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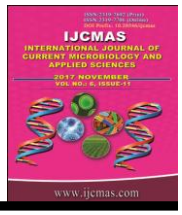

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Survey for Little Leaf of Brinjal Disease (*Candidatus phytoplasmatrifolii*) Incidence in Northern Karnataka, India

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A B S T R A C T

Little leaf disease caused by phytoplasma (*Candidatus phytoplasmatrifolii*) is one of the important diseases in Brinjal. In recent years incidence of little leaf disease is increasing in Karnataka. The roving survey was undertaken to know the incidence of little leaf phytoplasma disease of brinjal in different parts of northern Karnataka *viz.*, Dharwad, Belgaum and Haveri districts during *kharif*, 2013. It was evident that the disease was severe in all the districts during *kharif*, 2013 and the average disease incidence recorded from 20.55 to 35.44 per cent in northern Karnataka. The maximum disease incidence of 35.44 per cent was recorded at Dharwad district followed by Belgaum district 32.48 per cent and minimum disease incidence was noticed in 20.55 per cent in Haveri district.

Introduction

The brinjal or eggplant (*Solanum melongena* L.) belongs to the family Solanaceae. Brinjal is the most common, popular and widely grown vegetable crop of both tropics and sub-tropics of the world. Brinjal is a self-pollinated and annual herbaceous plant. It is being grown extensively in India, Bangladesh, Pakistan, China, Philippines, France, Italy and United States. Vavilov (1931) reported that India is the centre of origin. It is highly productive and finds its place as the poor man's vegetable (Som and Maity, 2002).

It is grown in almost all parts of India, except in higher altitudes throughout the year.

Brinjal is affected by several diseases of which little leaf causing phytoplasma is one of the most important disease causing considerable economic losses (Mitra, 1993). The infected plants are characterized by severe stunting, shortened internodes, proliferation of shoots, and reduction in leaf size and phyllody of flowers. Brinjal little leaf disease was first reported in the central farm, Coimbatore by Thomas and Krishnaswamy (1939) and several biological aspects of the disease have been described (Varma *et al.*, 1969; Mitra, 1993). The insect vector, *Hishimonus phycitis* Distant was reported by (Bindra and Singh, 1969).

Plants infected with phytoplasmas exhibit symptoms suggesting a profound disturbance in the normal balance of growth regulators, leading to virescence/ phyllody i.e., development of green leaf-like structures instead of flowers, sterility of flowers, proliferation of axillary buds resulting in "witches broom" symptoms, abnormal internode elongation and generalized stunting (Bertaccini, 2007). Phytoplasmas are transmitted by insects belonging to the families' viz., Cicadellidae, Cixidae, Psyllidae, Delphacidae and Derbidae (Weintraub and Beanland, 2006).

Materials and Methods

The roving survey was conducted during *kharif*/summer season 2013 to know the per cent disease incidence of little leaf of brinjal and prevalence of leafhopper populations in three major brinjal growing areas of Karnataka *i.e.* Dharwad, Belgaum and Haveri districts. In each village five fields were selected and the percent of disease incidence was assessed by recording the number of plants showing disease symptoms and the total number of plants examined by using the formula.

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

Results and Discussion

The roving surveys were undertaken to know the incidence of little leaf phytoplasma disease of brinjal in different parts of Northern Karnataka *viz.*, Dharwad, Belgaum and Haveri districts during kharif, 2013 when the crop was in flowering stage and fruiting stage. During survey brinjal plants showing typical symptoms of reduction in the size of the leaves, leaf curling or cupping, Yellowing, reduction in the petiole and the lamina, flower is converted into leaf like structure, Malformation of brinjal fruits were observed (Fig. 1).

From the survey it is revealed that the disease was severe in all the districts during kharif, 2013 and disease incidence ranged from 2 to 95 per cent in different parts of the districts surveyed. The highest incidence (95%) of Little leaf phytoplasma disease was noticed in fields of Garaga village in Dharwad district, whereas least (2%) incidence of the disease was recorded at Hedigonda village of district Haveri.

Village wise incidence

The incidence in Dharwad district ranged from 10 to 95 per cent. The maximum incidence of the disease 95 per cent was recorded in Garag village of Dharwad taluk at flowering stage, followed by 70 and 60 per cent incidence in Kundagol taluk and Hebsur village of Hubli taluk respectively. However, the minimum incidence of 10 percent was recorded in UAS campus of Dharwad taluk. The incidence in Belgaum district ranged from 7 to 90 per cent. The maximum incidence of the disease 90 per cent was recorded in Muragod village of Bailahongal taluk at fruiting stage, followed by 65 and 61.4 per cent incidence in Belavadagi village of Bailahongal taluk and Yamakanamaradi village of Hukkeri taluk respectively. However, the minimum incidence of 7 per cent was recorded in Sankeshwar village of Hukkeri taluk. The incidence in Haveri district ranged from 2 to 44.5 per cent. The maximum incidence of the disease 44.5 per cent was recorded in Akkialur village of Hanagal taluk at fruiting stage, followed by 36.7 and 34.7 per cent incidence in Ranebennur and Byadagi respectively. However, the minimum incidence of 2 per cent was recorded in Hedigonda village of Byadagi taluk (Table 1).

