Village	GPS	Disease Incidence (%)	Disease Severity (%)
1.	Thoothukudi	Karungulam	Kasilingapuram	8.76°N 77.87°E	46.70	25.60
			Koonarkulam	8.75°N 77.86°E	44.00	26.13
		Srivaikundam	Peikulam	8.53°N 77.88°E	16.00	10.93
		Ottapidaram	Pudhur pandiyapuram	8.90°N 78.10°E	36.00	22.13
		Kayathar	Solapuram	9.10°N 78.00°E	48.00	28.53
		Kovilpatti	Ettayapuram	8.33°N 77.60°E	33.33	20.00
2.	Tirunelvlei	Vallioor	Vallioor	8.33°N 77.60°E	80.00	58.40
			Panangudi	8.34°N 77.60°E	73.33	50.40
			Thalvaipuram	8.34°N 77.57°E	65.33	41.33

			Kavalkinaru	8.27°N 77.57°E	20.00	17.60
		Radhapuram	Radhapuram	8.34°N 77.57°E	53.33	28.53
		Manoor	Kalakudi	8.88°N 77.63°E	85.33	60.27
3.	Tenkasi	Aalangulam	Athiyuthu	8.88°N 77.46°E	46.67	25.60
		Keezhapavur	Pavoor chathiram	8.88°N 77.42°E	64.00	28.80
			Keezhapavur	8.89°N 77.38°E	66.67	36.27
4.	Ramanathapuram	Kamuthi	Peraiyur	9.37°N 78.43°E	49.33	33.33
			Kamuthi	9.40°N 78.38°E	50.67	30.67
		Mudhukulathur	Keelasirupothu	9.28°N 78.59°E	57.33	35.47
			Sadaiyaneri	9.30°N 78.56°E	57.33	36.53
			Mudhukulathur	9.31°N 78.55°E	56.00	31.20
		Kadaladi	Idhampadal	9.24°N 78.68°E	48.00	27.20



a) Thoothukudi b) Tirunelveli c) Tenkasi d) Ramanathapuram

Plate 1: Survey for the incidence of ChiLCD in Southern districts of Tamil Nadu.

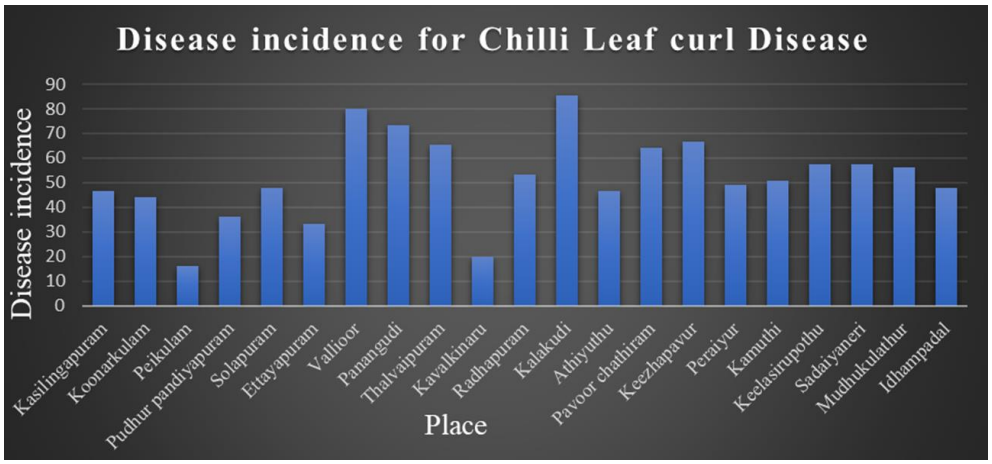


Fig. 1. Disease incidence of ChiLCD in Southern districts of Tamil Nadu.

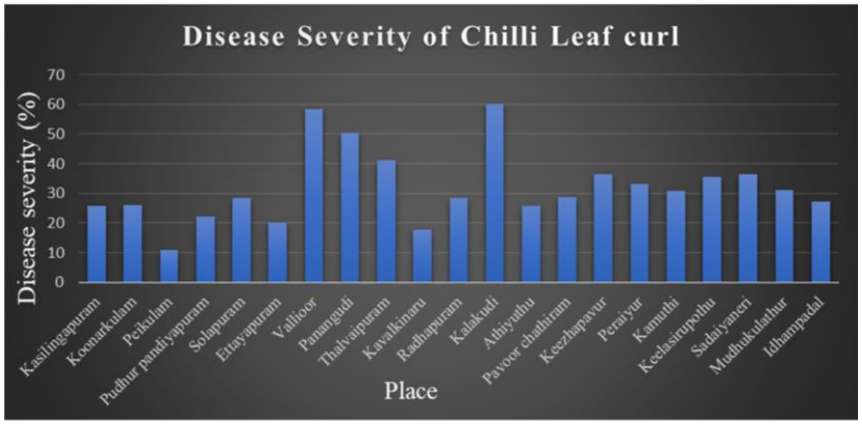


Fig. 2. Disease severity of ChiLCD in Southern districts of Tamil Nadu.

a) upward curling of leaves b) leaf curling c) puckering of leaf d) reduced leaf size e) bushy appearance of plants f) stunted plant

Plate 2: Symptoms of ChiLCD in chili.

