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Survey for the status of chilli leaf curl virus disease (ChiLCVD) in chilli in different districts of North Karnataka during kharif 2024-25

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Abstract
Chilli (*Capsicum annuum* L.) is one of the most important constituent of the cuisines of tropical and subtropical countries and the fourth major spice as well as commercial vegetable crop cultivated globally. Among the various biotic stresses chilli leaf curl virus (ChiLCV) is the major virus disease in the chilli cultivation. Due to the availability of inoculum from the alternate host, vector population (whitefly), congenial environmental conditions and monocropping of chilli the ChiLCVD has been spreading continuously and causing >98 per cent of yield loss as per the earlier reports. Information of its distribution, host cultivars and vector abundance helps in determining its management. In the present study, survey to know the status of ChiLCVD across six districts of North Karnataka was carried our during *Kharif* 2024-25. Among the six district surveyed, disease incidence ranging from 12.45 to 54.52 per cent and highest average district disease incidence was noticed in Raichur (48.35 %) and minimum in Haveri (12.45 %). Irrespective of soil types the ChiLCV infection was found in all the cultivars. This information helps to identify the ChiLCV and vector free areas for successful chilli cultivation

Keywords: Chilli leaf curl virus (chilcv), north karnataka, kharif 2024-25, disease incidence, vector (whitefly)

Introduction

Chilli (*Capsicum annuum* L.) is one of the most important constituent of the cuisines of tropical and subtropical countries and the fourth major spice as well as commercial vegetable crop cultivated globally. It was thought to be originated in Mesoamerica. Around 400 different varieties of chilies are cultivated throughout the globe. Chilli is the native of Southern America and was first cultivated in Peru at around 7500 BC. It has been the first ever domesticated crop of America. Introduction of chilli to India is being credited to the voyage of Columbus, who brought the seeds from Spain, introducing it to Europe, which subsequently spread to Africa and Asia. It was introduced to Asian countries by the Portuguese and Arabian traders (Saxena *et al*., 2016) [18]. India is one of the ten top chilli-producing countries in the world. Area, production and average productivity of dry chilli in India is 0.92 m ha, 2.69 mt and 29.2 q/ha respectively. In India, Andra Pradesh stands 1st with production of 1.03 mt, Telangana stands 2nd position with the production of 0.68 mt, Karnataka stands 3rd with the production of 0.33 mt and followed by Madhya Pradesh which stands 4th with the production of 0.31 mt of dry chilli (Anon, 2024-25). In Karnataka, Dharwad, Ballari, Gadag, Raichur and Haveri were the major chilli producing districts, constituting 41.31, 40.44, 7.76, 5.62 and 0.20 per cent of its total area with a production share of 28.00, 57.29, 2.36, 6.91 and 0.18 per cent, respectively (Ashoka *et al.,* 2022) [2].

Viruses are the major constraints in chili production worldwide because, at present, nearly 75 viruses are known to infect chilli (Kenyon *et al*., 2014) [6] among which chilli leaf curl virus which is transmitted by whitefly (*Bemisia tabaci*) is the major one. In the recent past, chili leaf curl virus disease (ChiLCVD) has emerged as a serious constraint to chili production in India (Kumar *et al*., 2011 [8]; Roy *et al*., 2019 [17] and Shingote *et al*., 2022) [20]. The highest (>98%) percent yield loss due to ChiLCVD infection was recorded in the plants infected during early stages of crop growth (Ashwathappa *et al*., 2022) [4], known to cause 100 per cent losses to the marketable fruits (Kumar *et al*., 2011 [8]; Senanayake *et al*., 2012 [19] and Thakur *et al*., 2018) [22] and these viruses cause huge economic losses of about 15billion US Dollar per annum world wide.

