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Survey for the assessment of arecanut yellow leaf disease (YLD) incidence in malnad region of Karnataka

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Abstract
Arecanut is one of the most important commercial crops of coastal and malnad region of Karnataka. It is threatened by many diseases, of which yellow leaf disease is the major threat for the arecanut cultivation. The roving survey conducted during September 2018 in Sringeri and Koppa taluks of Chikkamagalur district of Karnataka. The incidence of YLD in arecanut plantations was ranged from 86.59 to 96.20 per cent. Among different villages of Sringeri and Koppa taluks surveyed, highest disease incidence was recorded in Muruvinakombe village (96.20%) followed by Talamakki (94.89%) and disease index was also highest in the Muruvinakombe (95.14 %) and followed by Talamakki (95.15 %). YLD incidence was comparatively more in certain varieties / hybrids where highest population of the plant hoppers found in that particular area. This could be attributed by the genetic composition of the cultivars grown in that area and the variation in the environmental conditions like temperature and relative humidity, vector population, cropping pattern and collateral natural hosts.

Keywords: arecanut, disease incidence, disease index, malnad, yellow leaf disease

Introduction

Arecanut (*Areca catechu* L.) is a high value commercial crop of India, which is also called as betel nut. The genus *Areca* belongs to the family Palmae (Arecaceae), which was first identified as monospecific (*Areca catechu* L.) in Linnaeus's Species Plantarum (1753) [8]. The genus expanded rapidly from its mono-specific status and at present the genus *Areca* had 76 species within the family. Among these, *Areca catechu* is the only cultivated species in the tribe Arecae.

According to Watt (1889), areca nut is a native of Cochin China and Malay Peninsula. It is also reported to be a native of Indonesia (Gode, 1961) [4]. The generic name *Areca* was coined by Linnaeus based on popular Malayalam name 'Adeca' or a variant Kannada name as indicated by Bavappa (1964) [2]. Two wild species viz., *Areca triandra* and *Areca concinna* are also used as masticatory (Kulkarni and Mulani, 2004) [7]. Areca palm is a monocot, has monoecious inflorescence and it is cross-pollinated. It is an allotetraploid with chromosome number 2n =32.

Arecanut cultivation is threatened by a number of diseases and pests during different stages of its growth and development. Based on the nature and extent of damage, kole roga (fruit rot), crown rot, crown choking, anabe roga (foot rot), yellow leaf disease and inflorescence die back are considered to be the major diseases. Yellow Leaf Disease (YLD) of arecanut is a major serious malady affecting areca palms in Kerala and Karnataka states. The disease was first reported from Muvattupuzha, Meenachil and Chalakudi areas of Central Kerala succeeding a heavy flood (Nambiar, 1949) [10]. YLD affects the normal growth and vigour of palms. Since YLD is caused by phytoplasma, the permanent solution to this disease would be field tolerant/ resistant varieties. Survey conducted in Karnataka during 1989 and 1990 showed that the disease is present in all six areca growing districts of Karnataka (Rawther, 2000) [11]. One of the significant features of this disease is that it is not lethal but is slow declining disease. The yield loss is as high as 50 per cent over the period of three years immediately following the disease incidence.

As the management practices do not yield much result, the only practical solution for controlling this malady is to produce tolerant/ resistant plants by identifying natural escapes which are present in the habitat. Natural escapes are free from the disease and they give high yield compare to the YLD affected plants. The natural escapes are used as resistance sources for the YLD. That will clutch the YLD incidence as well as it maintains the access YLD and further genotypes has been used in the arecanut breeding programme to develop the variety with YLD resistance.

Material and Methods

Survey of arecanut growing areas for assessment of disease incidence and identification of natural escapes:

Roving survey was carried out during the month of September - 2018 to assess the incidence and intensity of yellow leaf disease in major arecanut growing Malnad regions of Karnataka viz., Sringeri and Koppa talukas of Chikkamagalur district. A minimum of five fields were selected randomly at each location. The survey conducted at the seven villages of Sringeri (Honnavalli, Bandlapur, Melnemmar, Muruvinakombe, Addagadde, Benkikudige and Doddahonne) and seven villages of Koppa (Kachkal, Hosakoppa, Totadakoppa, Makkimane, Hoskeri, Talamakki and Gunavante).

