GAU Res. J. 1991. 16 (2) : 27-31

Studies on Physico Chemical Characters of Coconut (*Cocos nucifera* L.) Cv. "Dwarf Green" Under Coastal Gujarat Conditions

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ABSTRACT

The results of the present investigations revealed that fruit, breadth, fruit girth and weight of kernel were maximum in 12 months old nuts of coconut. The volume of coconut water was recorde to the highest (241.3 ml.) in 6 months old fruit whereas, it was the lowest (162.0 ml.) in 12 months old fruit.

The age of the furit affected the reducing sugar content significantly, however non-reducing sugar content was not affected. Total sugars content was found to be 5.92 and 2.66 per cent in 6 months and 12 months old fruits, respectively. The highest total soluble solids content of 6.16 per cent was recorded in 10 months old fruit.

(Received on 17th July 1990)

INTRODUCTION

Coconut palm (*Cocos nucifera L.*) is an important vegetable oil producing crop in humid tropical countries of the world. It is grown in more than 80 countries of the tropics. It is the most important among all cultivated palms (Thangaraj and Muthuswami, 1985).

Gujarat is endowed with 1600 k.m. sea coast where tremendous expansion possibilities exitst for the cultivation of coconut and about 11000 hectares of land is under coconut cultivation. Out of this about 40 per cent area is under 'dwarf Green' variety which is preferred for drinking purpose over other varieties, and is one of the parents in many existing hybrids. The 'Dwarf Green' maintains almost cent per cent purity on account of self pollination in this dwarf variety is due to the over lapping of male and female phases.

For hybridization it is essential to know the breeding behaviour of the crop. There is a scarcity of dwarf coconut seed garden in the country perhaps due to lack of information regarding cultivation of these varieties. However, no systematic studies seem to have been conducted on this cultivar on physico-chemical fruit charcters, which is of paramount importance in hybridization work. Therefore the investigation was undertaken to study physicochemical fruit characters of coconut cv. ' Dwarf Green' at Plantation Crops Research Station, Mahuva Distt. Bhavangar of Gujarat Agricultural University.

MATERIALS AND METHODS

Out of 192 palms, 30 palms of 'Dwarf Green' cultivar of coconut were randomly selected for observation, during July 1984 to June 1985. They were all uniform in size, age (10 years old) and height, having planting distance of 7.5 x 7.5 m. To have the comparative informations of 6, 8, 10 and 12 months old nuts, 10 tender and ripe nuts were

selected randomly from 10 coconut trees out of 30 selected trees and observations were recorded on length, breadth, girth and volume. Each nut was weighted individualy on the day of harvest, whereas weight of fruit shell and husk, kernel, from each nut was recorded carefully. Water from each nut was collected in a container by cutting the nut and measured with the help of a measuring cylinder. Reducing, non reducing and total sugars were analysed by the titrimetric method of lane and Enon as described by Ranganna (1977). Total soluble solids were redcorded with the help of 'zeiss' hand refractometre. To study the variation in different characters towards maturity, observetions on randomly selected four nuts of 12 months age were recorded from each of the 30 coconut trees. The weather data at Mahuva (Gujarat) where the study was conducted are given in Appendix-I.

RESULTS AND DISCUSSION

Results of physico-chemical characters for various factors are presented in Table-1 and the average of four fruits randomly taken from thirty trees in respect of different physical characters of coconut fruit Cv. Dwarf Green' are given in Appendix-II.

A. Effects of Different Age Stage on the Physical Characters of Coconut Fruits.

(i) Size of the fruit. There was progressive increase in length of fruit from 6th month (21.50 cm.) up to 12th months (27.25 cm.) through size of 10 months and 12 months old fruits was at par. Similarly, the breadth and girth of fruit progressively increased with the age. The 12 months old fruit being the maximum in breadth (15.78 cm.) as well as girth (46.9 cm.).

(ii) **Weight of fruit.**
The highest fruit weight of 2253.9 g. was recorded in 10 months old fruits followed by 1974.9 g. in 8 months and 1507 g. in 12 months old fruit in comparison 1287.7 g. in control (6 months old).

(iii) **Volume of fruit.**
The highest value of 1950.5 ml. at 12 months age and a minimum value of 1196.0 ml. at 6 months age was recorded. There were significant differences among the different factors. Which are being discussed in the following paragraphs.

(iv) **Weight of shell and husk.**
Similar to the volume of fruit the weight of shell and husk also differed significantly among the different factors. The highest weight of shell and husk (1950.0 g.) was obtained at 10 months age and minimum in 6 months age (1033.9 g).

(v) **Weight of kernel.**
There were significant differences among different factors with a highest value of 257.5 g. at 12 months age and a minimum value of 14.5 g. at 6 months age.

