International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(5): 3137-3139
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Received: 16-07-2019
Accepted: 18-08-2019

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Evaluation of coconut hybrids for tender nut water quality under central dry zone of Karnataka

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Abstract
Investigations was carried out at Horticulture Research and Extension Station, Arsikere, University of Horticultural Sciences, Bagalkot during 2018-2019 to identify superior coconut hybrid for nut water. The volume of nut water content and qualitative attributes *viz.,* pH, TSS, total sugars, sugars and mineral contents were analysed. The maximum amount of nut water content (306.67 ml/nut) and the maximum qualitative characters such as TSS (5.77 ˚Brix), pH (5.35), calcium (60.33 mg/100 ml), magnesium (19.17 mg/100 ml), lowest to optimum level of sodium and potassium content (24.80 and 1771.05 ppm) and organoleptic score for colour, taste and overall acceptability (8.23, 8.27 and 8.25, respectively) was recorded highest in Abhaya Ganga. Kalpa Ganga recorded highest values for total (3.77 g/100 ml) and reducing sugar (2.01 g/100 ml), protein (1.11 %), phosphorous (55.10 mg/100 ml) and lowest titrable acidity (0.052%). Hence, hybrid GBGD x LCOT can be utilized for tender nut water purpose followed by GBGD x FJT.

Keywords: Coconut, hybrids, tender nut water, quality

Introduction
Coconut is an important perennial crop in humid tropics. It provides food, nutrition, fibers, beverage, medicine, shelter, and wide range of handicrafts throughout its lifetime. India consumes more than 50 per cent of its production as raw nuts as culinary and religious purposes, 35 per cent of the production is utilized for conversion to copra, 11 per cent for tender nuts, 2 per cent for seed purposes and hardly 2 per cent is utilized for value addition and industrial purposes (Muralidharan and Jayashree, 2011) [5]. Tender nut water is found to be one of the value added by products from coconut with vast commercial potenial. It is a natural, nutritious, medicinal, mineral drink with well acceptable flavour and taste. With the recent shift from synthetic to natural soft drinks, tender nut water is gaining popularity in traditional and export markets. Tender coconut water comprises of 95.5 per cent water, 4 per cent sugar, 0.1 per cent fat, 0.02 per cent calcium, 0.01 per cent phosphorous, 0.5 per cent iron, a considerable amount of amino acids, mineral salts, vitamin B complex, vitamin C and cytokines (Vigliar *et al.,* 2006) [7]. Quality and acceptability of nut water mainly depends on the variety, maturity of the nut, soil and climatic factors. Identification of suitable hybrids with superior quality and quantity will be a favourable footstep for farmer's or industries preference from the commercial point of view. Hence, this study was taken up to identify the superior coconut hybrids for nut water under central dry zone of Karnataka.

Material and methods
An experiment was carried out at Horticulture Research and Extension Station, Arsikere, University of Horticultural Sciences, Bagalkot during 2018-2019. A total of 9 hybrids *viz.*, CCNT x LCOT, LCOT x PHOT, LCOT x CCNT (VPM-5), WCT x COD (Kera Sankara), WCT x GBGD (Kera Ganga), WCT x MYD (Kera Shree), GBGD x FJT (Kalpa Ganga), GBGD x PHOT (Vasista Ganga), GBGD x LCOT (Abhaya Ganga) along with TPT (Tiptur Tall) as local check were taken for the study. The list of hybrids with their parental information were given in table 1. The experiment was laid out in a randomized complete block design with three replications. The hybrids for the study which had been planted at a distance of 7.5 x 7.5 m during 1987.

Recommended package of practices were followed for all the hybrids. Nuts of six to seven months old were harvested and three nuts were taken at randomly from replicated palms. The volume of nut water was measured, from which total soluble solids (TSS) and pH was estimated by using hand refractrometer and digital pH meter, respectively. Biochemical parameter *viz.,* total sugars were estimated by anthrone method (Yoshida *et al*., 1972), reducing sugar by Dinitro Salicylic Acid method (Miller, 1972). Protein estimation by micro-kjeldahl method (Tondon, 1993). Phosphorous, calcium and magnesium by using atomic absorption spectrophotometer at 120 nm and 228.8 nm, respectively. The sodium and potassium were determined by using flame photometer (Tondon, 1993). Nine panelists evaluated the tender nut water organoleptically and rating was done on 1-9 scale and the ranks were grouped as 1-dislike extremely, 2-like only slightly, 3-dislike moderately, 4-dislike slightly, 5-neither like nor dislike, 6-like slightly, 7-like moderately, 8-like very much and 9-like extremely. The data were statistically analyzed.

