

Distribution and Severity of Turcicum Leaf Blight of Maize caused by *Exserohilum turcicum* (Pass.) Leonard and Suggs. in Northern parts of Karnataka

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ABSTRACT: Maize (*Zea mays* L.) is the third most important cereal crop in India after wheat and rice in terms of production and productivity. Among various foliar diseases affecting the maize, turcicum leaf blight (TLB) caused by *Exserohilum turcicum* has become a major limiting factor for maize production affecting photosynthesis with severe reduction in grain yield to an extent of 28 to 91%. The disease effect leads to qualitative changes in the seed resulting in reduced germination capacity and decreased sugar content. In order to get comprehensive information on disease prevalence, level of incidence and severity, to prepare a disease distribution map and for hot spot location for screening of genotypes against disease resistance, a roving survey was carried out during *kharif* 2018-19 in major maize growing districts of northern parts of Karnataka viz., Bagalkot, Belagavi, Dharwad, Haveri and Uttara Kannada. The disease severity varied from 35.61% to 52.84%. The maximum disease severity of turcicum leaf blight was recorded in Haveri district with a mean disease severity of 50.61%. While the minimum disease severity of TLB was recorded in Bagalkot district (42.69 %).

Keywords: Maize, Turcicum leaf blight, *Exserohilum turcicum*, Disease severity.

INTRODUCTION

Maize (*Zea mays* L.) is one of the important cereal crops that belong to the family Poaceae. Maize can be grown under varied agro-climatic conditions as it has wider adaptability. It is globally recognized as the “Miracle crop” and “Queen of cereals” because of its higher genetic yield potential compared to other cereals. In India, maize is the third most important cereal crop after wheat and rice. Maize consumption in India can broadly be divided into three categories viz., feed, food and Industrial non-food products (mainly starch). The most important use and demand driver of maize is poultry and cattle feed, which accounts for 63 per cent of total maize consumption and nearly 8 per cent of maize is consumed by humans. It has got its importance as it is used for the production of other maize products such as corn starch, corn syrup, corn ethanol and other value-added products (www.Indiastat.com, 2020).

The major consumption states in India are Karnataka, Andhra Pradesh, Punjab, Gujarat, Haryana, Telangana, Tamil Nadu, Bihar and West Bengal. It is the most versatile crop and is grown in more than 166 countries across the globe, including tropical, subtropical and temperate regions, from sea level to 3000 m above sea level. It is cultivated on nearly 197 million hectares with a production of 1148 million tonnes and productivity of 5823.8 kg/ha all over the world, having a wider diversity of soil, climate, biodiversity and management

practices, contributing 37 per cent of the global grain production (FAO STAT, 2019). India produced 30 million tonnes in an area of 9.9 million hectares in 2020-21 (agricoop.nic.in). The United States of America (USA) is the largest producer of maize, contributing 30 per cent of the total production in the world and maize is regarded as the driver of the US economy.

Turcicum leaf blight (TLB) or Northern Corn Leaf Blight (NCLB) is a ubiquitous foliar disease of corn (maize) caused by *Exserohilum turcicum*, the anamorph of the ascomycete *Leptosphaeria*. The TLB fungus survives through the winter on infected maize residue at the soil surface. As temperatures rise in the spring and early summer, the fungus produces spores on residue, and then the spores are splashed or wind-blown onto leaves of the new maize crop. Infection occurs during periods of moderate (64° to 81°F), wet and humid weather. The disease begins as long, slender, greyish or tan leaf lesions that run parallel to the mid vein. Lesions can eventually expand to a more oblong or “cigar” shape. Lesions may also form on husks. Loss of photosynthetic tissue can result in decreased yield, and silage quality can be affected (Jakhar *et al.*, 2017).

Considering the severity and loss caused by *E. turcicum*, it was thought necessary to initiate systematic studies on the destructive turcicum leaf blight disease problem occurring in different parts of Karnataka.

