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SURVEY FOR SEVERITY OF *ALTERNARIA* LEAF BLIGHT OF SAFFLOWER IN MAJOR SAFFLOWER GROWING AREAS OF NORTH KARNATAKA INDIA

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ABSTRACT

Leaf blight of safflower caused by *Alternaria carthami* is a major concern in safflower growing regions. Surveying leaf blight in safflower fields over the time reveals its impact on yield and identifies the crop's most susceptible growth stages. The roving survey was conducted in the major safflower growing districts *viz*., Dharwad, Gadag, Belagavi and Vijayapura during *rabi* 2023-24 to assess the severity of leaf blight in safflower. Yamanur village (Navalgunda taluk, Dharwad) recorded maximum disease severity (36.25%) and Mutwad village (Saundatti taluk, Belagavi district) had the lowest disease severity (20.42%). Among the various districts surveyed, the maximum disease severity was recorded in Dharwad district (33.31%) followed by Vijayapura district (31.44%). The least disease severity was observed in the Belagavi district (27.29%). Overall, there was very low to moderate leaf blight severity among the surveyed districts during *rabi* 2023-2024.

Keywords **:** *Alternaria*, Disease severity, Leaf blight, Survey.

Introduction

Safflower (*Carthamus tinctorius* L.) is one of the most important oilseed crops of semi-arid regions in the world. It belongs to the family Asteraceae and is native to parts of Asia, the Middle East and Africa. Historically, it played a significant role in textile dyeing. Today, the significance of safflower has evolved beyond the dye production to include diverse applications in agriculture, industry and health. Safflower oil derived from its seeds is rich in polyunsaturated fatty acids particularly linoleic (75%) and oleic acids which are potent antioxidants (Furuya *et al*., 1987), making it a popular choice in culinary, cosmetic and industrial products. In India, safflower is grown on 0.79 lakh hectares, yielding 0.61 lakh tonnes annually, with an average yield of 777 kg per/ha. Area, production and productivity of safflower in Karnataka is 0.41 lakh hectare, 0.33 lakh tonnes and 810 kg/ha respectively (Anon, 2022).

Safflower is known for its tolerance to cold and drought and its ability to extract soil water that is inaccessible to most other dryland crops. Despite its significant potential and adaptability to a wide range of agro-ecological conditions, safflower remains underutilized by farmers. This is due to several challenges, including its extended rosette stage, spiny nature, relatively low seed oil content (30-38%), late maturity and susceptibility to various diseases and pests (Sujatha *et al*., 2008). Among the various diseases affecting safflower, *Alternaria* leaf blight

considered the most significant biotic constraints on production leads to annual yield losses of 25-60 per cent (Wagh *et al*., 2015). The major symptoms of leaf blight are small circular to irregular dark brown to blackish spots, surrounded by yellow hallow on the leaf surface. Later these spots merge to form larger necrotic, circular lesions, gradually resulting in the blighted appearance of the leaves. Hence, it necessitates constant vigilance of the disease, especially in vegetative stage, in order to take timely plant protection measures. Therefore, this investigation was conducted with an objective to identify the severity of leaf blight in the major safflower growing areas of North Karnataka.

Material and Methods

A comprehensive roving survey was undertaken during the *rabi* (December and January) 2023-24 to evaluate the severity of *Alternaria* leaf blight across the major safflower growing areas of North Karnataka such as Dharwad, Belagavi, Gadag and Vijayapura. The severity of the disease was meticulously quantified using a standardized disease scoring scale (0-9) given by Mayee and Datar, 1986. 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 1).

Disease scale (0-9 grade) for *Alternaria* leaf blight of safflower

Numerical rating	Description
0	No symptoms on leaf
1	Small, brown spots covering 1% or less of the leaf area.
3	Small, brown spots with concentric rings covering 1-10% of the leaf area.
5	Lesions enlarging, irregular, brown with concentric rings covering 11-25% of the leaf area.
7	Lesions coalesce to form irregular brown patches with concentric rings covering 26-50% of the leaf area. Lesions also on stem and petioles.
9	Lesions coalescing to form irregular, dark brown patches with concentric rings covering 51% or more of the area. Lesions seem on the stem and petiole.

Per cent disease index was calculated as per the formula given by Wheeler (1969).

$$PDI = \frac{\text{Sum of individual scores}}{\text{Total number of observations}} \times \frac{100}{\text{Maximum score}}$$

Results and Discussion

The roving survey was conducted in the major Safflower growing districts such as Belagavi, Dharwad, Gadag and Vijayapura during *rabi* 2023-24 to assess the severity of *Alternaria* leaf blight of Safflower. In each district various taluks and villages were surveyed and the results obtained are presented in the Fig 1 and 2 (Table 1 and 2).

Belagavi district

In Belagavi district, the survey was conducted in two taluks: Saundatti and Bailhongal. Among these, Bailhongal taluk recorded the highest disease severity during the survey, with 35.88 PDI followed by Saundatti taluk with severity of 23.01 per cent. Out of the villages Bailhongal recorded maximum severity of (33.55%) and Mutwad showed least severity of 20.42 per cent (Table 1).