Table 1: Treatment details of hybrids and their parental information used in experiment

Cross combination	Parental information
T_1 -CCNT X LCOT	Selection from Cochin China Tall as female parent and selection from Laccadive Ordinary Tall as male parent.
T_2-LCOT X PHOT	Selection from Laccadive Ordinary Tall as female parent and selection from Phillipines Ordinary Tall as male parent.
T_3-LCOT X CCNT (VPM-5)	Selection from Laccadive Ordinary tall as female parent and selection from Cochin China Tall as male parent.
T_4-WCT X COD (Kera Sankara)	Selection from West Coast Tall as female parent and selection from Chowghat Orange Dwarf as male parent.
T_5-WCT X GBGD (Kera Ganga)	Selection from West Coast Tall as female parent and selection from Gangabondam Green Dwarf as male parent.
T_6-WCT X MYD (Kera Shree)	Selection from West Coast Tall as female parent and selection from Malayan Yellow Dwarf as male parent.
T_7-GBGD X FJT (Kalpa Ganga)	Selection from Gangabondam Green Dwarf as female parent and selection from Fiji Tall as male parent.
T_8-GBGD X PHOT (Vasista Ganga)	Selection from Gangabondam Green Dwarf as female parent and selection from Phillipines Ordinary Tall as male parent.
T_9-GBGD X LCOT (Abhaya ganga)	Selection from Gangabondam Green Dwarf as female parent and selection from Laccadive Ordinary Tall as male parent.
TPT	Tiptur Tall, local check

Results and discussion

In the present investigation, significant differences were observed for all the characters among the hybrids (table 2). The maximum quantity of nut water volume in tender nut was recorded by GBGD x LCOT (306.67 ml/nut) compared to minimum quantity of nut water volume recorded by Tiptur Tall (203.67 ml / nut). The decline in volume of water may be due to the absorption of water by the developing endosperm as well as minor evaporation losses. The results are in agreement with earlier findings of Jayalekshmy *et al*. (1986); Apshara *et al.* (2007) [1] and Chattopadhyay *et al.* (2009) [2]. In tender nut water, the hybrid GBGD x LCOT recorded higher TSS content of 5.77 ˚Brix and lowest values were recorded by Tipturt Tall (4.43 ˚Brix). The highest pH of tender nut water was recorded by hybrid GBGD x LCOT (5.35) compared to the lowest pH values recorded by WCT x MYD (4.68). Among the hybrids studied, the lowest titrable acidity was recorded in the hybrid GBGD x FJT (0.052 %). The highest titrable acidity was recorded in TPT (0.092 %). According to Nandasabapathy and Kumar (1999) the highest content of acidity was recorded in 'Malayan Orange Dwarf' (0.092 %) followed by Tiptur Tall (0.084 %). Nut water becomes acidic due to the presence of organic acids, free amino acids, fatty acids. The present finding is also supported by Jayalekshmy *et al.* (1986); Chattopadhyay *et al.* (2009) [2] and Poornadhivya (2015).

The mean value of biochemical characters like sugar content and mineral content of tender nut water varied significantly among the coconut hybrids (table 3). The maximum sugars content *viz.,* total (5.41 g/100 ml) and reducing (3.77 g/100 ml) was recorded by Kalpa Ganga and non reducing (2.01 g/100 ml) in tender nut water was recorded by Abhaya Ganga. Rethinam and Nandakumar (2001) have observed that the quantity of total sugars in tender coconut is found to vary from variety to variety and from place to place towards the maturity. This decline in sugar level could be attributed to the incorporation of sugars into the developing endosperm. The developing endosperm might therefore, be utilizing these sugars as precursors for fat synthesis. The present investigation results are in conformity with earlier findings of Apshara *et al*. (2007) [1]; Chattopadhyay *et al.* (2013) [3] and Poornadhivya (2015).

Significant differences were also observed among coconut hybrids with respect to mineral contents (table 3). Among the hybrids evaluated, maximum phosphorous (5.83 mg/100 ml), calcium (60.33 mg/100 ml) and magnesium (19.17 mg/100 ml) was recorded in GBGD x LCOT. The lowest to optimum quantity of sodium content in tender water was recorded by GBGD x LCOT (24.80 ppm) and highest quantity recorded by CCNT x LCOT (47.80 ppm). In tendernut water, the lowest potassium content was recorded by hybrid GBGD x PHOT (1225 ppm) and the maximum of 3203 ppm was recorded by WCT x GBGD. Generally less to optimal levels of sodium and potassium contents were preferred for the best nut water. In the present study GBGD x LCOT, GBGD x PHOT and GBGD x FJT recorded less amount of sodium and potassium content. The results are in agreement with earlier findings of Jayalekshmy *et al.* (1986); Apshara *et al.* (2007) [1] and Chattopadhyay *et al.* (2006). organoleptic acceptance for colour, taste and overall acceptance were recorded by GBGD x LCOT (8.23, 8.27, 8.25, respectively), followed by the hybrid GBGD x FJT (8.01, 8.05, 8.03, respectively). The pleasant taste of nut water could be attributed mainly due to the sugars and minerals content present in nut water.

Conclusion

For tender nut purpose, quality parameters play an important role in selection. Considering the above facts, GBGD x LCOT

recorded highest values for most of the parameters. Hence, it is concluded that dwarf x tall hybrid (GBGD x LCOT) is comparatively suitable for tender nut purpose followed by GBGD x FJT.

