

Significance of deranged chlorophyllase—chlorophyll system associated with yellow leaf disease of Arecanut*

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Yellow leaf disease (YLD) of arecanut (also known as betel nut palm, *Areca catechu* L.) is a serious disease of unknown etiology widely prevalent in different parts of Kerala and Karnataka of South India^{4,7}. Foliar yellowing is the principal aerial symptom wherein the yellowing invariably starts from the apex of the leaflets and gradually spreads to the entire pinna.⁸ The decline in chlorophyll content is due to damage of chloroplasts.^{5,6} Present investigation was carried out with a view to know the role of chlorophyllase in development of yellow leaf symptoms.

The leaf samples were collected from mild and severally (YLD) affected palms. Leaves of comparable age from apparently healthy trees were used as control. Samples were maintained under standard conditions after the harvest of leaves from palms and analyzed for total chlorophyll and chlorophyllase activity. The total chlorophyll was estimated to using the equation.

$$\text{Total chlorophyll (mg/g)} = \frac{\text{O.D.} \times 1000}{34.5} \times \frac{50}{1000} \times \frac{100}{5} \times \frac{1}{2}$$

where the O.D. represented the optical density. The chlorophyllase activity was estimated² and the enzyme unit is defined as the amount of enzyme which will catalyze the breakdown of 10 per cent of the substrate chlorophyll to chlorophyllide in 1 h. Optical density of the pigment extract in both the set of experiments was determined in a ECIL spectrophotometer at 652 nm. Three representative samples were analysed for each treatment.

The data on chlorophyll—chlorophyllase levels are given in Table 1. It is seen that in YLD affected palms, the leaves had less chlorophyll than the comparable healthy leaves. The reduction in pigment content increased with the severity of the disease. The highest percentage of mean reduction in chlorophyll (81.50 per cent) is seen in leaves of severely affected palms and 69.55 per cent pigment destruction in the mild stage of the disease itself indicates the serious damage to the chlorophyll system.

The data also revealed that the activity of chlorophyllase was greater in diseased than in healthy leaves. The enzyme activity was greater (a mean of 51.36 per cent) in mild stage of the disease as compared to healthy. As the severity of the disease increased the activity of chlorophyllase also increased (a mean of 74.28 per cent) suggesting the activation of the enzyme by an unknown agent or factor.

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TABLE 1 : Levels of chlorophyll—chlorophyllase in leaves of *A. catechu* infected with yellow leaf disease (YLD).

S. No. of sample palm	Nature of sample	Levels of total chlorophyll				Levels of chlorophyllase activity			
		Chlorophyll content		Healthy vs. Diseased (H) (D)		Enzyme activity		Healthy vs. Diseased (H) (D)	
		mg/g	Mean	D/H×100	Mcan	Unit/h	Mean	D/H×100	Mean
1.	Apparently healthy	1.45				0.10			
2.	Apparently healthy	1.74	1.62			0.11	0.11		
3.	Apparently healthy	1.67				0.11			
4.	YLD-Mild	0.45		27.75		0.16		155.24	
5.	YLD-Mild	0.51	0.49	31.34	30.45	0.16	0.16	152.18	151.36
6.	YLD-Mild	0.52		32.26		0.15		146.67	
7.	YLD-Severe	0.28		17.00		0.19		176.19	
8.	YLD-Severe	0.33	0.30	20.58	18.50	0.19	0.18	180.95	174.28
9.	YLD-Severe	0.29		17.92		0.17		165.71	

Early studies indicated that chloroplast was damaged in leaves of YLD affected arecanut palms and chlorophyll content declined^{5,6}. It has been reported that increased chlorophyllase activity to be responsible for lowering of chlorophyll in different pathogen—host combinations^{1,8,9,11,12}. It is suggested that the reduced chlorophyll content of YLD affected leaves of arecanut is due to the increased activity of its chlorophyllase activity.

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