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RESEARCH PAPER

Distribution of anthracnose disease in arecanut (*Areca catechu* L.) across non-traditional growing regions of Karnataka

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Abstract: Crop intensification and expansion of arecanut plantations in non-traditional areas is facing greater challenges of insect pest and diseases, among which anthracnose disease caused by *Colletotrichum* spp. is of greater concern. The roving survey was conducted in the major non-traditional arecanut growing districts of Karnataka like Chitradurga, Davanagere and Haveri during the months of October to November, 2023 to assess the disease severity of anthracnose of arecanut. The plantation in Shravanagere village (Hiriyur taluk, Chitradurga) had the maximum disease severity (53.33%) and Hothnalli village (Shiggaon taluk, Haveri district) had the lowest disease severity (26.03%). Among the various districts surveyed, the maximum disease severity was recorded in Chitradurga district (44.67%) followed by Davanagere district (35.45%). The least disease severity was observed in the Haveri district (28.07%).

Key words: Anthracnose, *Colletotrichum* spp, Disease severity, Survey

Introduction

Arecanut (*Areca catechu* L.) palm which belongs to the family Arecaceae, is grown in most parts of the tropical and subtropical regions of Asia and East Africa. The arecanut palm is the source of a masticatory nut, commonly known as arecanut, betelnut or supari. It has a greater significance in social and religious ceremonies. India, being the largest producer of arecanut in the world, has an acreage of 0.84 mha with the production of 1.66 MT and a productivity of 1.96 t/ha. Area, production and productivity of arecanut in Karnataka is 0.5 mha, 0.95 MT and 1.9 t/ha respectively (Anon, 2022). The production and productivity of arecanut palm is hindered by various biotic and abiotic stresses. Since arecanut is a perennial crop, it is exposed to various pests and diseases around the year at all crop growth and development stages. However, in the last two decades, crop intensification and expansion of arecanut plantations in non-traditional areas is facing greater challenges of insect pest and disease occurrence, particularly the emergence of new diseases (Balanagouda *et al*., 2021). Among the diseases that infect arecanut, leaf spots and blights on younger stage of the arecanut crop is responsible for the destruction of a measurable amount of leaf area, thus lowering the growth rate of the arecanut palm. These were reported to be caused by *Colletotrichum gloeosporioides* (Penz.) Penz. and Sacc. (Hegde *et al*., 1988), *Pestalotia palmarum* Cooke. (Chowdhury, 1946) and *Phyllosticta arecae* Hohnel. (Rao, 1964). Among them anthracnose caused by *Colletotrichum* spp. is a serious concern. This fungus can survive in the crop debris of the previous year's infected bunches for up to eight months (Yashoda *et al*., 1992). In India, approximately 60 per cent of the areca palms were affected by *C. gloeosporioides* (Lokesh *et al*., 2013). The major symptoms of anthracnose 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 lesions, gradually resulting in the blighted appearance of the leaves. Hence, it necessitates constant vigilance of the disease and to develop anthracnose control measures in newly established plantations of non-traditional areas to ensure the maximum productivity and economic viability of the growers. Therefore, this investigation was conducted with an objective to identify the severity of anthracnose in the major non-traditional arecanut growing areas of Karnataka.

Material and methods

The roving survey was carried out in the parts of Chitradurga, Davanagere and Haveri districts of Karnataka which are the non-traditional areas for arecanut, during October – November, 2023. The individual fields were visited and observations were recorded on spacing, age of the palm, soil type, Percent Disease Index (PDI) and other diseases observed. Randomly, the villages were chosen in each taluk and the arecanut fields were surveyed. In each field, five plants were selected and from each plant, lower, middle and upper fronds were chosen. Two leaves from each frond were selected and the disease severity on these leaves was then assessed using

Disease scale (0-5 grade) for anthracnose of arecanut

Score	Per cent leaf area infected
0	No anthracnose symptoms
1	1 - 10 per cent of leaf area covered by anthracnose
2	11 - 25 per cent of leaf area covered by anthracnose
3	26 - 50 per cent of leaf area covered by anthracnose
4	51 - 75 per cent of leaf area covered by anthracnose
5	>75per cent of leaf area covered by anthracnose

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

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

Table 1. Survey on severity of anthracnose of arecanut in non-traditional areas of Karnataka, 2023. [Year of survey and survey location details (GPS)]

District	Taluk	Village	Spacing (Feet)	Age of the palm(years)	Soil type	Percent Disease index	Other diseases observed
Chitradurga	Chitradurga	Janukonda	9×9	4	Red	42.67	*Phyllosticta* leaf spot
		Singapura	8×8	1	Red	32.00	-
	Hiriyur	Shravanagere	8×9	3	Red	53.33	Bacterial leaf stripe
		Parashuramadevarakote	8×8	2	Red	50.67	Bacterialleaf stripe
Davanagere	Davanagere	Santhebennur	8×8	3	Red	36.00	-
		Elebethur	8×8	2	Red	34.67	-
	Channagiri	Honnemaradahalli	8×8	3	Red	30.32	-
	Harihar	Malebennur	8×8	2	Red	40.69	-
Haveri	Ranebennur	Kakol	8×9	2	Red	30.70	*Phyllosticta* leaf spot
		Kajjari	8×8	2	Red	26.88	-
	Byadagi	Motebennur	8×8	2	Red	29.39	-
	Shiggaon	Hothnalli	6×6	3	Red	26.03	-

