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Survey for the assesment of bark and wood splitting disease in acid lime (*Citrus aurantifolia* Swingle)

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Abstract

Acid lime is prone to attack by more than 150 diseases caused by fungal, viral and few bacterial pathogens right from the nursery level to bearing stage resulting in considerable yield loss. An extensive roving survey was conducted during 2021-2022 to assess the incidence of bark and wood splitting disease (*Lasiodiplodia theobromae*) in acid lime at YSR Kadapa, Kurnool, Chittoor and SPSR Nellore districts of Andhra Pradesh and observed the per cent disease incidence of 0.66-8.00. We had reported that the disease incidence varied considerably among different locations, with a range of 0.66 to 8.00 per cent. The mean maximum disease incidence was observed in Tirupati (8.00%) followed by Kurnool (5.81%), Kadapa 4.11% and least incidence (3.95%) was recorded from Nellore district. Among the 12 different locations surveyed, the highest disease incidence was recorded from Tirupati (8.00%) of Chittoor district and least incidence was observed in Pagadalapalle (0.66%) of Kadapa district. During this survey we had observed the symptoms of longitudinal splits on trunk and branches, internal discoloration on the infected bark and twigs.

Keywords: Acid-lime, survey, per cent disease incidence, symptoms, constraint, investigate

Introduction

Acid lime (*Citrus aurantifolia* Swingle) is considered as one of the fundamental crops among tropical and subtropical fruit crops grown worldwide. Acid lime belongs to the family Rutaceae and is believed to be originated from South East Asia during 4000 BC and is native to the Indo Malayan region (Nicolosi *et al.*, 2000). The key lime (*Citrus aurantifolia*) is a citrus hybrid (*Citrus micrantha* × *C. medica*). It is also known as Kagzi lime or Mexican lime or Pati lime. It is the third most important citrus crop grown in India next to mandarins and sweet oranges. Andhra Pradesh is the largest producer of acid lime, accounting for about 80% of the country's total lime production. In Andhra Pradesh, acid lime is grown in the districts of SPSR Nellore, Kurnool, YSR Kadapa, Chittoor, Guntur, East Godavari, West Godavari, and Anantapur. The fruits of Acid lime are an excellent source of vitamin C (varies from 25 to 100 mg/100 ml) and are mostly used in the manufacturing of beverages. In traditional medicine, it is utilized as astringent, antiseptic, anti-helminthic and as mosquito repellent. Acid lime is currently susceptible to more than 150 diseases caused by fungal, bacterial and a few viral pathogens from nursery to bearing stage, resulting in significant yield loss. Diseases such as Tristeza, mosaic, ring spot, exocortis, greening and bacterial diseases like Canker and nutritional disorders are responsible for the citrus decline. The slow decline of acid lime in Andhra Pradesh due to bark and wood splitting disease caused by *Lasiodiplodia theobromae* was observed (3.5-10%) in older gardens, which is affecting both plant life and yield. Gopal *et al.* (2005) reported this disease for the first time and noticed a 10-15% incidence in acid lime orchards in various districts of Andhra Pradesh. The symptoms first appear as two longitudinal splits on the trunk and branches. The splits gradually deepen into inner woody portions of the stem and appear as a canal and the infected plant shows internal discoloration and darkening of the bark of the infected twigs, ash coloured discoloration of vascular tissues are also seen on splitting regions. The tissue within the splits is dead, and the branches above the split region dry up from top to bottom. In the early stages, epidermal and sub-epidermal cells of twigs and branches appear slightly shrivelled and finally kills the tree within one year after the onset of the disease (Gopal *et al.*, 2005). The objective of the present study is to estimate the severity of bark and wood splitting disease in acid lime in different regions of Andhra Pradesh.

Materials and Methods

Survey for the incidence of bark and wood splitting disease of acid lime in Andhra Pradesh

An extensive roving survey was conducted during 2021-22 in the months of November, December and January in four major acid lime growing districts of Andhra Pradesh viz., YSR Kadapa, Kurnool, Chittoor and SPSR Nellore. In this study a total of 12 different locations in 6 mandals from 5 districts of A. P were covered and recorded the incidence of bark and wood splitting disease. In each orchard 25 randomly selected plants were observed for calculating per cent disease incidence. At every orchard total number of plants and number of diseased plants were counted and expressed in terms of percentage. The representative diseased plant samples were collected randomly from the farmer's fields from different locations.