In Karnataka, due to the continuous cultivation of chilli in major chilli growing districts, due the presence of alternate host like cotton which is the alternate host for vector multiplication, presence of weed hosts such as *Parthenium* sp., *Euphorbia geniculata* and *Cassia tora etc.*no rainfall at reproductive crop stage might have supported increase in vector population and virus spread (Raju, 2010 [16]; Manjesh, 2018 [12]; Sudhapatil, 2018; [21] Mallikarjun *et al*., 2021 and Prashanth, 2024) [15] and hence disease has been increasing in recent years.

The present study was aimed to identify the incidence and understand the present status of chilli leaf curl virus disease (ChiLCVD) under field conditions in major chilli growing districts of North Karnataka. The data of district, taluk, village, name of variety, stage of the crop, soil type, types of symptoms, surrounding crops or weed hosts, per cent disease incidence and management practices undertaken by the farmers were collected.

Materials and methods

An intensive roving survey was carried out to assess the incidence and to understand present status of chilli leaf curl virus disease under field conditions in different chilli growing areas of North Karnataka *viz*., Raichur, Ballari, Gadag, Dharwad, Haveri and Yadgir districts during 2024-25.

In each district, at least two taluks were selected. In each taluk two villages and in each village two fields were selected. In each field randomly 10×10 sq m area was selected and infected plants out of total plants were counted, further disease incidence was calculated as per the formula

mentioned below. During the survey, data on different types of symptoms observed on chilli, variety/hybrid grown, stage of the crop, its surrounding weeds, soil type and Global Positioning System (GPS) way points were also recorded. The data collected were imported to draw the spatial map of leaf curl disease distribution using the software.

$$\text{Disease incidence (\%)} = \frac{\text{Number of infected plants}}{\text{Total number of plants observed}} \times 100$$

Results and Discussion

A roving survey was conducted to assess the incidence and understand the present status of chilli leaf curl virus disease (ChiLCVD) under field conditions in major chilli growing districts of North Karnataka during *Kharif* 2024 (Fig. 1). In the surveyed fields, infected chilli plants expressed characteristic begomoviral disease symptoms such as interveinal chlorosis, downward and upward leaf curling with the prominent enations, reduced leaf size, boat-shaped leaves, and yellowing. As the infection progressed, the plants developed a bushy appearance, stunted growth, apical bunchy tops, and extensive leaf curling. At early stages of infection, these symptoms often led to failure in flower and fruit production (Fig. 2), these diagnostic symptoms consistent with earlier reports (Muniyappa and Veeresh, 1984 [14]; Chaubey and Mishra, 2017 [5]; Senanayake *et al*., 2012 [19]; Manjesh, 2018 [12]; Sudhapatil, 2018 [21]; Mallikharjunarao, 2020 [11]; Ashwathappa, 2021 [3] and Prashanth, 2024) [15].