Dharwad district

In Dharwad district, survey was conducted across three taluks and six villages, revealing an overall mean PDI of 33.31. The disease severity in Dharwad district ranged from 27.36 –36.25 per cent in the surveyed areas. Of which Yamanur of Navalgunda taluk showed highest disease severity of (36.25%) followed by Main Agricultural Research Station (MARS) with severity of (36.18%). Whereas, Annigeri showed least severity of 27.36 per cent (Table 1).

Gadag district

In Gadag district, a survey was conducted across two taluks and four villages, revealing an overall mean PDI of 27.68. Among the two taluks Gadag and Nargund, Nargund recorded the highest mean PDI of 31.30 followed by Gadag with 27.45 per cent mean disease severity. Within Gadag taluk, Hombal village exhibited the highest disease severity of 22.45 per cent. In Nargund taluk, Nargund and Kalkeri villages showed the highest and lowest disease severities of 35.65 per cent and 26.96 per cent respectively (Table 1).

Vijayapura District

In Vijayapura district, the disease severity in the surveyed areas ranged from 25.61 per cent to 35.21 per cent. District recoded mean severity of 31.44 per cent. Bagewadi village of Basavanabagewadi recorded

maximum severity of (35.21%) whereas least PDI of 25.61 was seen in Nandihal cross (Table 1).

Among the surveyed districts, the highest mean disease severity of 33.31 per cent was recorded in Dharwad district followed by Vijayapura with 31.41 per cent severity (Table 2, figure 2). Conversely, the lowest mean disease severity of 27.29 per cent observed in Belagavi district. However, wilt was also noticed in some fields during the survey. (Table 1).

Black soils, being more moisture-retentive, create a microenvironment that favours the development of fungal diseases. The one instance of red soil in Kalkeri village corresponded with a lower PDI, suggesting that soil type could play a role in disease dynamics. The flowering stage is critical compared to other stages of the crop, as it is the period when the crop is most vulnerable to *Alternaria* infection, especially during the flowering and bud formation stages, due to the greater surface area for spore deposition and higher humidity levels.

Chattannanavar *et al*. (2013) also observed the similar severity levels of *Alternaria* blight in northern parts of Karnataka through the survey conducted during *rabi* 2013.

Conclusion

In conclusion, the study reveals that *Alternaria* leaf blight is a significant threat to safflower across the surveyed regions, with varying levels of disease severity ranging from 20.42-36.25 per cent. The severity was notably higher during the flowering stage across all districts, suggesting that this is the most vulnerable phase for the crop. The disease was more pronounced in rainfed conditions, though irrigated areas like Yamanur also showed high disease pressure. Wilt was a secondary issue in some areas, further compounding the health challenges faced by safflower.

Table 1: Survey on severity of *Alternaria* leaf blight of safflower in major growing areas of North Karnataka

Sl. No.	Districts	Taluks	Village	Variety	Soil Type	Rainfed /Irrigated	Crop stage	Per cent Disease Index	Other diseases noticed
1	Belagavi	Saundatti	Inchal	A1	Black	Rainfed	Flowering	25.59	Wilt
			Mutwad	A1	Black	Rainfed	Pre flowering	20.42	-
		Bailhongal	Bailhongal	A 300	Black	Rainfed	Flowering	35.88	Wilt
2	Dharwad	Annigeri	Annigeri	A1	Black	Rainfed	Flowering	27.36	-
			ARS	DSAF 1	Black	Rainfed	Flowering	34.22	-
		Dharwad	MARS	A1	Black	Rainfed	Flowering	36.18	-
			Narendra	A1	Black	Rainfed	Flowering	31.20	-
		Navalgund	Koratti	A1	Black	Irrigated	Flowering	34.62	-
			Yamanur	A1	Black	Irrigated	Flowering	36.25	-
3	Gadag	Gadag	Hombal	DASF 1	Black	Rainfed	Flowering	22.45	Wilt
		Nargund	Kalkeri	A 300	Red	Rainfed	Flowering	26.96	Wilt
			Nargund	A1	Black	Rainfed	Flowering	35.65	-
4	Vijayapura	Basavanabagewadi	Bagewadi	A1	Black	Rainfed	Flowering	35.21	-
			Nandihal cross	A1	Black	Rainfed	Bud formation	25.61	-
		Talikote	Talikote	A1	Black	Rainfed	Flowering	33.51	-

Table 2: Mean *Alternaria* leaf blight severity of safflower in different districts and taluks

Sl. No.	District	Taluk	Mean disease severity (%)	
			Taluk	District
1	Belagavi	Saundatti	23.01	**27.29**
		Bailhongal	35.88	
2	Dharwad	Annigeri	31.62	**33.31**
		Dharwad	33.69	
		Navalgund	35.43	
3	Gadag	Gadag	22.45	**27.68**
		Nargund	31.30	
4	Vijayapura	Basavanabagewadi	30.41	**31.44**
		Talikote	33.51	