Table.1 Incidence of brinjal little leaf in various villages in northern Karnataka during *kharif* 2013

Dharwad District		
Taluk	Villeges name	Incidence (%)
Dharwad	UAS, Campus	10.00
	Narendra	16.00
	Garaga	95.00
	Govanakoppa	37.50
	Somapura	15.00
	Sulla	25.00
	Byahatti	12.00
	Shivalli	45.00
	Tadakoda	35.00
Hubli	Bhadrapura	38.00
	Annigere	30.00
	Hebsur	60.00
	Siraguppi	36.00
Kundagol	Kundagol	70.00
	Saunsi	15.00
	Gudigeri	25.00
	Devanuru	30.00
	Kambadhalli	45.00
Navalagund	Alagavadi	20.00
	Amaragol	5.00
	Belavatagi	36.4
	Karalawada	22.5
	Karalgund	50.00
Kalagatagi	Hulikoppa	32.00
	Hirenalli	30.00
	Devikoppa	42.00
	Dummavada	57.50
Belgaum District		
Taluk	Villages name	Incidence (%)
Savadatti	Hirehulligere	40.00
	Kabbenuru	18.00
	Karikatte	24.8
	Yadalli	14
	Inchal	55.4
Bailahongal	Muragoda	90.00
	Belavadi	65.00
	Kenganura	44.2
	Nesargi	25.00
	Madanabavi	20.00
Gokak	Tukkanatti	40.00
	Kallolli	11.00
	Kolvi	20.00
	Gilihosaru	34.6
	Ankalagi	12.00
Chikodi	Nagarmunoli	15.00
	Navalihal	14.00
	Shamanewadi	37.4
Hukkeri	Borgal	44.6

	Yamakanamaradi	61.4
	Sankeshwar	7.00
Haveri District		
Taluk	Villages name	Incidence (%)
Haveri	Devihosur	8.0
	Nelogalla	10.3
	Devagiri	26.5
	Haveri	25.00
Ranebennur	Ranebennur	36.7
	Halageri	23.00
	Hanumanamatti	9.00
	Kakola	15
Byadagi	Byadagi	34.7
	Hedigonda	2
	Sidenur	13.0
	Kanamadi	6.4
Hirekerur	Hirekerur	15.00
	Hamsabhavi	23.00
Hanagal	Akkihalur	44.5
	Negavanagi	24.8
	Tilavalli	25.00

Table.2 Average incidence of brinjal little leaf in various taluks of northern Karnataka during *kharif* 2013

Taluk	**Number of villages surveyed**	**Incidence range**	**Incidence average**
Dharwad district			
Dharwad	9	10-95	32.20
Hubli	4	30-60	41.00
Kundagol	5	15-70	37.00
Navalagund	5	5-50	26.70
Kalagatagi	4	30-57	40.30
Average		**35.44**	
Belgaum district			
Savadatti	5	14-55.4	30.40
Bailahongal	5	20-90	48.80
Gokak	5	11-40	23.50
Chikodi	3	14-37.4	22.10
Hukkeri	3	7-44.6	37.60
Average		**32.48**	
Haveri district			
Haveri	4	8-26.5	17.45
Ranebennur	4	9-36.7	20.90
Byadagi	4	2-34.7	14.00
Hirekerur	2	15-23	19.00
Hanagal	3	24.8-44.5	31.40
Average		**20.55**	

Table.3 Little leaf disease of brinja incidence - District wise

Sl. No.	Di District	N Number of fields	Pe Percent Disease Incidence		
			minimum	M maximum	A Average
11 1	Dharwad	135	5	95	50
2	Belgaum	105	7	90	48.5
3	Haveri	85	2	44.5	23.25

Fig.1 Brinjal little leaf disease symptoms

Taluk wise incidence

The incidence in Dharwad district taluks, the maximum incidence of 41 per cent was recorded in Hubli taluk followed by 40.3 and 37 per cent in Kalagatagi and Kundagol taluk respectively. However, the minimum incidence of 26.7 per cent was recorded in Navalagund taluk. The incidence in Belgaum district taluks, the maximum incidence of 48 per cent was recorded in Bailahongal taluk followed by 37.6 and 30.4 per cent in Hukkeri and Savadatti taluk respectively. However, the minimum incidence of 22.1 per cent was recorded in Chikodi taluk. The incidence in Haveri district taluks, the maximum incidence of 31.4 per cent was recorded in Hanagal taluk followed by 20.9 and 17.45 per cent in Ranebennur and Haveritaluk respectively. However, the minimum incidence of 14 per cent was recorded in Byadagi taluk (Table 2).

District wise incidence

On an average, the maximum disease incidence of 35.44 per cent was recorded at Dharwad district followed by Belgaum district 32.48 per cent and minimum disease incidence was noticed in 20.55 per cent in Haveri district (Table 3).

The roving survey during *kharif*2013 was undertaken to know the incidence of little leaf phytoplasma disease of brinjal (*Solanum melongena* L.) in northern Karnataka. The results revealed that the per cent disease incidence varied from place to place.

The disease was present in all the parts of the Dharwad, Belgaum, and Haveri districts in northern Karnataka. The average disease incidence ranged from 20.55 to 35.44 per cent.

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