The plants exhibiting the symptoms of bark and wood splitting disease such as longitudinal splits on trunk and branches, internal discoloration on the infected bark and twigs etc. were identified and recorded. Per cent disease incidence was assessed by counting the number of affected plants out of the total number of plants. The representative samples were used in further studies.

A proforma for survey was prepared to collect and record the information on planting time, previous crop, fertilizer and fungicide application, crop rotation, inter crops and other diseases in acid lime. The details of villages surveyed were listed in the Table 1.

The per cent disease incidence was calculated by counting the number of affected plants out of total plants and also healthy aerial parts were collected from healthy plants for isolating endophytes.

$$PDI = \frac{\text{Number of diseased plants}}{\text{Total number of plants}} \times 100$$

Results and Discussion

During 2021-2022, an extensive roving survey was supervised to estimate the incidence of bark and wood splitting disease in key acid lime growing districts of Andhra Pradesh viz., Nellore, Kadapa, Kurnool, and Chittoor. It is evident from the data that the disease incidence varied considerably among different locations, with a range of 0.66 to 8.0 per cent.

Incidence of bark and wood splitting disease in Andhra Pradesh during 2021-2022

From the data it was noticeable that among different districts surveyed in Andhra Pradesh, the highest disease incidence was recorded from Chittoor district i.e., 8.00% followed by Kurnool- 5.81%, Kadapa- 4.11% and least incidence was noticed from Nellore district with mean per cent disease incidence of 3.95. Among the 12 different locations surveyed

the highest per cent disease incidence was reported from Tirupati regions 8.00% followed by Petluru (7.50%), Orvakallu (6.20%), Thandrapadu (6.00%), Cheemalapenta, (5.80%), Nandikotkuru (5.25%) Pendlimarri (5.00%), Venkatreddipalli (5.00%), Kuppayapalem (3.75%), Dakkili (3.30%), Devulapalle (1.25%) and the lowest per cent disease incidence was noticed from Pagadalapalle (0.66%).

Symptomatology

During this survey we had noticed the symptoms of longitudinal splits on trunk and branches, internal discoloration on the infected bark and twigs, ash coloured discoloration of vascular tissues and darkened bark on the infected twigs on the splitted regions. Drying of branches was reported on severely infected trees. The fruiting bodies (pycnidia) of the fungus were observed on the infected stem regions, if left unchecked the whole tree may be killed in course of time.

Similar findings were reported by Naga Lakshmi *et al.* (2014) [1] conducted a survey on longitudinal bark and wood disease in sweet orange and acid lime in districts of Andhra Pradesh viz., Chittoor, Anantapur, Mehaboob Nagar, Nalgonda, Prakasam and West Godavari districts and reported the per cent disease incidence of 3.80-6.88 in both the citrus species. Gopal *et al.* (2005) also conducted survey on bark and wood splitting disease in acid lime in Andhra Pradesh and reported the per cent disease incidence of 3.5-10.00.

Similar descriptions about the symptoms of bark and wood splitting disease of acid lime were given by Gouri Sankar *et al.* (2017) [3], they had noticed and reported the symptoms of bark and wood splitting disease of acid lime caused by *Lasiodiplodia theobromae* as drying of stem and branches, loss of vigour and finally death of the infected trees within a span of one year after appearance of severe disease incidence. Dwiastuti *et al.* (2021) reported the similar symptoms on citrus crop in Indonesia. They had noticed the appearance of golden yellow gumming on the infected branches and the affected part was found with brownish discoloration.