Table 2: Volume of water, total soluble solids, pH, titrable acidity and sugar content in tender nut water of different coconut hybrids

Treatments	Volume of water (ml/nut)	Total soluble solids (° Brix)	pH	Titrable acidity (%)	Sugars (g/100ml)		
					Reducing (g/100 ml)	Non reducing (g/100 ml)	Total (g/100 ml)
T_1: CCNT x LCOT	236.00	5.02	5.02	0.065	3.24	1.12	4.36
T_2: LCOT x PHOT	239.67	4.97	4.86	0.062	3.37	1.64	5.01
T_3: LCOT x CCNT	238.00	4.63	4.85	0.071	3.36	1.04	4.40
T_4: WCT x COD	241.67	4.80	5.14	0.068	2.95	1.77	4.72
T_5; WCT x GBGD	268.33	4.97	4.69	0.077	2.58	1.53	4.11
T_6: WCT x MYD	239.67	5.12	4.68	0.072	3.41	1.32	4.73
T_7: GBGD x FJT	249.67	5.14	5.16	0.052	3.77	1.64	5.41
T_8: GBGD x PHOT	222.33	5.27	5.34	0.059	3.44	1.55	4.99
T_9: GBGD x LCOT	306.67	5.77	5.35	0.057	3.27	2.01	5.28
T_{10}: TPT	203.67	4.43	4.80	0.092	3.07	1.18	4.25
S.Em. ±	15.00	0.07	0.13	0.0019	0.11	0.11	0.17
CD @ 5%	44.58	0.21	0.39	0.0054	0.34	0.34	0.49
CV (%)	10.63	2.57	4.51	2.80	3.99	2.87	4.10

Table 3: Performance of coconut hybrids with respect to protein, mineral content and overall acceptability in tender nut water

Treatments	Protein (%)	Phosphorous (mg/100ml)	Sodium (ppm)	Potassim (ppm)	Calcium (mg/100m)	Magnesium (mg/100ml)	Organoleptic evaluation		
							Colour	Taste	Overall acceptability
T_1: CCNT x LCOT	0.94	41.68	47.80	2820.50	21.15	12.16	7.75	7.66	7.70
T_2: LCOT x PHOT	0.86	34.92	36.05	2468.50	29.94	17.83	7.57	7.78	7.67
T_3: LCOT x CCNT	0.99	41.93	45.43	2279.00	23.51	14.25	6.68	7.44	7.06
T_4: WCT x COD	0.90	35.57	37.45	2058.50	40.50	12.96	7.30	7.58	7.44
T_5; WCT x GBGD	1.04	44.92	40.25	3203.00	37.59	15.53	7.45	7.55	7.50
T_6: WCT x MYD	1.05	44.63	25.90	2480.50	38.17	12.26	7.35	7.35	7.35
T_7: GBGD x FJT	1.11	55.10	31.15	2302.00	59.30	14.83	8.01	8.05	8.03
T_8: GBGD x PHOT	0.97	54.57	26.20	1225.00	49.90	18.58	7.77	7.60	7.69
T_9: GBGD x LCOT	1.06	50.27	24.80	1771.05	60.33	19.17	8.23	8.27	8.25
T_{10}: TPT	0.97	45.27	34.00	2476.00	30.01	11.22	7.27	7.11	7.19
S.Em. ±	0.03	2.01	0.62	24.06	0.94	0.40	0.19	0.10	0.12
CD @ 5%	0.08	5.96	1.86	71.49	2.78	1.20	0.57	0.31	0.36
CV (%)	4.58	3.74	3.10	1.81	4.16	4.71	4.37	2.39	2.75

References

1. Apshara SE, Arunachalam V, Jayabose C, Kumaran PM. Evaluation of coconut hybrids for tender nut purpose. Indian Journal of Horticulture. 2007; 64(3): 314-319.
2. Chattopadhyay N, Samanta MK, Hore JK, Alam K. Studies on the physico-chemical composition of tender coconut water during development in selected varieties. Journal of Plantation Crops. 2009; 37(1):1-6.
3. Chattopadhyay N, Samanta MK, Hore JK, Alam K. Evaluation of coconut cultivars for tender nut water. Acta Horticulture. 2013; 975(28):255-262.
4. Jayalakshmy AC, Arumugham S, Narayanan C, Mathew AG. Changes in the chemical composition of coconut water during maturation. Journal of Food Science and Technology. 1986; 23:203-207.
5. Muralidharan K, Jayashree A. Value addition, product diversification and byproduct utilization in coconut. Indian Coconut Journal. 2011; 7:4-10.
6. Poornadhivya B. Evaluation of coconut (*Cocos nucifera* L.) genotypes and hybrids suitable for tender nut and copra yield. M.Sc. Thesis submitted to Tamil Nadu Agricultural University, Coimbatore, India, 2015.
7. Vigliar R, Sdepanian VL, Fagundes-Neto. Biochemical profile of coconut water from coconut palms planted in an inland region. Journal de pediatria. 2006; 82(4):308-312.