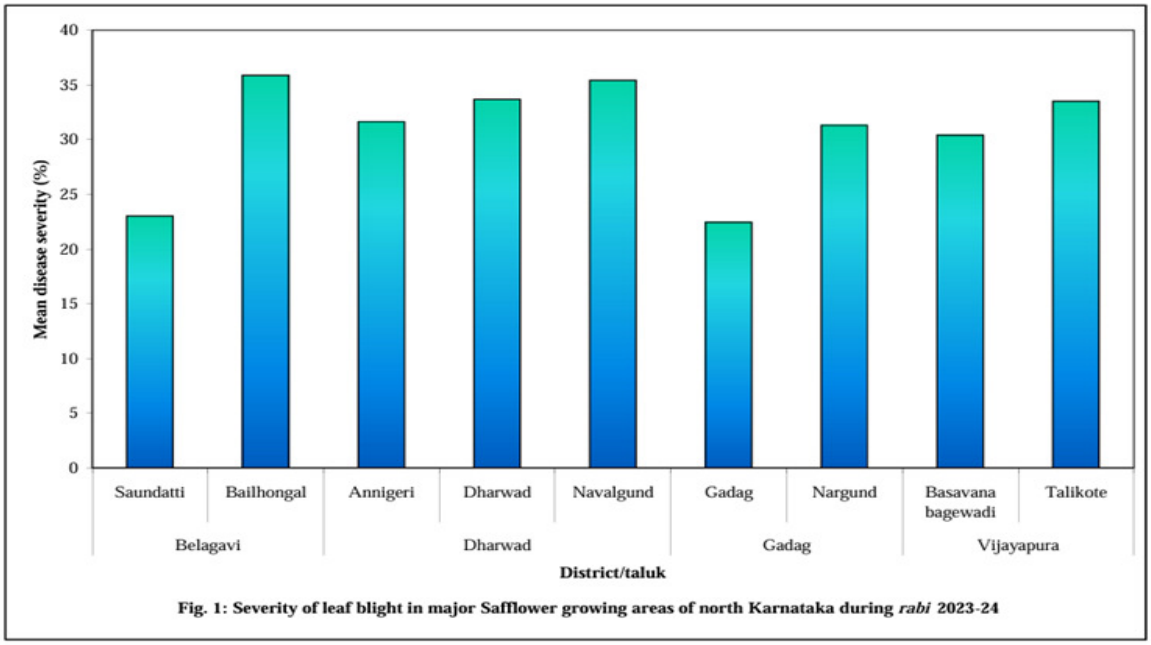

Fig. 1: Severity of leaf blight in major Safflower growing areas of north Karnataka during *rabi* 2023-24

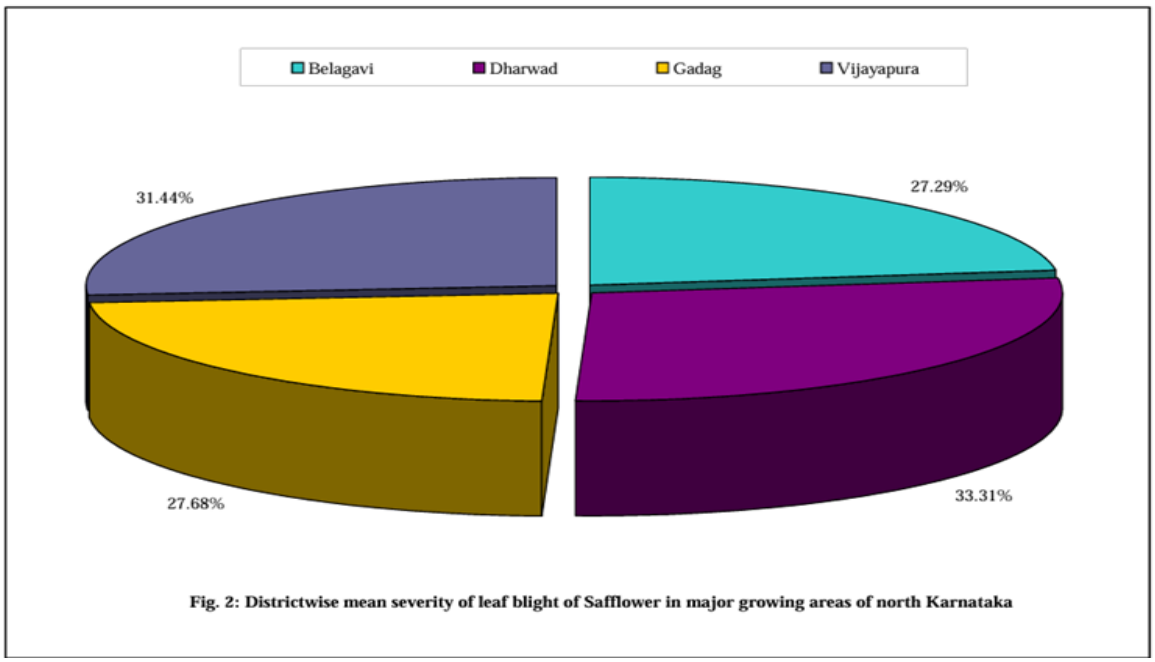

Fig. 2: Districtwise mean severity of leaf blight of Safflower in major growing areas of north Karnataka

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