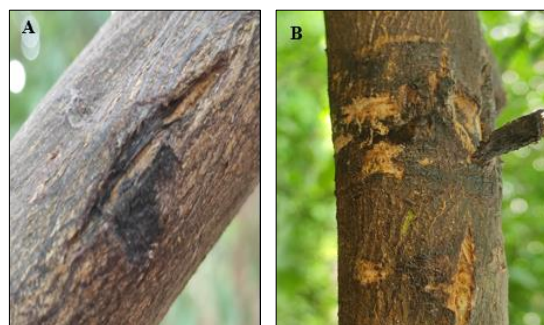


Fig A and B 1: Representing the symptom of bark and wood splitting disease

Table 1: Survey for the incidence of bark and wood splitting disease of acid lime in Andhra Pradesh during 2021-22

S. No	District	Location		Latitude & Longitude	PDI*
		Mandal	Village		
1	SPSR Nellore	Dakkili	Kuppayapalem	14.1057°N, 79.526°E	3.75
			Dakkili	14.1067°N, 79.5512°E	3.30
			Devulapalle	14.1528°N, 79.4760°E	1.25
		Venkatagiri	Petluru	15.447°N, 79.7799°E	7.5

Mean- 3.95					
2	YSR Kadapa	Pendlimarri	Pagadalapalle	14.4491°N, 78.6314 °E	0.66
			Cheemalapenta	14.4505°N, 78.6273 °E	5.80
			Pendlimarri	14.3986°N, 78.5945 °E	5.00
		Koduru	Venkatareddipalli	13.9976°N, 79.3304 °E	5.00
Mean-4.11					
3	Kurnool	Kurnool	Nandikotkuru	15.8556°N, 78.2646 °E	5.25
			Thandrapadu	15.6841°N, 78.1778 °E	6.00
			Orvakallu	15.8352°N, 78.1707 °E	6.20
Mean-5.81					
4	Chitoor	Tirupati	Tirupati	13.6288°N, 79.4192 °E	8.00
Mean- 8.0					
Over all Mean- 4.8					

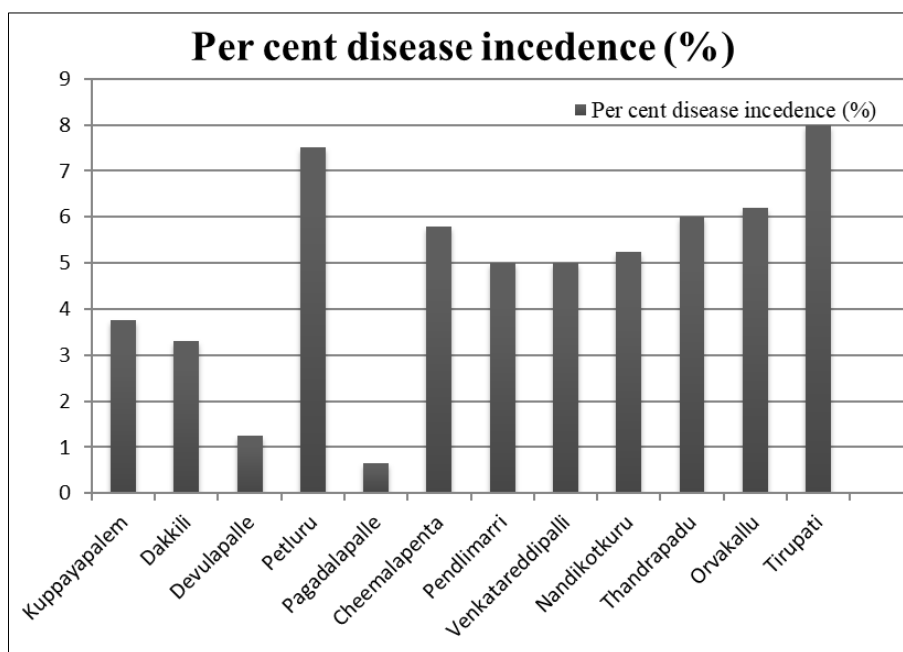


Fig 2: Graph representing the per cent disease incidence in different locations of Andhra Pradesh during 2021-22

Conclusion

The present study reveal that the disease incidence was more in Tirupati regions when compared to remaining areas. At present there was 0.66-8.00% per cent disease incidence in the above surveyed regions, but in upcoming years we may expect a great complication in acid lime cultivation due to this emerging disease. Very meager work on bark and wood splitting had been carried out, therefore to address the severity of the disease and management practices it was intended to investigate on different aspects of this disease by this survey.

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