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Chemical Composition of the Leaves of Chiku (*Achras sapota* Syn.) During Different Stages of the Crop*

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ABSTRACT

The N and Zn content were high in the medium aged leaves of chiku. The old leaves had low K-content. Ca, Mg and Fe concentrations increased with the increase in age. After application of N, P and K, the leaf-N and K increased and leaf-Ca was also slightly increased. Fe and Mn depleted during fruit-set. Mg depleted during fruit-development. Leaf-N and K declined during fruit-set and fruit-development.

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INTRODUCTION

Application of optimum amount of fertilizers at the right stage is most important for securing good yield each year from every fruit-crops. It is frequently observed that the tissue composition changes as the season is changed. The tissue composition differs during the different stages of the crop. This is mainly because, the different nutrient elements are used in different proportions during the various processes namely, growth, flowering, fruit setting, fruit-development, ripening etc. Leaf age is another major factor which determines the contents of nutrient elements in the leaves. The leaf compositions, of *chiku* as affected by age has been discussed (Chavan, 1978). Efforts have been made to isolate the effect of different stages of crop on the chemical composition of the *chiku* leaves by excluding the effect of age of the leaf. Such type of information will be useful in understanding the need of each nutrient element during the different stages of crop and thereby help in scheduling the dose and time of fertilisers for *chiku*. In order to attain this, *chiku*-leaves of similar ages during the various stages of the crop were collected for the chemical analysis and results reported in this paper.

MATERIALS AND METHODS

The study was carried out at the orchard of Horticulture Department, Marathwada Agricultural University, Parbhani during 1977-78. The seven year-old trees of Kali Patti cultivar of *chiku* was selected for the study. All the trees ware supplied with recommended dose of fertilisers during second week of June. New growth was seen in January when labelling was done. Large number of such spring cycle nonfruiting shoots

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were kept under close observations. The 35 leaves, evenly distributed at a workable height of one to two metre all around the trees were collected. The leaf samples were collected on the first date of each month starting from the appearance of new growth, i.e., when the leaves were one month-old, two month-old and so on upto 11 months. The leaf samples were brought to the laboratory, and washed first with ordinary water secondly with 0.1 N HCl and finally rinsed in distilled water. They were dried in an oven at 65° C for 48 hours, ground and analysed for NPK, Ca and Mg (Chapman and Pratt, 1961). The Fe, Zn and Mn contents were estimated on atomic absorption spectrophotometer (Bradfield and Spancer, 1965).

RESULTS AND DISCUSSION

All the samples were analysed for the NPK, Ca, Mg, Fe, Zn and Mn contents in the leaves. For the sake of convenience the average mineral contents of one to three month-old, four to seven month-old and eight to eleven month-old leaves have been presented in Table 1a, 1b and 1c, respectively.

It is evident from the data in Table 1a, 1b and 1c that N and Zn were low in young leaves, high in medium aged leaves and low in old leaves. Old leaves had low K, Ca, Mg and Fe which increased with the increase in age of the leaf. Young leaves contained low Mn. P-content did not differ with the change in age.

It may be seen from the data in Table 1a that the leaf-N sharply increased after application of fertilizers. The leaf-N however, declined during the stages of fruit-setting and fruit-development. The data on P and Zn contents did not show any consistent change. After application of fertilizers leaf-K appeared to increase to some extent. Ca content in the leaves was also increased after application of fertilizers. It was also noticed that the Ca increased during the stages of fruit-setting and fruit-development. The Mg content in the leaves appeared to decrease during the fruit-development. The Fe and Mn contents were depleted during the fruit-set. The Fe content further increased to some extent during the fruit-development stage.

The chemical composition of the leaves of medium age (4 to 7 month-old) has been presented in Table 1b and the data indicated that the leaf-N suddenly increased after application of fertilizers. The N content in the leaves depleted during the fruit setting and fruit-development stages. No consistent differences in the P-content of 4 to 7 month-old leaves sampled in various months could be observed. The K and Zn in the leaves also increased with the application of fertilizers. Gradual decline in the K-content was seen during fruit-set and fruit-development. The calcium increased during the stages of fruit-setting and fruit-development. Leaf-Mg depleted during fruit-set and fruit-development. The Fe content increased during fruit development. The Mn, Fe and Ca contents depleted suddenly at the last month of the fruit-development.

TABLE IA

Average mineral contents of 1 to 3 month-old *chiku* leaves sample in different months.

Months	*Per cent*					*ppm*			*Remarks*
	N	*P*	*K*	*Ca*	*Mg*	*Fe*	*Zn*	*Mn*	
Feb.	0.08	0.09	1.30	0.84	0.42	75.00	74.63	16.66	Before
Mar.	0.06	0.13	1.75	0.88	0.49	170.00	97.65	24.44	manuring
Apr.	0.03	0.11	0.24	0.91	0.50	258.34	122.25	25.18	
May	0.21	0.10	1.08	0.95	0.38	258.33	60.03	27.60	
June	0.56	0.09	1.40	1.02	0.56	183.33	186.62	15.00	
July	0.91	0.09	1.57	1.17	0.60	108.34	82.46	16.67	After
Aug.	1.83	0.09	1.84	1.19	0.38	258.34	158.41	11.11	manuring
									** L x B
Sept.	1.10	0.11	1.57	1.30	0.72	150.00	122.25	9.78	1.07 x 1.23
Oct.	1.05	0.17	1.24	1.20	0.22	216.67	94.76	27.78	1.90 x 2.30
Nov.	0.91	0.13	1.77	1.50	0.26	360.67	179.99	51.11	3.10 x 3.23
Dec.	0.98	0.13	1.57	1.60	0.24	258.34	70.89	14.82	4.03 x 3.47
Jan.	0.31	0.09	1.37	1.50	1.04	308.34	143.95	27.61	5.23 x 4.67
Mean	0.750	0.110	1.394	1.171	0.484	217.641	116.157	22.313	
SD	0.553	0.025	0.429	0.261	0.231	82.913	43.203	11.216	
CV	74.000	23.000	31.000	23.000	48.000	38.000	38.000	51.000	
t	4.405*	11.938*	10.760*	14.703*	6..02*	8.805*	8.920*	6.600*	

*Significant at 1%.