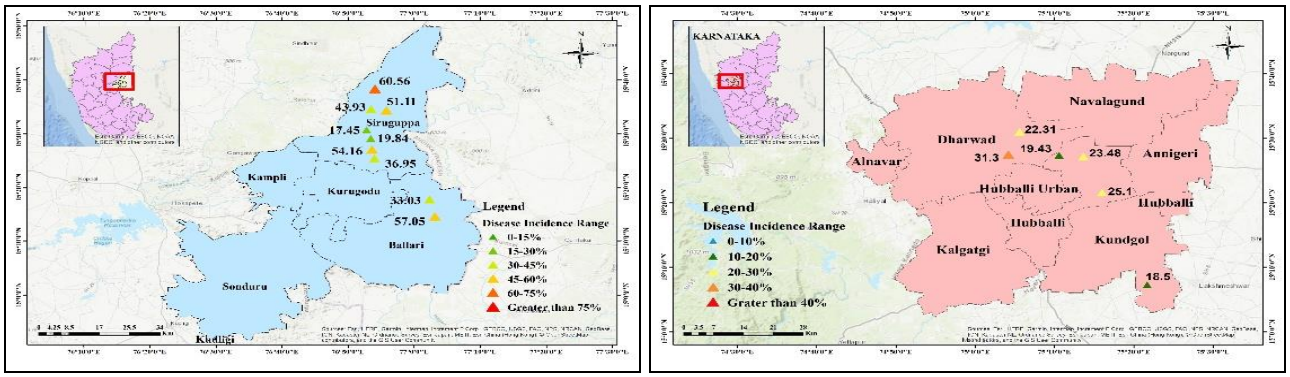
The survey data showed that ChiLCVD incidence varies from 12.45 to 54.52 per cent. Maximum disease incidence of 54.52 per cent was recorded from Raichur taluk of Raichur district and minimum disease incidence of 12.45 per cent was recorded from Ranebennur thaluk of Haveri district. In case of Ballari district, Ballari taluk recorded disease incidence of 45.04 per cent and Siruguppa taluk (40.57%). In case of Dharwad district, Dharwad taluk recorded the disease incidence 26.80 per cent, Hubballi (21.45%) and Kundgol (21.80%). In case of Gadag district, Gadag taluk recorded the disease incidence of 18.41 per cent and Rona (13.95%). In case of Haveri district, Ranebennur taluk recorded the disease incidence of 12.45 per cent. In case of Raichur district, Raichur taluk recorded the disease incidence of 54.52 per cent, Devadurga (41.70%) and Manvi recorded (48.82%). In Yadgir district, Shahapur taluk recorded the disease incidence 20.73 per cent. The district wise data indicated that maximum mean disease incidence of 48.35 per cent was recorded in Raichur district followed by Ballari (42.81%), Dharwad (23.35%), Yadgir (20.73%), Gadag (16.18%) and minimum disease incidence was observed in Haveri district (12.45%) (Table 1).

In the field conditions the symptoms of leaf curl virus was observed on different kind of weed host *viz. Parthenium hysterophorus, Euphorbia geniculata, Amaranthus viridis, Aeschynomene indica, Portulaca,Calyptocarpus, Cassia tora, Ase- Alternanthera sessilis, Cassia nigricans, Croton* and *Chenopodium album* were noticed adjacent to surveyed plots with the symptoms such as inter veinal chlorosis, vein clearing, yellowing, curling and crinkling.

The average incidence of the Raichur district was 48.35 per cent (Table 1). In the current study ChiLCVD incidence was increased as compared with earlier reports by (Manjesh, 2018 [12]; Sudhapatil 2018 [21]; and Ashwathappa, 2021) [3] and comparable with disease incidence reported by Prashanth (2024) [15] the enhancement of incidence is due to the availability of alternate host which harbours virus and vector, monocropping and crops like cotton which is the most preferable host for vector multiplication. The disease incidence in Haveri, Gadag and Yadgir was lesser compare to earlier reports of (Raju, 2010 [16]; Mallikharjunarao, 2021 [11] and Prashanth, 2024) [15] due chilli crop has been replaced by non host crops like onion and maize etc., adoption of management practices like use of green labelled insecticides, sticky traps etc.,

In addition to this, the mean severity of chilli leaf curl disease was documented on different chilli varieties/hybrids grown in the North Karnataka. Among the varieties/hybrids grown the maximum incidence was observed HPH 5531 (42.99%) followed by Byadgi Kaddi (33.49%), Super 10 (32.69%), Local cultivar (27.64%) and Byadgi Dabbi (21.21%) (Table 2).

ChiLCV infection can be noticed in all the verities/hybrids grown in the surveyed districts. The variation in disease incidence may also be influenced by external environmental factors affecting whitefly populations (Meghashree, 2017) [13], the presence of different virus strains (Khan *et al*., 2013 [7] and Zehra *et al.*, 2017) [23], management practices implemented, intercropping with non host and host resistance to both the virus and the whitefly vector (Kushwaha *et al.*, 2015 [9] and Prashanth, 2024) [15].