MATERIAL AND METHODS

A roving survey was conducted during *khariif* 2018 to find out the prevalence and severity of foliar diseases of maize in major maize growing districts *viz.*, Bagalkot, Belagavi, Dharwad, Haveri and Uttara Kannada. In each district, three to four major maize cultivating

taluks and one to three villages were assessed for disease severity. From each village, samples were randomly selected from a farmer's field for recording the disease severity. The observations on disease severity, stage of the crop, hybrids and other details were recorded. Disease severity was recorded by the following 1-9 disease rating scale (Anon., 2016).

Disease rating scale for TLB (1-9)

Rating scale	Degree of infection
1	Very slight infection ($\leq 10\%$)
2	Slight infection, a few lesions scattered on two lower leaves (10.1 - 20 %)
3	Light infection, moderate number of lesions scattered on four lower leaves (20.1 - 30 %)
4	Light infection, moderate number of lesions scattered on lower leaves, a few lesion scattered on middle leaves below the cob (30.1 - 40 %)
5	Moderate infection, abundant number of lesions scattered on lower leaves, moderate number of lesions scattered on middle leaves below the cob (40.1 - 50 %)
6	Heavy infection, abundant number of lesions scattered on lower leaves, moderate infection on middle leaves and a few lesions on two leaves above the cob (50.1 - 60 %)
7	Heavy infection, abundant number of lesions scattered on lower and middle leaves and moderate number of lesions on two to four leaves above the cob (60.1 - 70 %)
8	Very heavy infection, lesions abundant scattered on lower and middle leaves and spreading up to the flag leaf (70.1 - 80 %)
9	Very heavy infection, lesions abundant scattered on almost all the leaves, plant prematurely dried and killed ($> 80\%$)

Further the per cent disease index (PDI) was calculated using the following formula given by Wheeler (1969).

$$PDI = \frac{\text{Sum of all the individual disease ratings}}{\text{Total number of plants observed}} \times \frac{100}{\text{Maximum grade}}$$

RESULTS AND DISCUSSION

A roving survey was undertaken to record the severity of turcicum leaf blight prevailing on maize during *khariif* 2018-19 at Bagalkot, Belagavi, Dharwad, Haveri and Uttara Kannada districts of Karnataka (Fig. 1). The results indicated that the disease severity varied from 35.61% to 52.84%. The maximum mean disease severity of TLB was observed in Haveri district with disease severity of 50.61% succeeded by Dharwad and Uttara Kannada districts with mean PDI of 49.59 and 49.08 respectively. While the minimum disease severity of TLB was recorded in Bagalkot district (42.69 %) followed by Belagavi district with disease severity of 47.39% (Tables 1, 2 and Fig. 2).

Maximum disease severity of TLB in Bagalkot district was recorded in Chimmad village of Jamakandi taluk with disease severity of 49.35 % followed by Belagali village (46.61 PDI) of Mudhol taluk, both at dough stage of the crop under irrigated condition. Whereas, the minimum disease severity was found in Gaddanakeri village of Badami taluk (35.61 PDI) at grain filling stage followed by Govinakoppa village of Badami taluk (36.73 PDI) at dough stage both under rainfed condition.

In Belagavi district, maximum severity of TLB was observed in Arabhavi village of Gokak taluk with PDI of 51.32 followed by Hooli village of Saundatti taluk (49.31 PDI) both at silking stage under the irrigated condition. Whereas, the lowest disease severity was

found in Saundatti village of Saundatti taluk with PDI of 42.56 at grain filling stage under irrigated condition.

In Dharwad district, maximum disease severity was noticed in Karadikoppa village of Hubballi taluk with PDI of 51.92 at grain filling stage followed by Tabakadahonnalli village (51.62 PDI) of Kalaghatagi taluk at dough stage both under rainfed conditions. Whereas, the minimum disease severity was noticed in Shivalli village (46.87 PDI) of Hubballi taluk at dough stage under rainfed condition followed by Dummawada village (47.32 PDI) of Kalaghatagi taluk at dough stage under irrigated condition.

