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RESEARCH PAPER

Survey for severity of anthracnose disease of dolichos bean in major growing areas of Karnataka

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Abstract: Dolichos bean is an important pulse-cum-vegetable crop. Karnataka only contributes about 90 per cent of both area and production of Dolichos in India. It is an important crop when considering food, nutritional and economic security for poor and marginal farmers, ecosystem stability, climate change resilience and cultural diversity for local food habits. Dolichos beans are prone to various biotic and abiotic stresses. Among several diseases affecting dolichos bean, anthracnose caused by *Colletotrichum lindemuthianum* (Sacc. & Magn.) is an important disease throughout the world including India. A roving survey was conducted for the severity of anthracnose in major dolichos bean-growing regions of Karnataka during the *kharif* and *rabi* seasons of 2022. Out of eight districts surveyed, Kalaburagi district had the highest mean disease incidence of 37.92 per cent. The most affected villages in this district were Madanhipparaga and Srirampura, where Ashoka and Selection-D varieties recorded a disease incidence (PDI) of 51.1 and 40.0 per cent, respectively at pod setting stage. Keribosga and Bhimalli villages, where the Riya (D-14) variety was grown at the flowering stage had lower PDI of 33.3 and 27.3 per cent, respectively. In the Dharwad district, Malligwad and Garaga villages had moderate PDI of 38.8 and 30.0 per cent, respectively on the HA-4 variety at the pod setting stage. In contrast, the Bidar and Chikkamagaluru districts had the minimum mean disease incidence of 9.4 per cent on VNR and HA-4 varieties at the flowering stage, respectively.

Key words: Anthracnose, Biotic, Dolichos bean, Disease incidence, Survey

Introduction

Dolichos lablab, commonly known as hyacinth bean, Indian bean or lablab bean, is a multipurpose leguminous crop that originated in India. Karnataka contributes about 90 per cent of both area and production of Dolichos in India (Laxmi *et al.,* 2015). Dolichos bean is affected by several biotic and abiotic stresses. Among biotic stresses, diseases like rust (*Uromyces fabae*), powdery mildew (*Erysiphe polygoni*), anthracnose (*Colletotrichum lindemuthianum*), bacterial leaf spot (*Xanthomonas campestris*) and bean common mosaic virus are the major constraints for dolichos bean cultivation.

Among the major diseases, anthracnose caused by *Colletotrichum lindemuthianum is* the most devastating seed-borne disease of the dolichos bean (Melouk and Backman, 1995). *Colletotrichum is* one of the most economically important polyphagous, hemi-biotrophic fungi, and is responsible for causing anthracnose and other diseases in a wide range of plant species (Hyde *et al.,* 2009). The anthracnose pathogen *C. lindemuthianum* (Sacc and Magn.) affects all plant parts *viz.,* stems, pods and seeds. The disease may appear on the cotyledonary leaves, as characteristic symptoms range from roundish to irregular reddish-brown necrotic spots. These lesions later grew bigger, merged and became large necrotic regions. The middle portion of the diseased area detached and the leaves developed a distinctive shot hole symptom after falling off.

In India, its occurrence was noticed for the first time in the Nilgiri hills in 1915 (Sharma *et al.,* 1994) and the disease occurs in tropical and subtropical regions, but it causes greater losses in the temperature zones than it does in the tropics. Its incidence in India ranges from 5.0 to 65.0 per cent in different locations, leading to significant yield losses (Basandri *et al*., 1999).

Management of disease requires an understanding of factors that contribute to epidemics. For effective integrated management of Dolichos bean anthracnose, knowledge of the relationships of the disease with different variables is very important. Survey data are useful for gaining insights into the occurrence, distribution and relative importance of different crop diseases. This research aimed to evaluate the extent of anthracnose disease in Dolichos beans across different regions of Karnataka, considering its significance for the crop.

Material and methods

Survey to assess the anthracnose diseases of Dolichos bean in parts of Karnataka

A survey was conducted to assess the severity of anthracnose disease in Dolichos beans during *kharif*-2022 in various districts of Karnataka. The survey was carried out when the crop was 45 to 90 days old. In each district, two or three taluks were selected and in each taluk, a minimum of two villages were selected to assess the severity of the disease. The fields were randomly selected in a village and in each field, ten plants were randomly selected and the incidence or severity of the disease was recorded. The survey was undertaken at different places in Karnataka during the crop growth period. The information on the disease rating scale and surveyed places are mentioned below fig. 1 and in fig. 3.

