Evaluation of Different Cultivars of Coconut (*Cocos nucifera* L.) at Tender Nut Stage

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ABSTRACT

The different cultivars of coconut of Malayan origin were evaluated for their physico-chemical characteristics at tender nut stage i.e., 7-8 months of maturity. A significant difference was recorded for weight of nut, length and breadth of nut, volume of water, pH, acidity and brix acid ratio. From the study it was observed that the tender coconut water can be kept fresh without any adverse effect on its quality for two months at low temperature (3-4°C). At ambient temperature (25-30°C) it was found to ferment after 8-10 hours. Further, it can be preserved with potassium metabisulphite (KMS) @ 600 ppm but for consumption the preserved water has to be heated upto boiling point to expel the SO_2 present in it. The processing and packing of tender coconut water can be taken up on commercial scale as the Bay islands is a tourist spot and tender coconuts are available in plenty. The farmers face problems to send the matured coconuts to mainland and the returns are not remunerative.

INTRODUCTION

Coconut (*Cocos nucifera* L.) is an important commercial plantation crop of the tropical region and is mostly cultivated for its matured nuts. It is being cultivated since time immemorial as references are available in various literatures including *Ramayana*. There are various disputes about its origin. According to some reports it is possible that coconut had been cultivated in many parts of India and the climatic and geographical changes in due course might have caused the confinement of coconut to coastal tracts in the country (Arvindakshan, 1995). It is mostly grown in Southern states viz., Kerala, Karnataka, Tamilnadu, Andhra Pradesh, Maharashtra, Gujarat, Orissa, West Bengal and some North Eastern states. It covers an area of 1.83 million hectares with an annual production of about 12,952 million nuts (95-96).

Andaman and Nicobar islands situated between 10° 31' and 13° 42' North latitude and 92° 14' and 94° 16' East longitude in the South-East Bay of Bengal, are having congenial agro-climatic conditions due to hot and humid tropics for the cultivation of coconut. It covers an area of about 24,746 hectares with an annual production of 83-85 million nuts (Anon., 1997). Although coconut comes up well in these islands, as the distance from the mainland is about 1200 km, it is difficult to transport the nuts. Due to uniqueness of the beautiful islands these are becoming a popular tourist spots attracting lot of visitors every year.

The coconut plantations in these islands are of Malayan origin. As the coconut in its tender stage contains soft and sweet water, it is important to analyse if for various physio-chemical characteristics so that it can be harvested at optimum maturity for better quality of water. The water itself is cool and refreshing containing liquid endosperm rich in sugars, vitamins and minerals like potassium, sodium and calcium. Several reports are available for the analysis of the matured nut but at tender nut stage the information is scanty. In the present study the different cultivars of coconut were evaluated for their physico-chemical characteristics at tender nut stage.

MATERIALS AND METHODS

The different cultivars viz. Malayan Yellow dwarf (MYD), Malayan Orange dwart (MOD), Malayan Green dwarf (MGD), Dwart x Tall (DxT) and Andaman Tall (AT) were harvested from Sipighat Farm of Central Agricultural Research Institute, Port Blair. The nuts were of 7-8 months of maturity. The samples were taken randomly with ten replications in each. The physical parameters observed by standard methods were nut weight (kg), length (cm), breadth (cm) volume of water (ml) and specific gravity of water. The total soluble solids (TSS) were recorded with hand refractometer whereas acidity by titrating a known volume of water with 0.1NNaOH using phenolphthalein as indicator (Ranganna, 1986). The pH of the coconut water was determined with

digital pH meter. The experimental data were satistically analysed by using Randomised Block Design (R.B.D) outlined by Cochran and Cox (1952). The tender coconut water was studied for its storage at room temperator (25-30°C) and low temperature (3-4°C) in glass containers with and without preservative (KMS@600ppm).

Results and Discussion

The physico-chemical characters of different tender coconut water have been presented in Table 1. The total weight of the coconut varied from 1.315 kg in MOD to 2.815 kg in AT. The length recorded was the highest (21.02cm) in DxT whereas the breadth was maximum (16.34 cm) in AT. The volume of the water varied significantly and it was recorded maximum (649.0 ml) in DxT. The specific gravity of water and TSS were found to vary among different cultivars but the variation was recorded as non-significant. The highest brix acid ratio (20.73) was observed in MOD coconut.

From the study it was found that although, the TSS of the water is less but from the sensory evaluation it revealed as good for consumption. The tender coconut stored in glass bottles at room temperature was found to ferment after 8-10 hours whereas at low tempearture it remained fresh with good quality even after two months. The water stored with KMS was also in excellent condition but due to presence of SO_2 the quality was not good.