In Haveri district, maximum disease severity was found in Kadahalli village of Shiggaon taluk with PDI of 52.68 at grain filling stage under rainfed condition followed by Byadgi village (52.61 PDI) of Byadgi taluk at grain filling stage under irrigated conditions. Whereas, the minimum disease severity was found in Karjagi village of Haveri taluk with PDI of 47.39 followed by Savanur village (49.32 PDI) of Savanur taluk both at dough stage under rainfed condition.

In Uttara Kannada district, maximum disease severity was found in Sanavalli village of Mundgod taluk with PDI of 52.84 followed by Bada village (51.80 PDI) of Sirsi taluk both at dough stage of crop under rainfed conditions. Whereas, the minimum disease severity was found in Bisalkoppa village of Sirsi taluk with PDI of 41.69 followed by Tavargere village (47.36 PDI) of Mundgod taluk both at dough stage under rainfed condition.

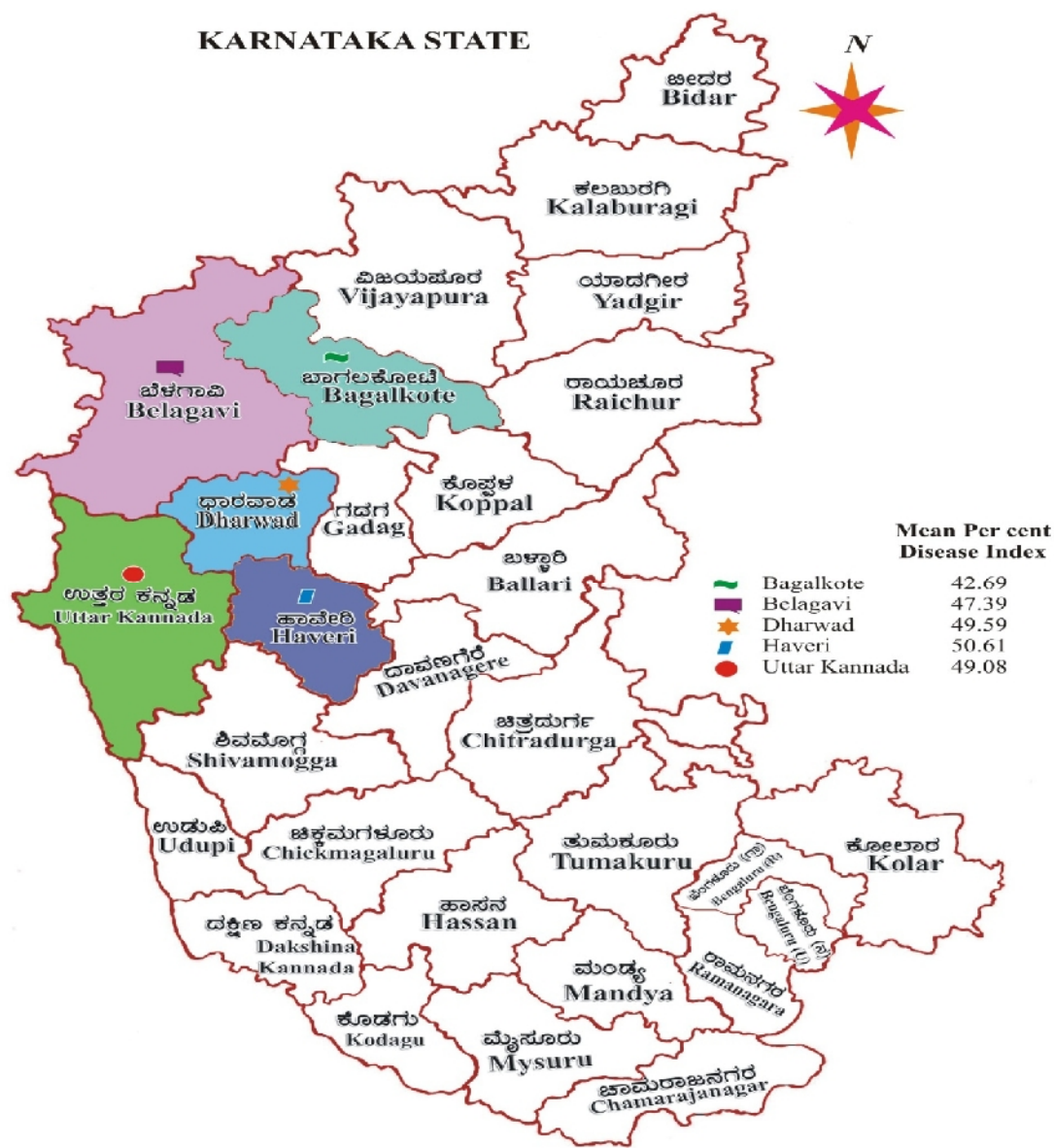


Fig. 1. Karnataka map showing district wise mean severity of turcicum leaf blight during kharif 2018.

Across the different locations surveyed, the maximum disease severity of TLB was observed in red soil with PDI of 49.79. With respect to crop grown condition, maximum disease severity was observed in irrigated condition with PDI of 49.67. With respect to stage of the crop, maximum disease severity was recorded at dough stage of the crop with PDI of 49.03 as indicated in Table 3. The variation of disease severity in these locations might be because of frequent and heavy rainfall, low temperature; increased relative humidity, intensive cultivation of maize season after season, susceptible cultivar grown and susceptible stage of crop have provided favourable environmental conditions for disease progress to greater extent.