Scale of per cent disease severity (Mayee and Dattar, 1986)

Score/Grade	Description
0	No symptoms on leaf/pods
1	Small round brown spots covering 1% or less of the leaf/pod area
3	Brown sunken spots covering 1-10% of leaf/ pod area
5	Brown spots enlarging to form circular spots covering 11-25% of leaf/pod area
7	Circular brown sunken spots covering 26-50% of the leaf/pod area
9	Circular to irregular brown sunken spots covering 50% or more of the leaf/pod area

Per cent Disease Index (PDI) was calculated by using the formula proposed by Wheeler (1969).

$$\text{Per cent disease index (PDI)} = \frac{\text{The sum of the individual disease ratings}}{\text{Number of leaves scored} \times \text{Maximum disease grade}} \times 100$$

Details of survey conducted in major Dolichos bean growing districts of Karnataka

District	Taluk	Village
Bidar	Bhalki	Markal
		Alamkeri
	Basavakalyan	Belura
		Bhatambra
Kalaburgi	Kalaburgi	Bhimalli
		Keribosga
	Aland	Srirampura
		Madanipparaga
Koppal	Koppal	Hitnal
		Basapura
	Kushtagi	Hiremannapur
		Ganganhal
Raichur	Devadurga	Arkera
		Kottadoddi
	Raichur	Chandrabanda
		Gonhal
Kolar	Srinivaspura	Kurapalli
		Byrapalli
	Kolar	Dummanur
		Kadrayanapura
Chikkaballapur	Chintamani	Kuraboor
		Maddanapalli
	Chikkaballapur	Jatavara
		Obalenahalli
Dharwad	Dharwad	Mallligwad
		Garag
Chikkamagaluru	Tharikere	Nandi
		Doranalu
	Kadur	Belaguru
Sanehalli		

Results and discussion

Survey and incidence of anthracnose disease of Dolichos bean in major growing areas of Karnataka

A survey of the disease over a period provides information about the intensity with which it affects the yield. In addition, it will be a source of information to assess the severity of disease in relation to the soil environment and environmental factors. A roving survey was conducted for the incidence of anthracnose in major Dolichos bean-growing regions of Karnataka caused by *C. lindemuthianum* during the *kharif* of 2022. Disease severity was documented (fig. 2) and the resulting data are presented in Table 1.

Out of eight districts surveyed (Fig. 1), Kalaburagi district with black soil, had the highest mean disease incidence of 37.92 per cent. The most affected villages in this district were Madanhipparaga and Srirampura, where Ashoka and Selection-D varieties recorded a disease incidence (PDI) of 51.1 and 40.0 per cent, respectively at pod setting stage. Keribosga and Bhimalli villages, where the Riya (D-14) variety was grown at the flowering stage had lower PDI of 33.3 and 27.3 per cent, respectively. In the Dharwad district, Malligwad and Garaga villages with black soil had moderate PDI of 38.8 and 30.0 per cent, respectively on the HA-4 variety at the pod setting stage. In contrast, Bidar and Chikkamagaluru districts with red soil, had the minimum mean disease incidence of 9.4 per cent on VNR and HA-4 varieties at the flowering stage, respectively. The variations in disease incidence among different locations could be attributed to the cultivar reactions to the disease and the prevailing environmental conditions.

These results are in line with report of Kulkarni and Benagi (2013), where they conducted a survey to assess the incidence of anthracnose of greengram in the Northern Karnataka districts of Bagalkot, Belgavi, Bidar, Bellary, Bijapur, Dharwad, Gadag, Kalaburagi, Koppal, Haveri and Raichur and found that disease severity was highest in Bidar district (49.43%), followed by Gulbarga district (48.12%) and Manjunath *et al.* (2012) revealed that anthracnose of Dolichos bean by the pathogen

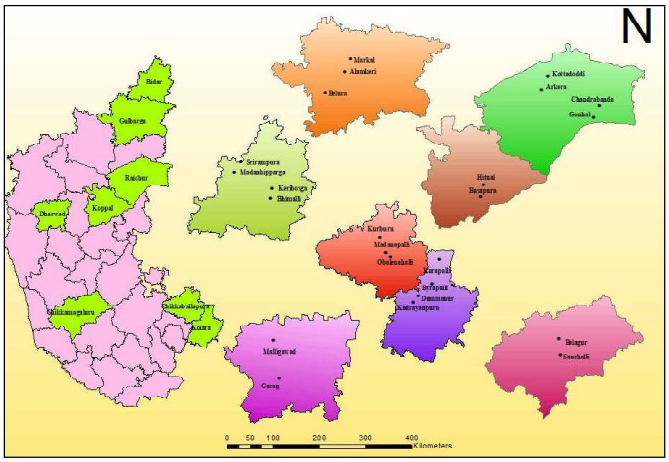

Fig. 1. Surveyed areas of major Doichos bean growing districts of Karnataka for anthracnose severity