**Fruit-set occurred. L x B Length x Breadth of fruit in cm.

The nutrient contents in the old leaves (8 to 11 month-old) sampled from September to January have been presented in Table 1c. It may be seen from the data that the N-content decreased sharply during the fruit-development stage. As the data of the 8 to 11 month old leaves were available only for a period of five months during the fruit-set and fruit-development stages, the changes in other nutrient elements could not be authentically attributed to any specific reason.

The N and Zn contents were high in the medium aged leaves. These, however, decreased during the old age. When the senescence starts the mobile elements like N and Zn seem to have been withdrawn from the old plant-parts. This type of physiological function has been noted (Smith, 1962). Low K-content in the old leaves could

TABLE 1b

Average mineral contents of 4 to 7 month-old *chiku* leaves sampled in different months.

Months	*Per cent*					*ppm*			*Remarks*
	N	*P*	*K*	*Ca*	*Mg*	*Fe*	*Zn*	*Mn*	
May	0.50	0.16	1.00	1.26	0.80	175.60	173.60	27.77	Before
June	0.55	0.09	1.03	1.33	0.61	200.00	57.51	22.22	Manuring
July	1.56	0.09	1.60	1.24	0.72	191.67	112.12	31.31	After
Aug.	1.81	0.10	2.13	1.33	0.55	200.00	219.72	19.94	manuring
									** L x B
Sept.	1.26	0.12	1.57	2.15	0.40	293.75	127.48	37.48	1.07 x 1.23
Oct.	1.03	0.14	0.87	1.60	0.48	381.25	135.62	51.38	1.90 x 2.30
Nov.	0.75	0.09	1.22	2.10	0.40	512.50	177.19	101.37	3.10 x 3.23
Dec.	0.77	0.09	1.28	2.03	0.23	412.50	69.44	20.71	4.03 x 3.47
Jan.	0.25	0.09	1.68	1.35	0.66	98.46	307.20	30.30	5.23 x 4.67
Mean	0.831	0.107	1.375	1.588	0.538	273.903	153.320	38.00	
SD	0.517	0.026	0.403	0.386	0.180	135.178	77.430	25.685	
CV	63.000	25.000	30.000	25.000	34.000	50.000	51.000	68.000	
t	4.533*	7.134*	9.616*	11.620*	8.277*	5.731*	5.601*	4.185*	

*Significant at 1%

**Fruit-set occurred. L x B Length x Breadth of fruit in cm.

TABLE 1c

Average mineral contents of 8 to 11 month-old *chiku* leaves sampled in different months.

Months	*Per cent*					*ppm*			*Remarks*
	N	*P*	*K*	*Ca*	*Mg*	*Fe*	*Zn*	*Mn*	
									** L x B
Sept.	0.98	0.09	0.95	2.00	0.76	425.00	184.45	44.44	1.07 x 1.23
Oct.	1.05	0.09	0.85	1.70	0.57	325.00	78.12	32.07	1.90 x 2.30
Nov.	0.56	0.09	1.06	2.13	0.36	341.66	104.16	44.44	3.10 x 3.23
Dec.	0.60	0.10	0.97	2.57	0.63	462.50	94.93	27.77	4.03 x 3.47
Jan.	0.15	0.09	1.60	1.60	0.66	229.13	86.80	40.27	5.23 x 4.67
Mean	0.670	0.090	1.090	2.000	0.600	356.660	109.690	38.000	
SD	0.363	0.004	0.297	0.385	0.149	91.329	42.890	7.545	
CV	55.000	5.000	28.000	20.000	25.000	26.000	40.000	20.000	
t	3.683*	14.429*	7.350*	10.350*	7.900*	7.810*	5.120*	10.080*	

*Significant at 1%.

**Fruit-set occurred. L x B Length x Breadth of fruit in cm.

be also explained on this phenomenon only. Ca, Mg and Fe went on accumulating in leaves with the advancement in age. Ca, Fe and to some extent Mg are less mobile (Brown *et al.* 1959) and hence they must have not been withdrawn from the old tissues for the utilisation in young growing parts.

A recommended dose of NPK was applied through chemical fertilizers. After application of these fertilizers, the N and P contents in the leaves appeared to increase. In the same way stages of fruit-setting, fruit-development also brought about changes in the chemical composition of the leaves, irrespective of the fact that the leaf-age remained constant. As the synergism exists between N and Ca (Smith, 1962), Ca tended to increase on the application of N-fertilizer. The Fe and Mn depleted during fruit-set and it seems that they are used up during fruit-set. Mg depletion during fruit-development also showed that Mg was utilised during fruit-development. In the same way leaf-N and K declined during the fruit-set and fruit-development stages.

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