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RESEARCH PAPER

Survey for the disease prevalence in major sesame growing areas of northern Karnataka

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Abstract: Stem and root rot caused by *Macrophomina phaseolina* is a major concern in sesame growing regions. Surveying stem and root rot in sesame fields over time reveals its impact on yield and helps identify the crop's most vulnerable growth stages to *Macrophomina phaseolina* infection. Random roving survey conducted in the major sesame growing regions of northern Karnataka *viz.,* Bagalkote, Belagavi, Dharwad, Gadag and Haveri districts during *kharif* 2024 recorded disease incidences ranging from (19.68-36.47%).The highest incidence was observed in Bailhongal of Belagavi district (36.47%), followed by Hanumanamatti village in Haveri district (35.6%) and Belleri village in Gadag district (34.56%), while lowest incidence was reported from Narendra village in Dharwad district (19.68%). Among these districts, Belagavi recorded the highest mean incidence (30.36%), followed by Bagalkote (27.59%) and lowest mean incidence recorded in Dharwad (25.24%). Overall, the incidence of *Macrophomina* was low to moderate across the surveyed districts during *kharif* 2024.

Key words: Disease incidence, *Macrophomina*, Root rot, Stem, Survey

Introduction

Sesame (*Sesamum indicum* L.), a member of the Pedaliaceae family, is one of the oldest oilseed crops, cultivated in India since ancient times and mentioned in texts like the Atharva Veda and Manusmriti. Though believed to have originated in Africa, it is now widely grown in tropical and subtropical Asia, which leads global production. Known as the 'Queen of Oilseeds,' sesame contains 48–55 per cent oil, 20–28 per cent protein, essential amino acids, minerals, and unique lignans such as sesamin and sesamolin, which enhance antioxidant activity and shelflife (Bashir, 2017). Globally, sesame ranks sixth among oilseed crops, covering 11.7 million ha with 6.02 million tonnes of production. India cultivates 15.23 lakh ha, producing 8.02 lakh tonnes with a productivity of 527 kg/ha, while in Karnataka it is mainly grown under rainfed conditions on 0.20 lakh ha, yielding 0.13 lakh tonnes at 650 kg/ha (Anon., 2023).

Sesame production is often reduced by several diseases, with stem and root rot caused by *Macrophomina phaseolina* being the most destructive. The disease initiates as black lesions at the stem base, followed by root darkening and deterioration of secondary rootlets (Khamari and Patra, 2018). Infected plants show premature capsule drying, browning, and splitting, eventually leading to wilting and death. The pathogen survives in soil and plant debris through microsclerotia, which can remain viable for 5–12 years. These resting structures ensure its persistence even under adverse conditions (Prabhu,2012).Pycnidia also develop on infected tissues, releasing conidia that facilitate secondary infections in the field. Such long-term survival and rapid disease spread make *M. phaseolina* a serious constraint to sesame cultivation (Marquez *et al*., 2021).Hence, constant vigilance of stem and root rot, particularly during the physiological maturity stage, is essential for timely plant protection measures. Therefore, the present investigation was undertaken to assess the incidence of stem and root rot in the major sesame-growing areas of northern Karnataka.

Material and methods

Random roving survey was conducted during *kharif* 2024 in four sesame growing districts of Northern Karnataka *viz*., Bagalkot, Belagavi, Dharwad, Gadag and Haveri districts and observation on disease incidence was recorded.A total of two to three villages were surveyed across different taluks. In each field, four one-square-meter quadrants were randomly selected and the number of infected plants within each quadrant was recorded. In addition to disease assessments, ancillary data were collected, encompassing soil type, the specific variety cultivated, agronomic conditions, crop growth stage, as well as the presence of other diseases are mentioned in (Table 1a).