The present findings are in accordance with the work of Harlapur *et al.* (2012) who conducted the survey on maize diseases in major maize growing regions of Karnataka and they reported that turcicum leaf blight

and common rust diseases were predominately found in heavy rainfall areas of hilly zone and transitional zone in Karnataka. However, turcicum leaf blight and common rust were severe in Kalaghatgi, Davanigeri, Dharwad and Haveri areas of northern Karnataka.

Similarly, Dalavai and Kalappanavar (2017) conducted a roving survey on turcicum leaf blight and common rust of maize in major maize growing areas of northern parts of Karnataka *viz.*, Bagalkot, Belagavi, Dharwad, Gadag, Haveri and Vijaypur. And they reported that among the 19 taluks surveyed, the minimum disease severity of TLB was observed in Indi taluk of Vijaypur district. While the maximum disease severity was noticed in Hukkeri taluk of Belagavi district.

Similarly, Geeta *et al.* (2018) conducted a roving survey was conducted in five districts of North Eastern Karnataka during kharif 2016 in major maize growing areas of Koppal, Ballari, Raichur, Yadgir and

Kalaburagi districts. The results revealed that, turcicum leaf blight disease was prevalent in all the maize growing areas of Raichur, Koppal, Ballari, Yadgir and

Kalaburagi districts in low to severe form with ranging from 2.00 to 40.00 percent.

Table 1: Severity of turcicum leaf blight of maize in northern parts of Karnataka during kharif 2018.

