Agri. Res. J. Kerala, 1973, 11 (1) 65-68

STUDIES ON THE PHYSIOLOGY OF VIRUS DISEASE OF BHENDI PLANT

V. P. Potty and K. I. Wilson
Agricultural College, Vellayani, Kerala

Very little work has been hitherto done on the physiology of host plants (ie Bhendi *Abelmoschus esculantus*) with yellow vein mosaic virus. Only few reports deal with symptomatology, host range, transmission tests of yellow vein mosaic virus infecting Bhendi (Uppal *et al* 1940). The present investigation has been therefore carried out to examine the influenc of virus infection on the carbohydrate and nitrogen metabolism of host plant.

Materials and methods

Local "Kilichundan" variety of Bhendi, which was highlly susceptible to the virus was used for the present study. The culture of Yellow Vein Mosaic Virus was maintained on Bhendi plants. Inoculation was done by releasing viruliferous white flies *Beminsia tabaci* Gen. on healthy uniformly aged plants The healthy and inoculated plants were kept separately in insect proof house.

Three plants selected at random from healthy and inoculated lots were used for each sampling. The leaves, stem and roots were separately analysed for determination of total nitrogen and total sugars, crude fibre and carbohydrates. Total nitrogen was determined colourimetricaly using Nesseler's reagent (Harper 1924). The nitrogen extract was prepared by wet oxidation method. The concentration of nitrogen was calculated from a standard curve prepared by using chemically pure ammonium chloride. Total sugar and carbohydrate were analysed by the titration method as outlined by Somogy (1945)

Results and discussion

The results are presented in Table 1 and The percentage of total sugar in the leaves of inoculated plant was lower than the healthy ones. In the stem, inoculated plants alway had lower percentage of sugars, than the healthy. Maximum difference was seen on 40th day after inoculation. Roots of inoculated plants also showed lower sugar content except on the 20th and 30th days after inoculation. The leaves of inoculated plants showed significantly higher percentage and maximum increase was noticed on the 50th day after inoculcion.

The stem and roots of inoculated plants did not show a definite pattern of increase or decrease from the healthy. Leaves of inoculated plants showed higher percentage of total nitrogen during different observations, execept on the 30th day after inoculation. The stem did not show any definite pattern of increase or decrease. Roots of inoculated plants exhibited higher nitrogen content than the healthy, from the 20th day after inoculation. Maximum difference was on the 50 days old plants. The ratio between carbohydrate and nitrogen in the leaves of inoculated plants was lower than that of the healthy. The stem of inoculated plants showed a higher C:N ratio than the healthy. The roots exhibited a higher ratio up to 20 days after inoculation. On whole plant basis the G:N ratio of the inoculated was lower than the healthy except at 3g days inoculation when the ratio was found to be same in both healthy and inoculated plants.

Y.V.M.V. influences the total sugar content of the plant. However due to higher content of crude fibre, the infected plants were found to have father percentage of total carbohydrate than the healthy ones. Reduction in sugars due to virus infection has been reported by Ramakrishnan (1969) in tomato, Sutic *et* .. (1959) in Sugar Beat, Sing and Aswathi (1969) in Chillies, Alagyanagalingom and Ramakrishnan (1970) in Tapioca. The reduction in sugars and starch in inoculated plant may be either the synthesis of these compounds is retarded or that the breakdown is enhanced to increased respiration or due to cumilative effect.

Accumilation of carbohydrates in virus infeted plants was due to prevention of translocation caused by degenerative changes in phloem. However Watson & Watson (1951) concluded that accumilation of carbohydrates could not *ha* attributed to reduced translocation since loss of starch and carbohydrate was great from the leaves of diseased plants. It is possible that the presence of higher percentage of total carbohydrate which resulted from higher levels of crude fibre in the infected Bhendi plants could be due to reduced activity of enzymes responsible for the breakdown of cellulose materials.

The presence of total nitrogen in the virus infected plants was generally higher than that in the healthy ones. This result was in accordance with the reports of Mclean (1926) in leaf roll of potato, Narayanaswamy and Ramakrishnan (1966) in pigeon pea sterility Mosaic. This increase in total nitrogen content of inoculated plant may be due to the presence of excess viral proteins. The inoculated plants exhibited a narrow C:N ratio as compared to healthy ones which was similar to the report of Brewer *et al* (1965) Jayarajan (1965) in virus infected plants. in this contest Bawden (1950) has stated that decrease C/N ratio of inefcted plant is typical of mosaic diseases.