Table 1. Status of anthracnose disease in major dolichos bean-growing areas of Karnataka

District	Taluk	Village	No of field visit	Variety/ hybrid	Rain fed/ irrigated	Cropstage (days)	Soil type	Disease incidence(%)
Bidar	Bidar	Markal	2	VNR	Irrigated	60	Black cotton	10.50
		Alamkeri	2	VNR	Irrigated	67	Black cotton	11.10
	Basavakalyan	Belura	1	Ankur	Irrigated	72	Red loamy	6.60
							Mean	9.40
Kalaburgi	Kalaburgi	Keribosga	2	Riya (D-14)	Rain fed	58	Black soil	33.30
		Bhimalli	2	Riya (D-14)	Irrigated	42	Black soil	27.30
	Aland	Srirampura	3	Selection-D	Irrigated	75	Black soil	40.00
		Madanhipparaga	2	Ashoka	irrigated	75	Black soil	51.10
							Mean	37.92
Koppal	Koppal	Hitnal	2	Dolichos-27	Rainfed	55	Clayey loam	19.90
		Basapura	1	Dolichos-27	Rainfed	63	Clayey loam	23.30
							Mean	21.60
Raichur	Devadurga	Arkera	2	Dolichos-27	Rainfed	52	Black soil	33.30
		Kottadoddi	2	Dolichos-27	Irrigated	48	Black soil	27.30
	Raichur	Chandrabanda	3	Dolichos-27	Irrigated	40	Sandy loam	23.30
		Gonhal	2	Dolichos-27	Irrigated	62	Sandy loam	16.60
							Mean	25.12
Kolar	Srinivaspura	Kuarapalli	2	HA-4	Rainfed	68	Red sandy	27.70
		Byrapalli	2	HA-1	Rainfed	72	Red sandy	8.80
	Kolar	Dummanur	2	HA-4	Rainfed	65	Red sandy	20.00
		Kadraynapura	2	HA-4	Rainfed	67	Red loamy	23.30
							Mean	19.95
Chikkaballapur	Chintamni	Kurbur	3	HA-3	Rain fed	80	Red loamy	16.60
		Maddanapalli	2	HA-3	Rain fed	70	Red loamy	30.00
Chikkaballapura	Obalenahalli	2	HA-4	Rain fed	75	Red sandy	12.20	
							Mean	19.60
Dharwad	Dharwad	Malligwad	1	HA-4	Rain fed	70	Black	38.80
		Garag	1	HA-4	Rain fed	75	Red	30.00
							Mean	34.40
Chikkamagaluru	Kadur	Belagur	2	HA-4	Rain fed	55	Red	7.70
		Sanehalli	3	HA-4	Rain fed	60	Red	11.10
							Mean	9.40

Fig. 2. Severity of anthracnose of Dolichos bean in major growing regions of Karnataka

C. lindemuthianum was a serious disease in Southern Karnataka. In addition, Javaid *et al*. (2022) also found that 77.06 per cent disease index and 54.51 per cent disease intensity were noticed due to average temperature (16.60 to 23.80°C), average relative humidity (62.20 to 76.50%) and weekly rainfall (1.7-48.2 mm).

Conclusion

Anthracnose caused by *Colletotrichum lindemuthianum* (Sacc & Magn.) is one of the most devastating diseases in Dolichos bean (*Dolichos lablab* L.). It has a wide host range in many legume species, including those grown as vegetables and grain legumes. The disease can cause serious losses in bean crops in temperate and subtropical zones. This study aimed to find out the occurrence and severity of anthracnose disease in Dolichos bean in Karnataka

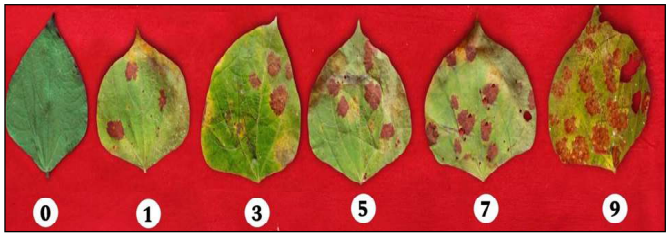

Fig. 3. Disease rating scale (0-9) for the assessment of anthracnose disease severity in Dolichos bean

and surveys results showed that in the year 2022 anthracnose was widespread in Dolichos bean areas of Karnataka. Disease severity ranged from 9.4 to 37.92 per cent. Kalaburgi had the maximum and Bidar and Chikkamagaluru had the minimum disease incidence. Further survey and surveillance of the disease have to be undertaken every year in future to observe rhythmic changes in the severity of the disease and also the status and regional severity of the disease and other information in field and market yards.

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