(vi) **Volume of coconut water.**
Significant differences were observed for this study, the highest values varied from 241.3 ml of water in 6 months old fruit to 162.0 ml of water in 12 months old fruit. Further the data indicated that quantity of coconut water decreased with age of fruits.

B. Chemical Composition of Coconut Fruits at Different Stages.

The results obtained for different characters are presented in Table-1.

(i) **Reducing sugar.**
The result showed that the reducing sugars were significantly influenced due to the age of the fruit. The content of reducing sugars was almost same up to 10 months old fruit i. e. 3.46 to 3.51 per cent. At the age of 12 months coconut fruit, the reducing sugars content, was drastically reduced (11 per cent) as compared to 6 months old fruit.

(ii) **Non reducing sugars.**
Non reducing sugars content was not affected significantly by the age of the fruit However, the highest content (2.49 per cent) was observed at 6 months old fruit while the lowest (1.77 per cent) at 10 months old fruit.

TABLE 1

Effect of different age stages on the physico-chemical characrers of coconut fruits Cv. Dwarf Green.

Sr. No.	*Factors*	*Length of fruit (cm.)*	*Breadth of fruit (cm.)*	*Girth of fruit. (cm.)*	*Weight of fruit*	*Volume of fruit*	*Weight of shell husk (g)*	*Weight of kernel (g).*	*Volume of coconut water(ml.)*	*Reducing sugar (per cent)*	*Non reducing sugar (per cent)*	*Total sugar (perc ent)*	*Total soluble solids (per cent)*
1.	6 Months	21.50	11.60	39.85	1287.70	1196.00	1033.90	14.5	241.7	3.46	2.49	5.95	4.81
2.	8 Months	24.00	12.60	40.35	1974.90	1755.80	1734.30	43.2	197.4	3.48	2.40	5.88	5.55
3.	10 Months	25.75	13.90	39.85	2255.00	1667.50	1995.00	97.5	173.5	3.51	1.77	5.28	6.16
4.	12 Months	27.25	15.78	46.90	1507.70	1950.50	1088.20	257.5	162.0	0.39	2.26	2.65	3.29
	S. Em ±	0.41	0.26	0.56	30.65	29.11	33.83	8.10	15.91	0.14	N.S.	0.17	0.05
	C. D. at 5%	2.62	1.64	3.56	194.60	184.50	214.77	51.44	101.00	0.89	N.S.	1.08	0.35
	C. V.%	5.29	6.07	4.24	5.47	5.60	7.31	24.43	36.04	16.50	N.S.	3.47	10.92

(iii) **Total sugars.**
The total sugars content was affected significantly by the age of the fruit. It significantly decreased with the increase in the age of the fruit. It varied from 2.65 to 5.95 per cent. The reduction was to the extent of 55.55, and per cent over 6th, 8th, 10th month old fruit., respectively. Kamladevi and Velayantham (1978) found that the sugar content decreased from about 8.8 per cent in the 8th month to 1.4 per cent in the 12th months old fruits. Similar trend in sugar content has been reported by Thampan (1981).

(iv) **Total soluble solids.**
The total soluble solids increased the increase in age of fruit up to 10 months and descreased at 123 months age of fruit. However, Thampan (1981) recorded the highest values of T, S, S, when the nuts were about 7 months old or just before the kernel began to harden. The iinfirmations generated by above studies can be utilized by breeders and horticulturists for hybridization and other research work as well as growers for tender nut production, for drinking purpose and the production of DXT and TXD hybrids, it is utilized as one of the parents in above hybrids.

APPENDIX I

Average monthly temperature, humidity and total rainfall, during July, 1984 to June '85.

No.	Month and year	Temperature Maxi. (C)	Temperature Mini. (C)	Relative humudity (%)	Total rainfall	No. of rainy days.
1.	July, 1984.	33.3	28.3	92	125.7	9
2.	August, '84.	31.7	28.3	93	167.0	10
3.	September, '84	33.9	27.2	91	75.8	3
4.	October, '84.	35.0	28.3	79	14.4	1
5.	November, '84.	31.7	24.4	69	—	—
6.	December, '84.	32.2	21.7	61	—	—
7.	January, '85.	32.2	21.7	63	—	—
8.	February, '85.	30.6	21.7	65	—	—
9.	March, '85.	36.7	25.6	67	—	—
10.	April, '85.	36.1	28.9	77	—	—
11.	May, '85.	36.1	28.3	88	1.2	1
12.	June, '85.	34.4	32.2	85	64.5	1

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APPENDIX- II

Physical characters of coconut fruits Cv. " Dwarf Green ".