Table I. Effect of yellow mosaic virus inoculation on certain chemical constituents of leaves, stem and roots of bhindi.

Constituents	Age of plants	Days after inoculation	Leaves H	Leaves I	Stem H	Stem I	Roots H	Roots I
Total Sugars	20	10	18.50	15.00	13.50	13.00	12.50	11.00
	30	20	10.50	12.50	13.94	12 24	11.39	12.09
	40	30	21.53	15.74	14.39	14.13	12.19	13.31
	50	40	24.71	22.61	15.10	13.17	15.13	14.31
	60	50	23.23	21.13	14.13	13.47	16.31	13.19
			1.77*		3 01*		1.00*	
Carbohydrtes	20	10	36.00	40.00	40.35	42.80	37.85	39.25
	30	20	39.51	41.73	37.37	37.71	38.98	34.54
	40	30	35.50	39.31	35.53	39.04	37.93	37.58
	50	40	37 37	44.75	40.23	36.48	41. 80	41.60
	60	50	36.70	45.32	38.44	40 96	44.58	45.50
			4.31*				2.00*	
Total Nitrogen	20	10	2.35	3.15	1.94	1.97	1.58	1.36
	30	20	2.93	3.10	2.31	2 01	1.21	1 39
	40	30	2.95	2.87	1.97	2.11	1.79	2.10
	50	*40*	3.01	3.49	2.10	2.31	1.91	3.17
	60	*59*	3.00	3.31	2.47	2.12	2.10	2.91
			2.27*		2.00*		2 05*	

H - Healthy I - Inoculated Computed value.

Table 2. Carbon nitrogen ratio of healthy and yellow vein mosaic virus inoculated bhendi plants (drywt basis)

Age of plants	Days after inoculation	Carbon. Nitrogen ratio	
		Healthy	Inoculated
20	10	19.4 : 1	18.8 : 1
30	20	18.0 : 1	17.6 : I
40	30	16.3 : 1	16.3 : 1
50	40	17.0 : 1	13.6 : 1
60	50	15.8 : 1	14.7 : 1

Summary

Chemical studies were undertaken to record the changes in total sugars, crude fibre, carbohydrates, Total nitrogen, C : N. ratio of *kilichundan* a local Bhendi veriety influenced by the Y. V. M. V. Inoculated plants showed lower content of total sugar. However crude fibre and carbohydrate was recorded higher than healthy. Total nitrogen was also found high in inoculated one. C : N. ratio of inoculated plant was narrow when compared to healthy ones.

REFERENCES

Alagianagalingom, M. N, and K. Ramakrishnan 1970 Studies on a virus disease of Tapioca-II carbohydrate metobolism. *Madras Agric. J. 57,* 55-61

Brewer, P.H , J. B. Kendrick and M. W. Gardner 1926 Effect of mosaic on the Carbohydrate and nitrogen content of tomato plants. *phytopathology,* \6, 843-851

Bawden, F. S 1950 PLANT VIRUS AND VIRUS DISEASE Chromica Botanica co Walthan Mass, U. S. A

Jayarajan, R. 1965 Studies on Virus disease of chilli in Madras State. Ph.D thesis submitted to Madras University.

Mc Lean, W. 1926 Effect of Leaf Roll disease in potatoes on the composition of Tubes and mother tube *J. Agric. Scic* 16, 316-326

Narayanaswamy P and K. Ramakrishnan 1966 Study of sterility Mosaic on Pigeon Pea Mosaic II Carbohydrate metabolism of infected plant. *Pro. Indian Acdd.* Sci. 62, 130-139

Sing B. P, and D. N Aswathi 1969 Influence of Cucumber Mosaic Virus on chemical composition of chilli. *Indian. Pytopath.,* 22, 194-196

Sutic, D. M. Joncic and R. Dordevic 1959 Effect of Beet Yellow Virus on the yield and Sugar content of Beet. *Zast. Bilja* (Plant port Beograd) 55, 15-22

Watson and Watson 1951 The effect of infection with best root yellow virus mosaic of Sugar best and translocation *Ann. appl. Biol,* 33, 276-28S

Uppal B. N, P. M Varma and 3. P. Gapoor, 1940 Yello.v Mosaic of Bhendi, Cux. *Sci. 9,* 227-228

(M. S. *received 30-10-1972*)