Disease scale (0-9 grade) for *Macrophomina* stem and root rot of sesame (Dinakaran and Mohammed, 2001)

Disease scale	Percent incidence	Disease reaction
1	1-10	Resistant
3	11-20	Moderately resistant
5	21-30	Moderately susceptible
7	31-50	Susceptible
9	>51	Highly susceptible

Disease incidence was then calculated using the formula provided by Wheeler (1969), based on the number of infected plants to the total number of plants.

$$\text{Per cent disease incidence} = \frac{\text{Number of plants infected}}{\text{Total number of plants}} \times 100$$

Table 1a. Survey for the disease prevalence of *Macrophomina* stem and root rot in major sesame growing areas of northern Karnataka during *kharif* -2024

Districts	Taluks	Village	Longitude (°E)	Latitude (°N)	Altitude (m)	Variety	Soil type	Irrigation type	Crop stage	Per cent disease incidence	Other diseases noticed
Bagalkote	Bagalkote	Achanur	75.9274	16.0924	541	Local	Black	Rainfed	Capsule formation	26.33	CLS, Phyllody
		KVK, Bagalkote	75.6958	16.1817	559	DS-5	Black	Rainfed	Capsule formation	34.67	Phyllody
	Hunagund	Honnarhalli	76.0609	16.0576	508	Local	Black	Rainfed	Physiological maturity	24.68	CLS
Belagavi	Bailhongal	Pattihal	74.4987	15.8527	770	Local	Red	Rainfed	Physiological maturity	32.55	CLS, Phyllody
		Kenganur	74.8778	15.7341	764	Local	Black	Rainfed	Capsule formation	25.66	Bacterial blight, CLS
		Bailhongal	74.8589	15.8137	764	Local	Black	Rainfed	Physiological maturity	36.47	CLS, Phyllody
		Budihal	74.8666	15.8167	600	Local	Red	Rainfed	Capsule formation	29.53	CLS
	Hukkeri	ARS, Hukkeri	74.6247	16.2244	727	DS-5	Red	Rainfed	Physiological maturity	29.57	CLS
	Kittur	Savatagi	74.3149	15.5640	755	Local	Red	Rainfed	Physiological maturity	30.46	CLS
Dharwad	Dharwad	Dharwad	75.0078	15.4589	750	DSS-9	Black	Rainfed	Capsule formation	22.66	CLS, Phyllody
		Somapur	75.0078	15.4589	750	Local	Black	Rainfed	Physiological maturity	23.46	CLS, Phyllody
		Narendra	75.0193	15.4635	681	Local	Black	Rainfed	Capsule formation	19.68	CLS
	Kundagol	Yaraguppi	75.3127	15.3087	615	Local	Black	Rainfed	Capsule formation	22.33	CLS
	Annigeri	Annigeri	75.4316	15.4273	624	Local	Black	Rainfed	Capsule formation	31.48	CLS, Phyllody
Gadag	Gadag	Bentur	75.5786	15.2307	764	Local	Black	Rainfed	Capsule formation	20.75	CLS, Bacterial blight
		Hirekoppa	75.6584	15.5510	655	Local	Black	Rainfed	Capsule formation	24.66	Phyllody
	Naragund	Belleri	75.3799	15.7200	605	Local	Black	Rainfed	Physiological maturity	32.47	CLS
Haveri	H.matti	Hombareddi	75.3940	14.6621	583	DS-5	Black	Rainfed	Capsule formation	26.9	CLS, *Alternaria* leafspot
	H.matti		75.5607	14.6640	600	DSS-9	Black	Rainfed	Capsule formation	35.6	CLS
	Byadagi	Kollapur	75.4106	14.7373	632	Local	Black	Rainfed	Physiological maturity	22.87	Phyllody

CLS: *Cercospora* leaf spot

Results and discussion

The results related to survey on incidence of disease are presented in (Table la, 1b, 1c and Plate 4). Random roving survey was conducted during *kharif* 2024 for recording stem and root rot incidence in Bagalkote, Belagavi, Dharwad, Gadag and Haveri districts of northern Karnataka at capsule formation and physiological maturity stage of the crop. The disease incidence was assessed by counting the number of plants showing typical stem and root rot symptoms in randomly selected plants and per cent disease incidence was calculated.