Development of a scoring system to assess the intensity of yellowing

The objective of the experiment was to study the visual Characteristics of yellowing affected arecanut palms to fix up indices for a scoring system to assess the intensity of yellowing. The extent of yellowing (Y), necrosis (N) and crown size reduction (R) were considered to quantify the intensity of yellowing was given by George *et al*. (1980). Using the formula

Yellowing intensity (I) = {(Y+N)/L + R} x 10

Y -Total score for yellowing for lower one-half of leaves in crown
N -Total score for necrosis for lower one-half of leaves in crown
R-Score for reduction in crown size
L -Half the number of leaves in crown

Estimation of disease incidence:

The per cent disease incidence was assessed by recording the number of plants showing disease symptoms, out of the total number of plants examined.

Symptoms: Rawther (1976) [12] recorded the characteristic symptoms of the disease as

- Inter-venial foliar yellowing starting from the tips of leaflets in two to three leaves of the outermost whorl. (Y)
- Tips of the chlorotic leaves eventually dry up. (C)
- In advanced stage, leaves are reduced in size, become stiff and pointed, closely bunched and abnormally puckered. (R) Diseased leaf samples of arecanut plants showing typical symptoms of yellowing were collected.

The percentage of disease incidence was calculated by using the following formula (PDI).

$$\text{Percent disease incidence (\%)} = \frac{\text{Number of infected plants}}{\text{Total number of plants examined}} \times 100$$

As the part of arecanut breeding programme for resistance to YLD, the field resistant palms were identified in the hot spot of the disease area for breeding programmes. The criteria followed for selection of mother palms are

1. More than 90 per cent of the surrounding palms should be affected by YLD.
2. Palm should have minimum age of 20 years.
3. Selected palms should be generally free from major pests and diseases.

Immature leaf samples were collected from Malnad region of the local genotype at the diseased endemic area of Sringeri and Koppa talukas of Karnataka. In this hotspot area, the diseased samples collected during the survey were brought to the laboratory and tested for YLD resistant plants by PCR by using RAPD, IISR and Resistant Gene Primers (RGP) were reported by Manimekali *et al*. (2010).

Results and Discussions

Survey was conducted to assess the incidence of yellow leaf disease in major arecanut area of Sringeri and Koppa talukas of Chikkamagaluru district. The incidence of YLD on arecanut ranged from 86.59 to 96.20 per cent (Table 1). Among different villages of Sringeri and Koppa taluks surveyed, highest disease incidence was recorded in Muruvinakombe village (96.20 %) followed by Talamakki (94.89 %) and disease index was also highest in the Muruvinakombe (95) and followed by Talamakki (95). In Sringeri taluk, the incidence of yellow leaf disease on arecanut varied from 87.28 to 96.20 per cent (Table 1). Highest incidence of YLD in Sringeri was recorded at Muruvinakombe (96.20 %) and lowest at Honnavalli (87.28 %) (Table 1).

Table 1: YLD incidence in arecanut plantations in Chikkamagaluru district

Talukas	Village	No. Of Gardens observed	Varieties	Disease incidence (%)	Disease index	Natural escapes	Mean disease Incidence (%)	Mean Disease Index (%)	Exposed to Disease (Years)	Symptoms
SRINGERI	Honnavalli	5	Sringeri Local	87.28	88	5	90.7	92.31	10	Y,N,R
	Doddahonne	4	Sringeri Local	89.02	91	4			20	Y,N,R
	Addagadde	6	Sringeri Local	90.27	93	3			20	Y,N,R
	Muruvinakombe	5	Sringeri Local	96.20	95	2			20	Y,N,R
	MelNemmar	7	Sringeri Local,	91.34	92	4			30	Y,N,R
	Benkikudige	6	Sringeri Local,	92.36	93	3			10	Y,N,R
	Bandlapur	5	Sringeri Local	88.49	90	5			8	Y,N,R
KOPPA	Kachkal	6	Sringeri Local	89.21	91	5	89.42	91.96	15	Y,N,R
	Totadakoppa	7	Sringeri Local	87.26	92	4			25	Y,N,R
	Makkimane	5	Sringeri Local	88.50	89	3			30	Y,N,R
	Hosakeri	6	Sringeri Local	92.20	94	3			30	Y,N,R
	Talamakki	6	Sringeri Local	94.89	95	3			30	Y,N,R
	Gunavante	5	Sringeri Local	86.59	91	4			30	Y,N,R
	Hosakoppa	5	SringeriLocal	87.29	90	5			25	Y,N,R

In Sringeri taluk the index of YLD on arecanut varied from 88 to 95 (Table 1). Highest incidence of YLD in Sringeri was recorded at Muruvinakombe (95.34) and lowest at Honnavalli (88.56).