District	Taluk	Village	Soil type	Cultivar grown	Crop grown condition (Irrigated/Rainfed)	Crop stage	Per cent disease index	Other diseases observed	
Bagalkote	Badami	Gaddankeri	Black	DKC 8101	Rainfed	Grain filling	35.61	CR, MLB	
		Govinakopp	Black	P 3501	Rainfed	Dough	36.73	CR, MLB	
		Keroor	Black	PAC 740	Rainfed	Silking	38.36	CR, MLB	
		Mean							
	Jamakhandi	Chimmad	Black	GK- 3164	Irrigated	Dough	49.35	CR, MLB	
		Mahalingpur	Black	PAC 751	Irrigated	Silking	45.63	CR, MLB	
		Sangamatti	Black	NK 6240	Irrigated	Grain filling	43.39	CR, MLB	
		Mean							
	Mudhol	Belagali	Black	Hi Shell	Irrigated	Dough	46.61	CR, MLB	
		Mantoor	Black	S 6668	Irrigated	Dough	43.36	CR, MLB	
		Mudhol	Black	DKC 9081	Irrigated	Dough	45.25	CR, MLB	
		Mean					45.07		
Belagavi	Bailhongal	Inchal	Black	D 4685	Rainfed	Dough	48.61	CR	
		Kenganur	Black	900 M super	Rainfed	Silking	43.52	CR	
		Marigeri	Black	DKC 9141	Rainfed	Dough	47.65	CR	
		Mean					46.59		
	Gokak	Arabhavi	Black	Chola	Irrigated	Silking	51.32	CR, MLB	
		Gokak	Black	Laxmi 999	Irrigated	Dough	48.91	CR, MLB	
		Kallolli	Black	Seedtech 740	Irrigated	Silking	47.82	CR, MLB	
		Mean					49.35		
	Saundatti	Hanchinal	Black	P 30 B 07	Irrigated	Dough	46.82	CR	
		Hooli	Black	DKC 9126	Irrigated	Silking	49.31	CR	
		Saundatti	Black	P 3401	Irrigated	Grain filling	42.56	CR	
		Mean					46.23		
	Dharwad	Dharwad	Garag	Black	D 4685	Rainfed	Dough	50.35	CR, CLS
			Mugad	Black	NK 6240	Rainfed	Dough	51.32	CR, CLS
			Narendra	Black	KHM 101	Rainfed	Dough	47.81	CR, CLS
			Mean	49.82					
Kalaghatagi		Dummawada	Black	Allrounder	Irrigated	Dough	47.32	CR, CLS	
		Jinnur	Black	CP 818	Irrigated	Dough	49.51	CR, CLS	
		Tabakadahonnalli	Black	P 3501	Irrigated	Dough	51.62	CR, CLS	
		Mean					49.48		

Table 2: District and taluk wise severity of turcicum leaf blight of maize during kharif 2018.

District	Taluk	Per cent disease index
Bagalkote	Badami	36.88
	Jamakhandi	46.12
	Mudhol	45.07
	Mean	42.69
Belagavi	Bailhongal	46.59
	Gokak	49.35
	Saundatti	46.23
	Mean	47.39
Dharwad	Dharwad	49.82
	Kalaghatagi	49.48
	Hubblli	49.47
	Mean	49.59
Haveri	Byadgi	50.87
	Haveri	49.19
	Savanur	50.61
	Shiggaon	51.78
	Mean	50.61
Uttara Kannada	Haliyal	49.62
	Mudgod	49.94
	Sirsi	47.67
	Mean	49.08

Table 3: Severity of turicum leaf blight of maize under different situations.

Particulars	Per cent disease index
Soil type	
Black soil	43.33
Red soil	49.79
Crop grown condition (Irrigated/ Rainfed)	
Irrigated	49.67
Rainfed	49.23
Stage of the crop	
Dough stage	49.03
Grain filling stage	48.23
Silking stage	44.67

