



EVALUATION OF AMYLASE ACTIVITY IN MEXICAN LEMON TREES WITH “HUANGLONGBING” COMPARED WITH HEALTHY TREES

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Introduction. The Huanglongbing (HLB) is the most destructive disease in citric trees because destroys the appearance, production and leads to the death of the infected plant. This disease takes place in most of the Mexico states citrus producers. Colima is the principal productive area of mexican lemon in the country and is mightily affected by the HLB since april 2010. The causal agent of the disease is the uncultivable bacteria *Ca. Liberibacter asiaticus*. The dissemination is by means of the vector *Diaphorina citri*. This insect carries bacteria in salivary glands and digestive tract to transmit them to the plant during feeding process. The principal disease symptoms are the leaf corky, the thickening in the central vein and the change in color due to excessive starch accumulation (1). However, there have not been reported methods for early diagnosis of the disease. Enzymes participating in starch metabolism could be affected for disease development in citric trees. Amylases (EC 3.2.1.1 and 3.2.1.2) are the principal enzymes which participate in the starch degradation.

The objective of the work was to define the degree of association between quantity of water, starch and amylase activity in lemon leaves infected or non-infected by HLB.

Methods. Leaves of Mexican lemon with and without HLB were obtained from “Zona 0” in Tecomán, Colima. The samples were weighted in fresh and dry states. Starch determination was carried out using 0.1 g of fresh tissue according spectrophotometric technique based on reaction with iodine (2). Amylase activity was measured at pH 6.9 using 1 g of minced tissue and soluble starch 1% as substrate. Hydrolysis products were quantified spectrophotometrically at 540 nm using dinitrosalicylic acid (DNS) method (3).

Results. Table 1 shows that the percent of water content and starch levels are modified by HLB. Average water content decreases from 64.8% in healthy plants to 54.2% in infected trees, while average concentration of starch is increased from 8.23 $\mu\text{g g}^{-1}$ of tissue

to 232.19 $\mu\text{g g}^{-1}$ of tissue in trees with HLB (Table 1). It is associated with the visual disease symptoms and previous reports (2). In response to excessive starch concentration, amylase activity is increased from 12.31 UI g^{-1} of tissue to 35.23 UI g^{-1} of tissue on average (Figure 1).

Table 1. Percent of water content and starch concentration in leaves of mexican lemon trees with and without HLB.

HLB	Sample	Water %	Starch $\mu\text{g g}^{-1}$ tissue	\pm	
With	1	55.17	269.35	3.9	
	2	55.40	201.55	2.7	
	3	55.25	279.28	8.2	
	5	52.21	292.17	7.9	
	6	54.84	298.44	2.8	
	7	53.16	284.37	0.8	
	8	54.44	147.14	2.9	
	9	53.47	198.36	5.4	
	11	55.63	277.01	2.5	
	12	53.52	179.44	6.3	
	13	53.27	126.95	9.2	
	Whitout	4	68.00	4.50	0.6
		10	61.62	11.97	2.5

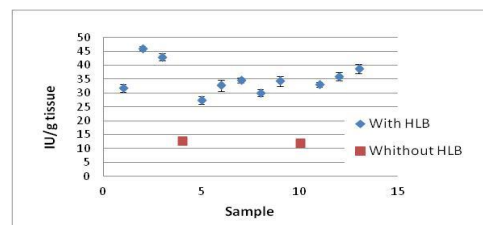


Fig.1 Amylase activity quantified in lemon leaves infected (with HLB) or non-infected (without HLB) by HLB.

Conclusions. The results indicate that HLB causes decrease of water content, increase of starch concentration and amylase activity. The relation between starch concentration and activity is much greater in infected trees and is less in healthy trees. This relation as well as the increase of amylase activity can be considered as indicators of the disease presence useful for its early diagnosis.

References.

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