The incidence of the disease in Koppa taluk varied from 86.59 to 94.89 per cent (Table 1). The incidence of YLD was highest at Talamakki (94.89 %) where lowest at Gunavante (86.59 %).

In Koppa taluk, the index of disease on arecanut varied from 89 to 95. The index was highest at Talamakki (95) and lowest at Makkimane (89) (Table 1). It revealed that the incidence of the disease ranged from 87.28 to 96.20 per cent and disease index ranged from 88 to 95. Among the surveyed districts, the highest mean disease incidence and disease index was recorded in Sringeri than Koppa.

Similarly, a comprehensive survey conducted during 1976 in Kerala showed that 233 million palms are diseased. About 36 per cent of the palms are affected in the state with maximum incidence in Idukki (97 per cent) followed by Kottayam 94.3 per cent and 28.4 per cent percent area in Koppa and Sringeri taluks of Karnataka is affected. (Anonymous, 1977; Rawther *et al*., 1982) [13]. Further, the garden to garden survey conducted in Karnataka during 1989 and 1990 revealed that the disease is present in all the six areca growing districts of Karnataka (Rawther, 2000) [11]. Yellowing has been reported from high rainfall hilly tracts (Sringeri, Tirthahalli and Sagar belt), coastal zones (Sampaje belt) of Karnataka and parts of Kerala (Kumaraswamy, 2000). In Karnataka, 40 per cent of areca gardens were affected with YLD (George *et al*., 1984; Krishnamurthy and Vajranabhaiah, 2000). Hence it is necessary to identify fresh incidence of yellowing as soon as it appears and manage the affected fields (Rawther, 2000) [11].

One of the possible contributing factors for high disease incidence in these districts could be extensive cultivation of arecanut. However, YLD was comparatively more in certain varieties/ hybrids where highest population of the plant hoppers found in that particular area. This could be attributed to the genetic composition of the cultivars grown in that area and the variation in the environmental conditions like temperature and relative humidity, vector population, cropping pattern and collateral natural hosts.

References

1. Anonymous. Annual Report for 1976. Central Plantation Crops Research Institute, Kasaragod, 1977, 116-119.
2. Bavappa KVA. The correct botanical nomenclature of arecanut (betelnut palm). Sci. Cult, 1964; 30:239-240.
3. George MV, Mathew J, Nagaraja B. Indexing the yellow leaf disease of arecanut. J. Plantn. Crops, 1980; 8:82-85.
4. Gode PK. Studies in Indian cultural history. Vishveshvarananda Vedic, 1961; 1:156-187.
5. Kumaraswamy AS. Yellow leaf disease of arecanut- Found induced by copper toxicity. Sharavathi nagara, Shivmoga, Karnataka, India, 2000, 28.
6. Krishnamurthy K, Vajranabhaiah SN. Arecanut-yellow leaf disease in Karnataka. Kisan world, 2000; 27:57-59.
7. Kulkarni AR, Mulani RM. Indigenous palms of India. Curr. Sci, 2004; 86:1598-1603.
8. Linnaeus C. Species Plantarum, 1753, 2.
9. Manimekalai R, Sathish Kumar R, Soumya VP, Thomas GV. Molecular detection of phytoplasma associated with yellow leaf disease in areca palms (*Areca catechu* L.) in India. Plant Dis, 2010; 94:1376.
10. Nambiar KK. A Survey of arecanut Crop in Indian Union. Indian central arecanut committee, Calicut, 1949, 74.
11. Rawther TSS. Yellow leaf disease of arecanut: Symptomatology, bacterial and pathological studies. Arecanut and Spices Bull, 1976; 8:22-24.
12. Rawther TSS, Radhakrishnan NAIR R, Saraswathy N. Diseases In: me Arecanut Mm. Monograph series No. 2. (Eds. Bavappa, K. V. A., - Nair, M. K. and Premkumar, TI. CPCRI, Kasaragod, 1982, 184-224.
13. Rawther TSS. Origin, distribution and spread. Arecanut yellow leaf disease. Central Plantation Crops Research Institute, Kasaragod, Kerala, India, 2000, 68-75.