In Bagalkote district, Bagalkote and Hunagund talukas were surveyed for disease incidence and it ranged from 24.68 to 34.67 per cent. In Bagalkote taluk, two locations were surveyed and disease incidence varies from 26.33 to 34.67 per cent. Among the surveyed villages, KVK, Bagalkote recorded maximum disease incidence (34.67%) followed by Achanur (26.33%). In Hunagund taluk, Honnarhalli village recorded 24.68 per cent.

Considering all the two talukas of Bagalkote district, the mean per cent disease incidence was found to be maximum in Bagalakote taluk (30.52%) and least in Hunagund (24.68%) (Table 1b).

Table 1b. Mean stem and root rot incidence of sesame in different districts and taluks

District	Taluk	Mean disease incidence (%)	
		Taluk	District
Bagalkot	Bagalkote	30.52	27.59
	Hunagund	24.68	
Belagavi	Bailhongal	31.05	30.36
	Hukkeri	29.57	
	Kittur	30.46	
Dharwad	Dharwad	21.93	25.24
	Kundagol	22.33	
	Annigeri	31.48	
Gadag	Gadag	20.83	26.65
	Naragund	32.47	
Haveri	Hanumanmatti	31.25	27.06
	Byadagi	22.87	

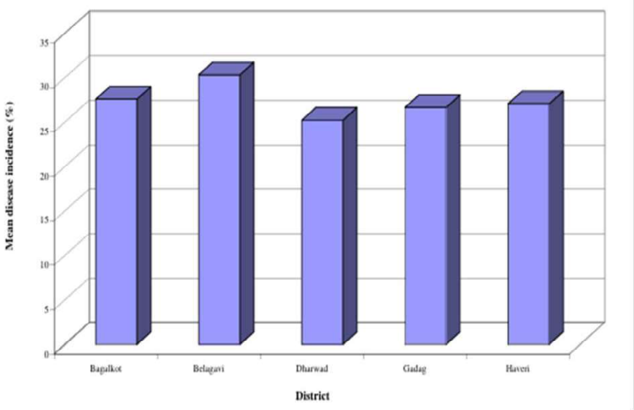

Fig. 1. Mean *Macrophomina* stem and root rot incidence among the surveyed districts

In Belagavi district, Bailahongal, Hukkeri and Kittur talukas were surveyed for disease incidence. In Bailahongal taluk four locations were surveyed and disease incidence ranged from 25.66 to 36.47 per cent. Among four locations surveyed, Bailhogal village recorded maximum disease incidence (36.47%) and least disease incidence was observed in Kenganur village (25.66%). In Hukkeri and Kittur taluks, ARS Hukkeri recorded 29.57 per cent and Savatagi village of Kittur taluk recorded 30.46 per cent.

Considering all the three talukas of Belagavi district, the mean per cent disease incidence was found to be maximum in Bailhongal taluk (31.05%) and least in Hukkeri taluk (29.57%) (Table 1b).

In Dharwad district, Dharwad, Kundagol and Annigere talukas were surveyed for disease incidence and it ranged from 19.68 to 31.48 per cent. In Dharwad taluk, three locations were surveyed and disease incidence ranged from 19.68 to 23.46 per cent. Among the three surveyed locations, Somapur village recorded highest disease incidence (23.46%) followed by Dharwad (22.66%) and Narendra recorded least disease incidence (19.68%). In Kundagol and Annigere taluk, Yaraguppi village of kundgol taluk recorded 22.33 per cent and Annigeri taluk recorded 31.48 per cent.

Considering all the three talukas of Dharwad district, the mean per cent disease incidence was found to be more in Annigeri taluk (31.48%) followed by Kundgol taluk (22.33%) and least mean disease incidence (21.93%) was observed in Dharwad taluk (Table 1b).