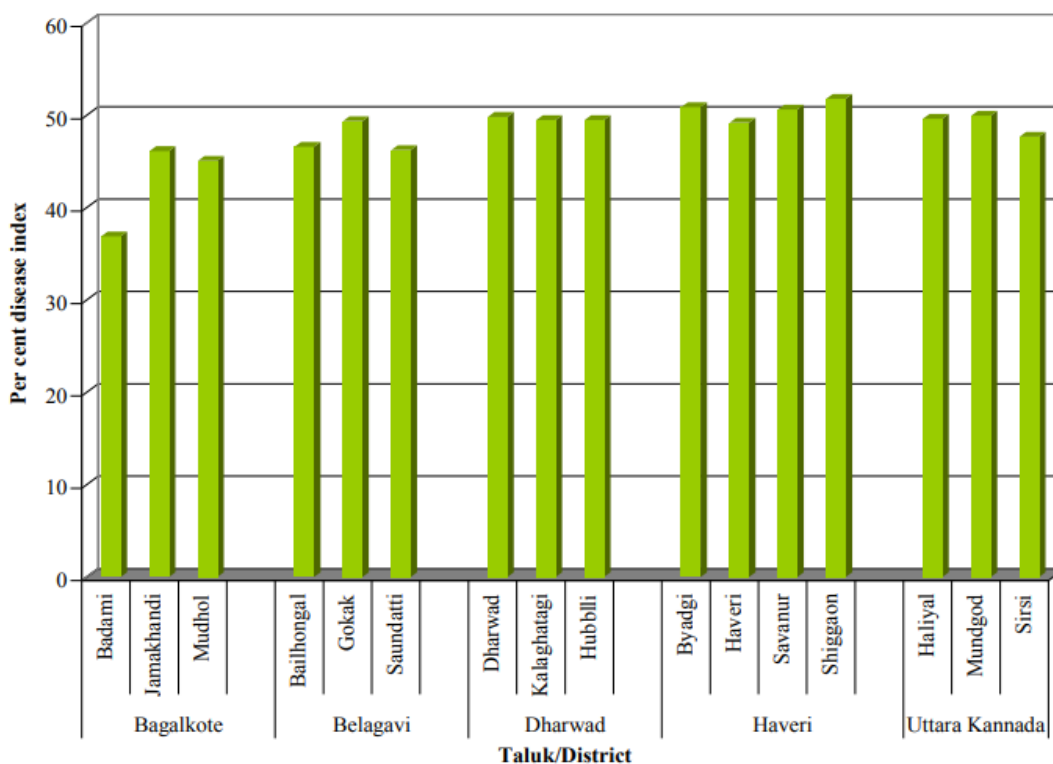


Fig. 2. District and taluk wise severity of turicum leaf blight of maize in northern parts of Karnataka during *kharif* 2018.

CONCLUSION

The results of roving survey carried out during *kharif* 2018 in Bagalkot, Belagavi, Dharwad, Haveri and Uttara Kannada districts revealed that maximum disease severity (52.84 PDI) of turicum leaf blight was recorded in Sanavalli village of Uttara Kannada district. The district wise mean disease severity was maximum in Haveri district (50.61 PDI).

In order to identify the effect of rhythmic changes in the different crop grown conditions on incidence and severity of the disease and to know the status of the resistance in commercial high yielding hybrids, the survey and surveillance of the disease shall be carried out every year in different agro climatic regions in different seasons.

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REFERENCES

- Anonymous (2016). Annual progress report (2016 - 2017), All India Coordinated Maize Improvement Project, Indian Council of Agricultural Research, Indian Institute of Maize Research, Ludhiana. pp. 214-216.
- Anonymous (2019). Agricultural Statistics Division, Directorate of Economics and Statistics, Department of Agriculture, Co-operation and Farmer's welfare, <http://agricoop.gov.in>.
- Anonymous (2019). FAO Statistical Database. FAO, Rome, Italy.
- Anonymous (2019). Area, production and productivity. Ministry of Agriculture and Farmers Welfare, Govt. of India. www.indiastat.com.
- Dalavai, P. A. and Kalappanavar, I. K. (2017). Investigations of Turicum Leaf Blight and Common Rust of Maize

- in Northern Karnataka. *Journal of Farm Sciences*, 30(3): 431-434.
- Geeta, Aswathanarayana, D. S., Naik, M. K., Mallikarjun, K. and Prakash, H. K. (2018). Survey For The Severity of Turcicum Leaf Blight of Maize in Major Maize Growing Regions of North Eastern Karnataka. *International Journal of Chemical Studies*, 6(5): 2484-2486.
- Harlapur, S. I., Ningalur, B. T. and Mummigatti, U. V. (2012). Research Project Report on Mapping of Maize Diseases Distribution in Karnataka. University of Agricultural Sciences, Dharwad. p. 63.
- Jakhar, D. S., Rajesh, S., Saket, K., Pargat, S. and Vivek O. (2017). Turcicum Leaf Blight: A Ubiquitous Foliar Disease of Maize (*Zea mays* L.). *International Journal of Current Microbiology and Applied Sciences*, 6(3): 825-831.
- Wheeler, B. E. J. (1969). An Introduction to Plant Diseases. John Wiley and Sons Ltd., London. p.301.

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