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Biochemical differences between Malformed and Healthy Vegetative and Reproductivc Shoots of Mango (*Mangifera indica* L.)

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Malformed as well as healthy vegetative and reprodutive shoots of mango were analyzed in respect of dry matter, nitrogen, phosphorus, ether extractive, RNA and DNA content. The constituents were determined at monthly interval, extending from the middle of March to the middle of July and from the middle of March to the middle of May, respectively for vegetative and reproductive shoots. The malformed vegetative shoots and reproductive shoots had higher level of nitrogenous and and ether extractlve fractions in particuiar, than identical healthy parts Most of the the constituents tended to decrease at the end of summer or during rainy-seasons. The trend in changes of the constituents with maturity and seasons did not differ much between healthy and melformed parts.

INTRODUCTION

Malformation of vegetative and reproductive shoots poses a serious threat to mango culture in India, especially in the drier tract of northern India, unlike the peninsular parts of the country that experience moist tropical climate (Singh, 1960). Mango trees of West Bengal and the eastern India are also not spared, although the hazard does not assume so serious proportion in this zone as in north India.

Extensive researches have been on record on this malady in the areas of survey, occurrence and varietal susceptibility (Nirvan, 1953 ; Khan and Khan, 1960 ; Mallik, 1959 ; Prasad *et al*, 1972 ; Hifny *et al*, 1978 ; Wahba *et al*, 1986 ; Zora Singh and Dhillon, 1987), etiology (Narasimham, 1954, Singh and Jawands,

1961 ; Verma *et alt* 1974 ; Chakravarti and Ghosal, 1989) and control measures (Shant, 1975 ; Majumdar *et al*, 1970 ; Wet, 1982 ; Chib *et al*, 1986). In order to have a biochemical understanding of the situation, the nitrogen, chlorophyll, amino acids, proteins, nucleic acids, carbohydrates and growth substances in malformed parts had also been determined by a number of scientists (Tripathi, 1955 ; Sadhu, 1975 ; Chattopadhaya and Nandi, 1978 ; Mishra and Dhillon, 1978 ; Dahshan, 1987 ; Nicholson and Staden, 1988 ; Zora Singh and Dhillon, 1989).

The present study has simed at examining the biochemical differences in respect of dry matter, nitrogen. phosphorus, ether extractive and the nucleic acids level of malformed and healthy vegetative shoots of mango during their maturation over the summer and the rainy-seasons as well as malformed and healthy inflore-scences maturing during the summer season.

MATERIALS AND METHODS

Mature mango trees of unknown variety that were grown within a radius of 200 metres from the Calcutta University College of Seience at Ballygunge, Calcutta-700 019 were chosen. Healthy as well as malformed vegetative shoots and pani-cles produced by each such tree that served as a replicate were explanted and were straightway washed thoroughly in running tap water. On surface drying, the samples were brought to the laboratory, suitably encasing in poly-bags, wrapped with moist cloth to avoid moisture loss and made into fine pieces to prepare the representative samples for conducting the tests.

Within a few hours of explanting. the representative sample under each set was allowed to dry in a hot-air oven (60°—70°C for 72 hrs.) to determine its dry matter content. The dried samples were subjeeted to determination of total nitrogen by micro-Kjeldahl method, phosphorus by Fiske and Subbarow (1925), ether extractive fraction by direct weighing and the nucleic acids, following the methods by Burton (1956), Cherry (1962) and Markham (1955) with necessary modlfications (Mazumdar and Chatterjee, 1972).

RESULTS AND DISCUSSION

Whatever may be the etiology, the malformed parts of the mango trees experi-mented with could be seen to have elevated the level of at least the lipid and the nitrogenous constituents analysed in the present study and evidently, without regard to the vegetative or the reproductive parts that had been afflcted with the abnormality symptoms (Tables 1 and 2). The results conform to these report by other workers who reported higher level of the different constituents, e.g., free-amino acids, carbohydrates, growth substances, e(c. in malformed organs of

Table 1. Changing pattern in the content of biochemical constituents in malformed and healthy vegetative shoots of mango during summer and rainy-seasons

Constituent	Type of shoot (*)	Content (Average of all replications)—on dates of sampling					C. D. (5%)
		March 16	April 13	May 11	June 15	July 13	
Dry matter (%)	M	32.93	35.27	37.30	49.25	43.50	2.9
	H	36.33	39.20	39.00	48.25	40.50	2.65
Nitrogen (%)	M	6.21	7.28	3.47	1.27	0.97	0.81
	H	4.53	5.87	2.19	4.21	2.79	0.50
Phosphorus (%)	M	0.006	0.006	0.006	0.006	0.003	0.002
	H	0.012	0.002	0.004	0.004	0.009	0,005
Ether Extr. (%)	M	11.00	8.67	14.33	11.67	5.33	3.64
	H	4.67	2.33	4.67	3.33	2.66	1.19
RNA (%)	M	3.67	6.83	7.41	3.33	3.17	0.47
	H	2.92	5.83	5.92	4.17	3.42	0.86
DNA (%)	M	0.57	0.27	0.11	0.27	0.33	0.09
	H	0.26	0.16	0.22	0.13	0.07	0.05
RNA : DNA ratio	M	6.44	25.82	67.36	12.57	9.60	25.19
	H	11.69	36.43	26.66	32.67	51.79	15.80

(*) M = Malformed. H = Healthy

mango (Sadhu, 1975 ; Pandey *et al*, 1977, Dahshan, 1987 ; Nicholson and Staden, 1988 : Zora Singh and Dhillon, 1989.

Unlike the dry matter content, most of the other constituents tended to decrease towards the end of the summer or during the rainy-seasons as the case may be and much differences could not be observed between the healthy and the mulformed parts as regards to the trend of changes of the constituents with maturity and seasons.

Signifieantly high ether extractive fraction both in the vegetative and the floral malformed parts over the identical healthy tissues deserve particular interest in the present study and is suggestive of critical study in this line, including that of sterols.

Table 2. Changing pattern in the content of biochemical constituents in malformed and healthy inflorescences of mango during summer season

Constituent	Type of shoot (*)	Content (Average of all replication)—on dates of sampling			C. D. (5%)
		March 16	April 13	May 11	
Dry matter (%)	M	27.13	30.67	31.29	1.42
	H	28.27	36.77	47.23	2.78
Nitrogen (%)	M	5.55	6.67	2.71	0.59
	H	3.47	4.68	1.58	1 60
Phosphorus (%)	M	0.001	0.012	0.004	0.002
	H	0.008	0.003	0.011	0.005
Ether Extr. (%)	M	8.67	10.67	10.67	1.49
	H	2.33	5.67	3.67	0.75
RNA (%)	M	2.50	2.75	3.00	2.05
	H	6.33	7.50	5.83	1.24
DNA (%)	M	0.24	0.54	0.37	0.04
	H	0.14	0.44	0.26	0.03
RNA : DNA ratio	M	10.55	5.06	13.39	0.83
	H	46.75	17.12	22.87	11.84

(*) M = Malformed. H = Healthy.

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