CONCLUSION

The disease incidence was observed in vegetable growing areas of southern districts of Tamil Nadu. Among the different districts surveyed, maximum disease incidence and disease severity of Chilli leaf curl virus was observed in Tirunelveli district and the lowest disease incidence and disease severity was observed in Thoothukudi district. ChiLCD produced systemic symptoms of upward curling of leaves, crinkling of leaves, puckering of leaf reduced leaf surface, shortening of internodes, bushy appearance of plants and severe stunting of plants.

FUTURE SCOPE

This study will provide the disease incidence and severity in soruthern districts of Tamil Nadu it help to develope a management practices in chilli for future use.

REFERENCE

Banerjee, M. and Kalloo, M. (1987). Sources and inheritance of resistance to leaf curl virus in Lycopersicon. *Theoretical and Applied Genetics, 73*, 707-710.

Briddon, R. and Stanley, J. (2006). Subviral agents associated with plant single-stranded DNA viruses. *Virology, 344*(1), 198-210.

Chakraborty, S., Pandey, P., Banerjee, M., Kalloo, G. and Fauquet, C. (2003). Tomato leaf curl Gujarat virus, a new begomovirus species causing a severe leaf curl disease of tomato in Varanasi, India. Phytopathology, *93*(12), 1485-1495.

Chattopadhyay, B., Singh, A., Yadav, T., Fauquet, C., Sarin, N. and Chakraborty, S. (2008). Infectivity of the cloned components of a begomovirus: DNA beta complex causing chilli leaf curl disease in India. *Archives of Virology, 153*, 533-539.

Fondong, V. N. (2013). Geminivirus protein structure and function. *Molecular plant pathology, 14*(6), 635-649.

Hanley-Bowdoin, L., Settlage, S. B., Orozco, B. M., Nagar, S. and Robertson, D. (1999)., Geminiviruses: models for plant DNA replication, transcription, and cell cycle regulation. *Critical Reviews in Plant Sciences, 18*(1), 71-106.

Kheyr-Pour, A., Bendahmane, M., Matzeit, V., Accotto, G. P., Crespi, S. and Gronenborn, B. (1991). Tomato yellow leaf curl virus from sardinia is a whitefly-transmitted monoparatite geminivirus. *Nucleic acids research, 19*(24), 6763-6769.

Kumar, R., Kumar, V., Kadiri, S. and Palicherla, S. R. (2016)., Epidemiology and diagnosis of chilli leaf curl virus in central India, a major chilli growing region. *Indian Phytopathol, 69*(4s), 61-65.

Malathi, V., P. Renukadevi, S. Chakraborty, K. Biswas, A. Roy, P. Sivalingam, V. Venkataravanappa, and B. Mandal. 2017. Begomoviruses and their satellites occurring in India: distribution, diversity and pathogenesis. *A century of plant virology in India*: 75-177.

Nigam, K., Suhail, S., Verma, Y., Singh, V. and Gupta, S. (2015). Molecular characterization of begomovirus associated with leaf curl disease in chilli. *World J Pharm Res, 4*(3), 1579-1592.

Senanayake, D., Mandal, B., Lodha, S. and Varma, A. (2007). First report of Chilli leaf curl virus affecting chilli in India. *Plant pathology, 56*(2).

Senanayake, D., Varma, A. and Mandal, B. (2012). Virus–vector relationships, host range, detection and sequence comparison of Chilli leaf curl virus associated with an epidemic of leaf curl disease of chilli in Jodhpur, India. *Journal of Phytopathology, 160*(3), 146-155.

Spice Board India 2022-2023. Major Spice wise area & Production, First Advance Estimate of spices, Ministry of Commerce and Industry, Government of India

Varma, A. and Malathi, V. (2003). Emerging geminivirus problems: a serious threat to crop production. *Annals of Applied Biology, 142*(2), 145-164.

Wahyono, A., Murti, R. H., Hartono, S., Nuringtyas, T. R., Wijonarko, A., Mulyantoro, M. and Purnama, I. C. G. (2023). Current Status and Complexity of Three Begomovirus Species in Pepper Plants in Lowlands and Highlands in Java Island, Indonesia. *Viruses, 15*(6), 1278.

How to cite this article: Muthamil Kumaran J., Rajinimala N., Theradimani M., Elanchezhyan K., M.I. Manivannan M.I., Ebenezar E. G. and Sheela J. (2023). Occurrence of Chilli Leaf Curl Disease (ChiLCD) in southern Districts of Tamil Nadu. *Biological Forum – An International Journal*, *15*(8): 206-210.