In Gadag district, Gadag and Naragund talukas were surveyed for stem and root rot incidence and it ranged from 20.75 to 32.47 per cent. In Gadag taluk, two villages were surveyed and incidence of disease ranged from 20.75 to 24.66 per cent. Among the surveyed villages, Hirekoppa recorded maximum disease incidence (24.66%) and least disease incidence was observed in Bentur (20.75%). In Naragund taluk, Belleri village recorded 32.47 per cent.

Considering two talukas surveyed in Gadag district, maximum mean disease incidence was found in Naragund taluk (32.47%) followed by Gadag taluk (20.83%) (Table 1b).

In Haveri district, Hanumanamatti and Byadagi talukas were surveyed for stem and root rot incidence and it ranged from 22.87 to 35.6 per cent. In Hanumanamatti taluk, two locations were surveyed and incidence of disease ranged from 26.9 to 35.6 per cent. Among the surveyed locations, Hanumanmatti recorded maximum disease incidence (35.6%) and least incidence of disease was observed in Hombaraddi (26.9 %). In Byadagi taluk, Kollapur village recorded 22.87 per cent.

Among two talukas surveyed in Haveri district, maximum mean disease incidence was recorded in Hanumanmatti taluk (31.25%) and least mean disease incidence was recorded in Byadagi taluk (22.87%) (Table 1b).

The incidence of disease in all the surveyed areas were ranged from 19.68 to 36.47 per cent. Among the five different districts surveyed, the mean maximum disease incidence was noticed in Belagavi district (30.36%) followed by Bagalkote district (27.59%), Haveri (27.06%) and Gadag (26.65%). The mean minimum disease incidence was noticed in Dharwad district (25.24%) and it was shown in Table 1b.

The variation in the incidence of stem and root rot of sesame with respect to soil type, crop grown condition and stage of the crop is depicted in Table 1c. The results confirmed that among red and black soil, the incidence of disease was more in red soil (30.52%) as compared to black soil (26.91%). In relation to stage of the crop, physiological maturity stage has recorded maximum disease incidence (29.06%) as compared to capsule formation stage of the crop (26.68%).

Table 1c. Incidence of stem and root rot of sesame in different soil type, crop grown condition and crop stage during *kharif* - 2024

Mean	Soil type		Crop grown condition		Crop stage	
	Red	Black	Rainfed	Irrigated	At capsule formation	At physiological maturity
Per cent Disease Incidence	30.52	26.91	27.38	-	26.68	29.06

Disease incidence was lower in black soils than red soils due to reduced germination and competitive ability of *M. phaseolina* under high soil moisture. Higher incidence was observed under rainfed conditions, where dry spells followed by intermittent rains favoured pathogen development compared to irrigated fields. Incidence peaked at physiological maturity, as nutrient drain to reproductive parts and a decline in plant defence made sesame highly susceptible (Umamaheswari *et al*., 2001).

Results are in agreement with Balabaskar *et al*. (2015) where they surveyed the different locations in Cuddalore district of Tamil Nadu to know the incidence of stem and root rot of sesame. Among the surveyed locations, Kothatai has recorded highest disease incidence of 38.75 per cent followed by Vridhachalam with 36.68 per cent. Least root rot incidence of 12.60 per cent was recorded in Annamalai nagar.

Conclusion

In conclusion, the study reveals that stem and root rot caused by *Macrophomina phaseolina* is a major threat to sesame across the surveyed regions, with disease incidence ranging from 19.68 to 36.47 per cent. The incidence was most prominent from flowering to physiological maturity, marking this as the most vulnerable phase of the crop. The disease was more severe under rainfed conditions, though certain irrigated areas also recorded considerable incidence. Wilt symptoms in some fields further aggravated the problem in sesame cultivation (Bharati *et al*., 2023).

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