

EFFECT OF BUNCHY-TOP VIRUS INFECTION ON THE CARBOHYDRATE AND NITROGEN CONTENTS OF BANANA LEAVES*

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Virus infection is known to bring about various changes in the metabolism of the host plant. These virus induced metabolic alterations eventually affect the presence and elaboration of certain chemical constituents in the diseased plant. Eventhough the physiology and biochemistry of a number of virus infected plants have been studied, it is seen that divergent results have been recorded in different diseases. In the present study, the carbohydrate and nitrogen contents of banana leaves were analysed after inoculation with bunchy-top virus and the results obtained are presented below.

Materials and Methods

The *Nendran* variety of banana which is highly susceptible to bunchy-top virus infection was used for the study. Sixty-days-old healthy plants were inoculated by feeding viruliferous aphids, *Pentalonia nigronervosa* Coq., at the rate of 100 per plant. After three days the aphids were killed by spraying 0.05 per cent parathion. The top, middle and bottom leaves of 5 plants selected at random from both healthy and inoculated ones were used for analysis. The chemical constituents were analysed at 15 days interval as per the methods of A. (.). A. C, (1960) and expressed as percentage on dry weight basis.

Results

Total sugars: The total sugar content in the leaves of inoculated plants was higher than that of the healthy plants, except in the top leaf on the 30th day after inoculation. The top leaf of both healthy and inoculated plants contained more total sugars than the middle and bottom leaves throughout the period of observation. The bottom leaves always had the minimum sugar content (Table 1.)

Total carbohydrates: The percentage of total carbohydrates in the leaves of inoculated plants was found to be higher than that of the healthy

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ones. A slight difference was, however, noticed in the top leaf at 90 days and bottom leaves at 60 days after inoculation (Table 2).

Total nitrogen The total nitrogen contents in the top, middle as well as bottom leaves of inoculated plants were lower than that of the healthy plants throughout the period of observation (Table 3).

Carbohydrate : nitrogen ratio. The top, middle and bottom leaves of inoculated plants showed wider carbohydrate : nitrogen ratio than the corresponding leaves of healthy plants during all the periods of sampling (Table 4).

Table 1
Percentage of total sugars in the leaves of healthy and bunchy-top virus infected banana plants

Days after inoculation	Percentage of total sugars					
	Top		Middle		Bottom	
	H	D	H	D	H	D
30	22.70	20.63	16.75	18.88	15.43	16.40
45	16.85	20.83	14.53	18.27	13.33	14.71
60	15.82	19.41	15.24	16.43	13.59	14.20
75	18.27	18.94	16.03	17.36	15.43	16.03
90	17.31	17.76	15.63	16.03	14.85	15.17

H — Healthy D — Diseased

Table 2
Percentage of total carbohydrates in the leaves of healthy and bunchy-top virus infected banana plants

Days after inoculation	Percentage of total carbohydrates					
	Top		Middle		Bottom	
	H	D	H	D	H	D
30	43.25	51.00	36.80	41.00	35.80	37.00
45	39.50	53.00	34.50	39.50	36.00	37.50
60	35.30	44.50	31.50	36.50	33.80	33.00
75	37.60	39.00	33.00	37.00	35.50	36.00
90	40.50	39.00	37.00	38.00	39.00	39.50

Table 3
Percentage of total nitrogen in the leaves of healthy and bunched-top virus infected banana plants

Days after inoculation	Percentage of total nitrogen					
	Top		Middle		Bottom	
	H	D	H	D	H	D
30	1.36	1.34	2.35	1.77	1.94	1.47
45	1.90	1.74	2.10	1.92	2.55	1.30
60	2.60	1.70	1.74	1.46	1.58	1.50
75	1.64	1.52	2.35	2.07	1.64	1.32
90	2.08	1.96	1.17	1.08	1.36	1.11

Table 4
Carbohydrate : Nitrogen ratio in the leaves of healthy and bunched-top virus infected banana plants

Days after inoculation	C : N ratio					
	Top		Middle		Bottom	
	H	D	H	D	H	D
30	31.80 : 1	38.06 : 1	15.66 : 1	23.16 : 1	18.45 : 1	25.17 : 1
45	20.79 : 1	30.46 : 1	16.43 : 1	20.57 : 1	14.12 : 1	28.55 : 1
60	13.58 : 1	26.18 : 1	18.10 : 1	25.00 : 1	21.39 : 1	22.00
75	22.93 : 1	25.66 : 1	14.04 : 1	17.87 : 1	21.65 : 1	27.27 : 1
90	19.47 : 1	19.90 : 1	31.62 : 1	35.19 : 1	28.68 : 1	35.59 : 1

Discussion

Watson and Watson (1953) suggested that a rise in carbohydrate content in the leaves of virus infected plants could result from an increase in the resistance to the movement of sugars from the leaf lamina; but Bawden (1959) and Diener (1963) believed that the accumulation of carbohydrates was due to the inactivation of enzymes concerned in their transformation. Even though the leaves of bunched-top virus infected banana plants showed higher carbohydrate content than those of the healthy ones, the data obtained during the present study does not permit any definite conclusion to be drawn on the mechanism of carbohydrate accumulation in

the leaves of infected plants. In regard to nitrogen content, the dilution effect of accumulating carbohydrates suggested by Wynd (1943) can be considered as a plausible explanation for the reduced levels of total nitrogen noted in the leaves of bunchy-top virus infected plants. Wider C:N ratio is brought about due to higher carbohydrate and lower nitrogen contents in the leaves of infected plants.

Summary

Leaves of bunchy-top virus infected banana plants contained higher percentage of total carbohydrates, lower percentage of total nitrogen and consequently had wider C:N ratio than those of the healthy plants.

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