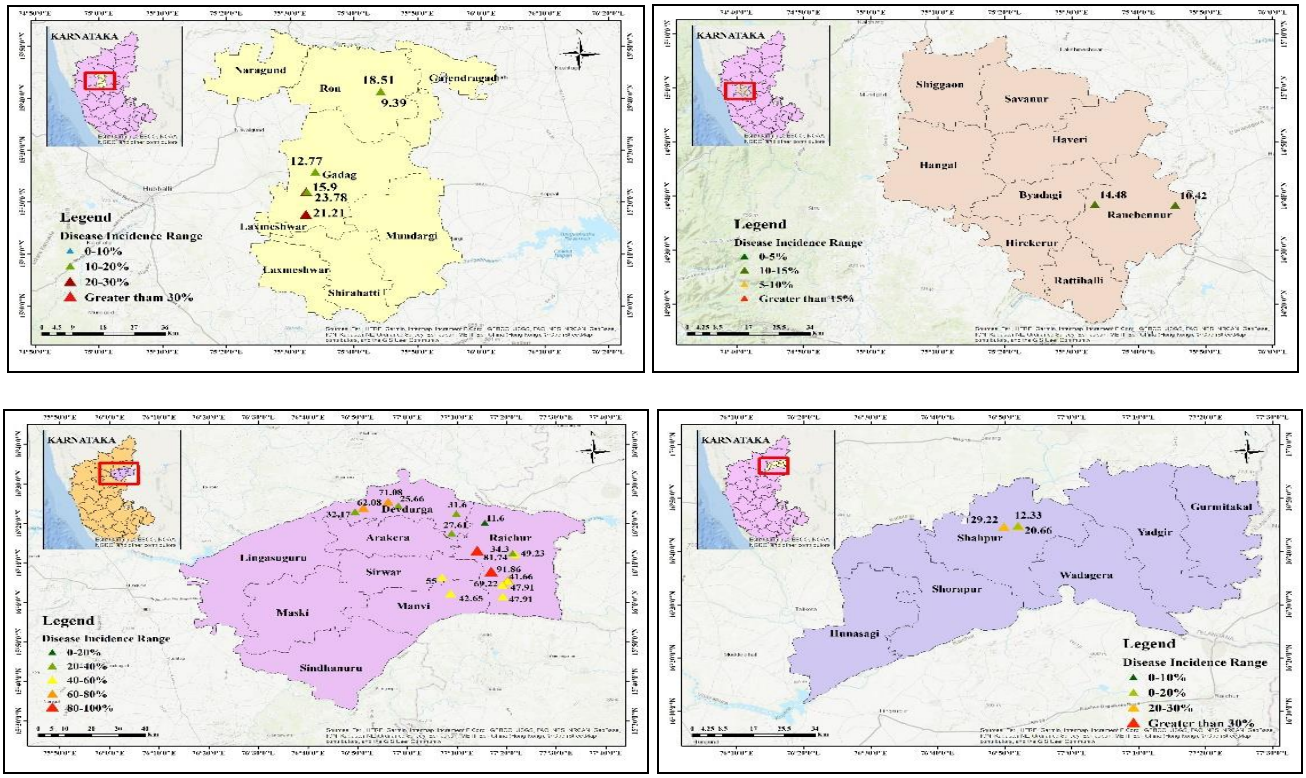


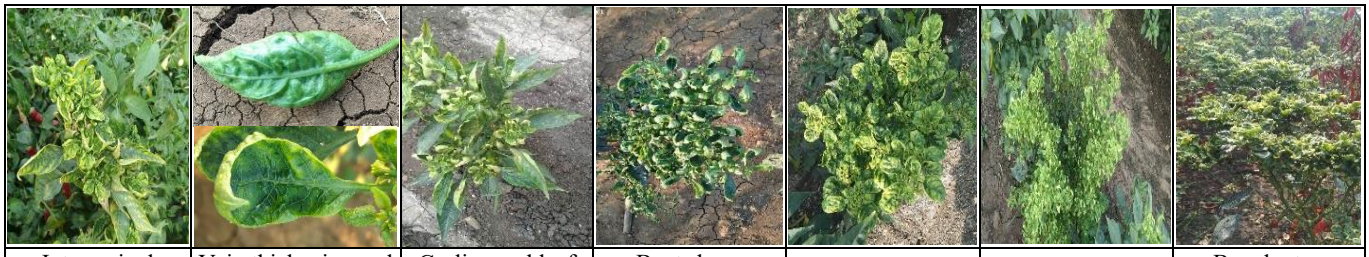
Fig 1: GIS mapping of chilli leaf curl virus disease incidence a. Ballari b. Dharwad c. Gadag d. Haveri e. Raichur

Table 1: Mean incidence of chilli leaf curl virus disease in different taluks and districts of North Karnataka during *Kharif* 2024-25

Sl. No.	District	Taluk	Mean disease incidence (%)	
			Taluk	District
1	Ballari	Ballari	45.04	42.81
		Siruguppa	40.57	
2	Dharwad	Dharwad	26.80	23.35
		Hubballi	21.45	
		Kundgol	21.80	
3	Gadag	Gadag	18.41	16.18
		Rona	13.95	
4	Haveri	Ranebennur	12.45	12.45
5	Raichur	Raichur	54.52	48.35
		Devadruga	41.70	
		Manvi	48.82	
6	Yadgir	Shahapur	20.73	20.73

Table 2: Status of chilli leaf curl virus disease on different varieties/hybrids during *Kharif* 2024

Sl. No.	Variety/Hybrid	Mean disease incidence (%)
1	HPH-5531	42.99
4	Byadgi Kaddi	33.49
5	Byadgi Dabbi	21.21
6	Local cultivar	27.64
7	Super 10	32.69



Inter-veinal chlorosis	Vein thickening and enations	Curling and leaf elongation	Boat shape appearance of leaf	Mottling of leaf	Severe leaf curling	Bunchy top appearance

Fig 2: Symptoms of chilli leaf curl virus disease

Conclusion

The study on distribution of ChiLCVD in chilli concludes that, the disease is prevalent in all the locations and disease incidence varied across the surveyed geographical regions of Noth Karnataka. which mainly due to the presence of varied environmental condition in different areas, vector population, monocropping, alternate host for virus and vector multiplication and adoption of management practices like use of green labelled insecticides, sticky traps etc. In some districts, known for intensive chilli cultivation, area under chilli cultivation has been decreasing and hence ChiLCVD incidence has been decreasing because chilli has been replaced by non host crops like maize and onion.