Trees Sr No.	Length of fruit in (cm.)	Breedth of fruit in (cm.)	Weight of fruit in (q)	Volume of fruit in (ml.)	Weight of husk in (q)	Weight of husked nut in (q)	Volume of water in ripen fruit in (ml.)	Weight of shell in (g)	Weight of kernel in (g)	Weight of copra (g)	Oil percentage (%)	Yield (Number of nuts/palm)
	1	2	3	4	5	6	7	8	9	10	11	12
1.	26.6	15.4	1261.3	2233.50	823.25	438.0	112.25	87.5	221.3	100.0	64.07	59.5
2.	27.8	16.1	1457.5	2237.75	930.00	527.5	227.75	95.0	243.0	98.8	68.72	52.5
3.	27.4	16.3	1617.5	2463.75	1071.25	546.3	171.50	92.0	257.0	95.0	70.07	52.5
4.	27.4	15.9	1330.0	2298.75	808.25	521.3	136.75	98.8	262.8	117.5	65.80	68.0
5.	28.5	16.5	1118.8	2397.50	584.50	544.3	198.75	106.3	267.0	125.0	65.97	65.5
6.	26.4	13.8	1148.8	1697.50	775.00	373.8	114.25	63.8	178.5	65.8	71.35	58.0
7.	26.6	15.5	1620.0	2269.50	1039.50	580.5	178.50	105.8	268.0	100.5	71.80	45.5
8.	28.8	16.0	1362.5	2460.00	861.00	510.5	159.25	93.5	233.0	93.0	72.02	56.0
9.	25.9	15.0	1300.0	1891.25	621.25	481.3	134.50	85.0	245.0	97.5	74.45	50.0
10.	27.6	14.3	1310.0	2100.25	886.00	428.0	128.25	72.5	201.3	85.0	75.65	21.0
11.	26.9	14.6	1515.0	1833.75	1020.00	495.0	196.00	86.3	183.3	67.0	74.47	52.5
12.	27.8	15.4	1461.3	2311.25	917.50	518.8	170.50	92.5	254.8	91.3	70.75	95.5
13.	27.1	15.6	1527.5	2206.00	957.00	570.5	198.25	96.8	245.8	90.0	71.57	52.5
14.	24.6	14.8	1426.3	1897.50	996.25	430.0	131.50	88.3	212.5	96.3	72.90	70.0
15.	27.1	15.1	1455.0	2046.75	936.25	518.8	154.50	67.5	253.8	90.0	72.97	86.5
16.	25.6	16.0	1145.0	2129.00	698.50	446.5	127.50	91.3	208.5	100.0	69.10	65.5
17.	25.0	14.9	1247.5	1823.75	778.50	569.0	153.25	81.8	210.8	73.0	70.40	69.0
18.	28.1	14.8	1305.0	2055.75	877.00	428.0	107.25	83.8	220.8	104.5	70.87	47.0
19.	27.9	15.6	1665.0	2295.75	1101.75	563.3	184.00	97.5	254.0	102.3	72.27	58.5
20.	27.1	14.5	1337.5	1888.25	991.00	396.5	120.25	82.5	175.5	80.5	73.25	55.5
21.	26.6	15.0	1812.5	1944.00	1250.00	562.5	246.25	68.0	210.0	68.8	71.10	68.0
22.	27.6	15.4	1805.0	2165.00	1241.25	538.8	188.25	83.8	263.0	83.0	74.40	69.5
23.	27.6	16.6	1575.0	2312.25	1074.00	504.0	175.25	97.5	204.0	90.0	73.10	44.5
24.	26.6	14.9	1308.3	1755.25	912.00	396.8	116.50	71.3	191.5	76.3	70.37	44.5
25.	23.1	12.1	794.3	1447.00	498.75	354.5	63.75	67.5	139.8	66.3	70.50	115.0
26.	26.0	15.9	1521.3	2171.25	1014.50	506.8	174.00	93.3	215.0	86.8	72.37	80.0
27.	26.1	15.4	1492.5	2173.25	942.00	460.5	140.50	78.8	230.3	87.8	70.15	18.5
28.	28.6	16.5	1635.5	2809.25	1020.00	615.0	195.75	113.8	276.8	127.5	69.72	45.5
29.	28.5	15.3	1650.5	2371.25	1206.25	491.8	184.50	85.5	215.3	83.8	70.35	62.5
30.	26.7	15.6	1390.8	2132.00	903.25	495.5	147.75	86.3	239.3	93.0	68.50	59.5
Total	809.6	458.8	42515.2	63819.00	27935.75	14814.1	4740.25	2634.3	6783.3	2738.3	2128.01	1788.5
Mean	27.0	15.3	1417.2	2127.30	931.19	493.8	158.00	87.8	226.1	91.3	70.93	59.6

* Mean of 30 palms each of 4 samples observed.