The effect of maturity on the chemical composition of tender coconut (*Cocos nucifera* L. var. Arsikere Tall) water have been studied by Chikkasubbanna *et al.* (1990). It has been found that the tender coconut of 7-8 months maturity was ideal for nutrition as well as for getting good returns. From the studies carried out by Srivatsa and Sankaran (1995), it has been reported that the tender coconut water can be packed in beverage cans of 200 ml/350 ml capacity after heating for commercial sterility by nisin. Further, it has been reported that about 200 million nuts are harvested and consumed in tender stage. Tender coconut kernel is good for convalescing patients. Addition of ascorbic acid @ 100 mg/100g increases the acceptability and nutritive value. Addition of antioxidant B.H.A @ 0.02% was found to have beneficial effect on the quality of the product during storage (Krishnamurthy, 1996).

It has rightly been reported that the water of tender coconut is the finest drink in the world and it is, no doubt, a valuable gift of nature to mankind. It not only quenches the thirst but also cures man's most of the diseases and helps him regain his lost health. It contains glucose, fructose and carbohydrate contents. The specific gravity of water is less than that of plasma and hence easily digestible. It helps purify urinary bladder. Further, it has been found that this water is a powerful medium for the production of antibiotic called oxytetracycline commonly known as tetracycline. It contains a number of nutrients including protein, fats and minerals like Na, K, Ca, Mg, Fe, Cu, P, S and chlorine with Vit. B Group and vitamin C (Nandakumar, 1995).

From the study, it can be concluded that the processing and packing of tender coconut water, which is the most nutritive drink, can be taken up on a commercial scale in Andaman group of islands where about 10-20 per cent of harvest is being used as tender coconut and the rest for nut purpose. According to a recent report 16 mineral water bottle samples of various firms marketed in Madras were analysed for various physico-chemical characteristics and surprisingly none of these samples were having the required composition. (Muthukrishnan *et al.*, 1997) Moreover, in these islands mineral water bottles are being imported from the mainland, which are not useful for drinking purpose, but are spoiling the fragile ecosystem due to dumping off of the non-degradable plastic bottles. If a small processing unit takes up the packaging of tender coconut water, it will not only stop the dependence of the islands on the mainland for mineral water but also the farmers will get remunerative returns and the islanders/tourists will have refreshing drink. The farmers are not getting good returns due to far away distance from the mainland and if the tender coconut is used on a large scale the problem of sending the matured nuts to the mainland will be solved.

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Table 1 : Physico-chemical characters of coconut samples

Coconut cultivar	Characters								
	Weight of nut (kg)	Length (cm)	Breadth (cm)	Volume of water (ml)	Specific gravity of water	TSS (OB)	pH	Acidity (%)	Brix acid ratio
MYD	1.930	17.28	14.98	404.0	1.017	1.51	5.33	0.105	14.38
MOD	1.315	16.04	13.75	359.0	1.015	1.70	5.69	0.082	20.73
MGD	1.770	17.96	14.68	315.5	1.023	1.60	5.29	0.115	13.91
DXT	2.675	21.05	16.08	649.0	1.016	1.22	5.47	0.089	13.70
AT	2.815	20.86	16.34	527.0	1.020	1.36	5.27	0.094	14.46
C.D. at 5%	0.555	1.46	1.43	106.65	NS	NS	0.135	0.018	1.47

Method for Early Detection of Sex in Papaya

Pune-based researchers have developed a DNA-based method to distinguish between female and male papaya plants at an early stage which can help papaya farmers.

Sex of "dioecious" varieties of papaya - which are extensively grown in India for producing an enzyme called papain, used in food production - can not be identified from their appearance initially.

The sex is revealed only after six to eight months when the plants start flowering. It affects farmers because they have to weed out excess of male plants, as only five per cent of male plants in a field are sufficient for pollination.

Scientists at the National Chemical Laboratory (NCL) have developed a method based on "deoxyribonucliec acid (DNA) markers" by which sex of papaya plants can be determined at the one- or two-month seedling stage. This helps farmers plant the requisite number of male and female plants to maximise harvest.

By cultivating male and female plants in a desired ratio, use of planting space, fertilizer and water could also be optimized, P.K. Ranjekar, head of biochemical sciences and plant molecular biology division at NCL, told PTI.

The method has been developed by Ranjekar together with Anjali Parasnis and Vidya S. Gupta.

DNA is isolated from the nucleus of papaya leaf cells and broken into pieces by using an enzyme called restriction enzyeme which digest, the DNA into fragments, Ranjekar said.

The DNA fragments are amplified using polymerase chain reaction (PCR) technique and then visualised by staining methods.

After amplification, a specific DNA fragement is seen only in male plants that helps identify them.

The lab-scale method needs to be scaled up for use by seed companies and papaya breeders, he said.

Earlier attempts to identify sex-specific differences in papaya by comparing biochemical constituents and external features had been unsucessful.

Patents for the method have been filed, Ranjekar added.

-PTI Science Service