Table 2. Mean anthracnose severity of arecanut in different districts and taluks

District	Taluk	Anthracnose severity (%)	
		Taluk mean	District mean
Chitradurga	Chitradurga	37.34	44.67
	Hiriyur	52.00	
Davanagere	Davanagere	35.34	35.45
	Channagiri	30.32	
	Harihar	40.69	
Haveri	Ranebennur	28.79	28.07
	Byadagi	29.39	
	Shiggaon	26.03	

a 0-5 scale (Bhat, 1983) with slight modifications, as given below.

Results and discussion

The roving survey was conducted in the major non-traditional arecanut growing districts, Chitradurga, Davanagere and Haveri during the months of October to November, 2023 to assess the severity of anthracnose of arecanut as mentioned in material and methods. In each district various taluks and villages were surveyed and the results obtained are presented in the Table 1 and 2.

Chitradurga district

In Chitradurga district, Chitradurga and Hiriyur taluks were surveyed. The maximum disease severity was recorded in the fields of Shravanagere village (53.33%) of Hiriyur taluk, followed by Parashuramadevarakote village (50.67%) of the same taluk. Least severity was observed in the fields of Singapura village (32.00%) of Chitradurga taluk.

Davanagere district

In Davanagere district, Davanagere, Channagiri and Harihar taluks were surveyed. The highest severity was observed in Malebennur village (40.69%) of Harihar taluk, followed by the fields in Santhebennur village (36.00%) of Davanagere taluk. Least severity was observed in the Honnemaradahalli village (30.32%) of Channagiri taluk.

Haveri district

Ranebennur, Byadagi and Shiggaon taluks were surveyed in Haveri district and the highest disease severity was observed in the arecanut fields of Kakol village (30.70%) of Ranebennur taluk, followed by Motebennur village (29.39%) of Byadagi taluk and the minimum severity was observed in the Hothnalli village (26.03%) of the Shiggaon taluk.

Among different taluks surveyed, the highest severity was observed in Hiriyur taluk (52.00%) of Chitradurga district, followed by Harihar taluk (40.69%) of Davanagere district and the least disease severity was observed in Shiggaon taluk (26.03%) of Haveri district. Among the districts, highest severity was observed in the Chitradurga district (44.67%) followed by Davanagere district (35.45%). Least severity was observed in the Haveri district (28.07%). Results obtained are presented in the Table 2.

Survey for disease severity helps to track the geographic spread and prevalence of plant diseases. By understanding where a disease is occurring and how severe it is, appropriate measures can be adopted to contain and manage the outbreaks. With this point of view the present study was undertaken.

Among the various regions surveyed, severity of anthracnose disease on arecanut leaves ranged from 26.03 to 53.33 per cent. Highest mean severity in disease was observed in the gardens of Hiriyur taluk of Chitradurga district, with a per cent disease index (PDI) of 52.00 per cent, followed by 40.69 per cent in the fields of Harihar taluk of Davanagere district. The reason for this increased severity can be attributed to the age of the arecanut trees in the plantations near the surveyed regions. Most of the palms in Chitradurga and Davanagere districts were approximately of 10 to 15 years of age and there was prevalence of the anthracnose disease which was observed on the fallen leaves and nuts, which acted as a source of inoculum for spreading disease to the new plantations that were surveyed. The lowest disease severity (26.03%) was observed in the Shiggaon taluk of Haveri district where most of the plantations were approximately of four to five years of age. The disease severity was low in all the regions surveyed from Haveri because of the less inoculum density available for the spread of the disease.

Older plantations created higher humidity due to well established crop canopy and have more fallen crop residues than the younger plantations. Therefore, age of the plantations

in the region of the survey has influenced the disease severity of that region. This finding is in accordance with the study conducted by Naik *et al*. (2021). The disease severity varied from plantation to plantation due to the different climatic conditions prevailing in the different agro-climatic zones. Highest disease severity was observed in the region where favourable conditions prevailed for the multiplication of inoculum and spread of the disease. This result is in line with the findings of Jamadar *et al*. (2011). The variation in the disease severity may also be attributed to the variability in the pathogenic fungi and the environmental factors like temperature, relative humidity and the rainfall patterns as stated by Venkataravanappa (2002). The progress in the disease severity is favoured by high rainfall with higher temperature and relative humidity.

Conclusion

The present investigation gives a clear picture of the severity of anthracnose in the major non-traditional arecanut growing areas of Karnataka. Due to the prevalence of older plantations in Chitradurga and Davanagere district, there was the availability of congenial epidemiological factors like higher humidity and enough inoculum build up for spreading disease to the new plantations, which was not the case in Haveri where the least disease severity was observed due to the prevalence of younger plantations. Considering the severity of the disease, immediate control measures have to be taken up in order to mitigate the devastating losses caused to the farming community.

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