Reference

1. Anonymous. India Stat, area, yield and production for the year 2024-25, 2024. https://www.indiastat.com.
2. Ashoka N, Kareem MA, Shashidhara N, Raju R, Harshavardhan M, Hongal S, *et al*. Dynamics of chilli (*Capsicum annuum* L.) production in Karnataka: An Economic Analysis. Indian Journal of Economics and Development,2022:18(2):374–380.
3. Ashwathappa KV. Molecular characterization of chilli leaf curl virus in Karnataka. Ph.D Thesis, Univ. Agric. Sci., Raichur,2021:45–71.
4. Ashwathappa KV, Reddy MK, Naik MK, Venkataravanappa V, Aswathanarayana DS, Govindappa MR, *et al*. Estimation of yield loss due to chilli leaf curl disease in chilli (*Capsicum annuum* L.) at different stages of the crop. Pest Management in Horticultural Ecosystems,2022:28(1):147–151.
5. Chaubey AN, Mishra RS. Survey of chilli leaf curl complex disease in eastern part of Uttar Pradesh. Biomed. J. Sci. Tech. Res,2017:1(7):230–248.
6. Kenyon L, Kumar S, Tsai WS, Hughes JDA. Virus diseases of peppers (*Capsicum* spp.) and their control. Adv. Virus Res,2014:90:297–354.
7. Khan AJ, Sohail A, Zaidi AMA, Singh AK, Briddon RW. Genetic diversity and distribution of a distinct strain of chilli leaf curl virus and associated betasatellite infecting tomato and pepper in Oman. Virus Res,2013:177:87–97.
8. Kumar Y, Hallan V, Zaidi AA. Chilli leaf curl Palampur virus is a distinct begomovirus species associated with a betasatellite. Plant Pathol,2011:60(6):1040–1047.
9. Kushwaha N, Sahu PP, Prasad M. Chilli leaf curl virus infection highlights the differential expression of genes involved in protein homeostasis and defense in resistant chilli plants. Appl. Microbiol. Biotechnol,2015:99:4757–4770.
10. Chirumella M, Kenganal M, Amaresh YS, Aswathanarayana DS, Hosmani A. Spatial distribution of chilli leaf curl virus disease in Northern Karnataka. Int. J. Curr. Microbiol. App. Sci,2021:10(3):188–194.
11. Mallikharjunarao C. Studies on molecular diversity and management of chilli leaf curl virus disease (ChiLCVD) in chilli (*Capsicum annuum* L.). M.Sc. (Agri) Thesis, Univ. Agric. Sci., Raichur,2020:110–130.
12. Manjesh VS. Studies on leaf curl disease in chilli. M.Sc. (Agri) thesis, Univ. Agric. Sci. Raichur (India),2018:4–49.
13. Meghashree. Epidemiology and host resistance for the management of mungbean yellow mosaic virus (MYMV) in mungbean. M. Sc. (Agri) Thesis, Univ. Agril. Sci. Raichur, Karnataka, India,2017:77–82.
14. Muniyappa V, Veeresh GK. Plant virus diseases transmitted by whiteflies in Karnataka. Proc. Indian Acad. Sci,1984:93:397–406.
15. Prashanth SV. Epidemiology and exploration of resistance source to chilli leaf curl virus disease. M.Sc. (Agri) thesis, Univ. Agric. Sci. Raichur (India), 2024, 14–45.
16. Raju SG. Studies on chilli leaf curl complex disease. Ph. D. Thesis, Univ. Agric. Sci., Dharwad, Karnataka (India),2010:45–51.
17. Roy A, Zhai Y, Ortiz J, Neff M, Mandal B, Mukherjee SK, *et al*. Multiplexed editing of a begomovirus genome restricts escape mutant formation and disease development. Plos one,2019:14(10):0223765.
18. Saxena A, Raghuwanshi R, Gupta VK, Singh HB. Chilli anthracnose: the epidemiology and management. Front Microbiol,2016:7:1527.
19. Senanayake DMJB, Varma A, Mandal B. 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. J. Phytopathol,2012:160(3):146–155.
20. Shingote PR, Wasule DL, Parma VS, Holkar SK, Karkute SG, Parlawar ND, *et al*. An overview of chili leaf curl disease: Molecular mechanisms, impact, challenges, and disease management strategies in Indian subcontinent. Front Microbiol,2022:13:899512.
21. Sudhapatil. Studies on diversity of leaf curl viruses and their vector in major crops. M. Sc. (Agri.) Thesis, Univ. Agric. Sci., Raichur, (India), 2018.
22. Thakur H, Jindal SK, Sharma A, Dhaliwal MS. Chilli leaf curl virus disease: a serious threat for chilli cultivation. J. Plant Dis. Prot,2018:125:239–249.
23. Zehra SB, Ahmad A, Sharma A, Sofi S, Lateef A, Bashir Z, *et al*. Chilli leaf curl virus an emerging threat to chilli in India. Int. J. Pure Appl. Biosci,2017:5:404 414.