

# Comparative Study of Physico-Chemical Parameters of Tender Coconut Water

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## Abstract

In the present work, the comparative study of tender coconut water (TCW) was carried out from irrigated and non-irrigated areas. The parameters like sodium, potassium, calcium, phosphorous, iron, pH, acidity, magnesium, copper, chloride and sulphate of tender coconut water from irrigated and non-irrigated areas was analyzed for the comparison.

**Keywords:** *Tender coconut water (TCW); Sodium; Potassium; Calcium; Phosphorous; Iron; pH; Acidity; Magnesium; Copper; Chloride and Sulphate*

## Introduction

Coconut water or tender coconut water has been used as a refreshing drink, cooking oil, hair oil and traditional medicine [1-5]. Tender coconut water has an antidote effect, antioxidant effect, hypolipidemic effect, cardio-protective effect, anti-atherosclerotic effect, antithrombotic effect, antifungal effect, anticancer effect, anti-cholecystitic effect, immunostimulatory effect, antibacterial activity and anti-dermatophytic activity [6-17]. The tender coconut water has been also used in coronary heart disease [17]. Tender coconut water has also been used to lower the blood pressure [18]. The green coconut water contains RNA phosphorous which was used in respiratory metabolism [19]. Coconut water is useful for the microbial growth [20] and also has antioxidant activity [21]. The coconut water contains soluble sugars, potassium, proteins, salts, oil, nicotinic acid, pantothenic acid and vitamin C [22,23]. The coconut water is also used in the organic synthesis research [24]. The chemical composition of tender coconut water varies with the hydrological and geographic change. In continuation of our ongoing research [25], in the present work we report chemical composition of tender coconut water from irrigated and non-irrigated areas.

## Study area

The tender coconut water samples were collected from the Rahata tehsil which falls within North Latitude 19°45' and East Longitude 74°25'. The samples were collected during the month of January to April 2015. A total of 20 samples were collected

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from different irrigated and non-irrigated places for analysis. The study area is situated around Pravara canal, Pravara River and non-irrigated region of Rahata tehsil.

## Experimental

The samples were collected, coconut fruits were removed and tender coconut water from each fruit was transferred into a new and clean polythene bottle. The determination of sodium, potassium and calcium was carried out flame photometrically [26] with working curve method. The phosphorous and iron was determined by spectrophotometrically [27]. The acidity of samples was determined by using titrimetric method [27]. The magnesium and copper were determined by atomic absorption spectrometry [26]. The chloride and sulphate were determined by turbidimetric method [26] with working curve method. The pH of the samples was analyzed by pH meter and all samples were kept in refrigerator at (2°C) for chemical composition.

## Results and Discussion

The chemical composition of tender coconut water from irrigated areas was analyzed and shown in TABLE 1. The chemical composition of tender coconut water from non-irrigated areas was analyzed and reported in TABLE 2. The values of sodium, potassium, calcium, phosphorous, iron, pH, magnesium, copper, chloride and sulphate were higher for tender coconut water collected from irrigated areas than non-irrigated areas. While the tender coconut water collected from irrigated areas have less acidity as comparing to tender coconut water collected from non-irrigated areas. The coconut plants were situated near canal and Pravara River which carry municipal waste, industrial waste and domestic waste materials therefore it shows higher values for certain parameters. The higher amount of certain ions is mainly due to the selective absorption by plants. The coconut water from irrigated as well as non-irrigated region shows differences in phosphorous, sulphate and chloride content [28-30].

TABLE 1. Chemical composition of tender coconut water (irrigated areas).

Parameters	Samples									
	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Sodium (mg%)	45.2	50.3	45.3	50.7	47.4	46.5	44.6	45.1	50.6	49.3
Potassium (mg%)	283.4	289.1	291.2	290.2	293.4	295.3	291.7	292.	290.6	291.9
Calcium (mg%)	45.3	50.9	48.7	48.7	46.8	47.2	46.1	47.3	50.1	49.8
Phosphorous (mg%)	9.6	9.7	9.8	8.9	9.4	9.3	8.9	9.6	9.1	9.5
Iron (mg%)	116.5	115.8	114.7	115.6	115.2	116.4	117.8	117.4	116.9	116.7
pH	4.8	4.9	4.7	4.9	5.1	4.8	5.1	4.7	4.8	4.9
Acidity (mg%)	121.3	122.4	123.5	124.1	122.8	122.6	123.8	123.4	124.7	123.6
Magnesium (mg%)	14.6	12.5	16.7	14.7	13.3	13.4	14.5	12.3	17.1	11.4
Copper (mg%)	7.4	7.6	8.7	6.1	7.3	8.8	7.2	6.9	8.4	7.5
Chloride (mg%)	103.2	104.3	105.7	111.4	101.9	107.6	115.4	117.2	118.7	102.5

Sulphate (mg %)	9.3	8.4	7.9	9.2	9.7	8.6	12.4	8.4	13.6	11.5
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TABLE 2. Chemical composition of tender coconut water (non-irrigated areas).

Parameters	Samples									
	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20
Sodium (mg %)	43.3	48.2	43.4	48.5	45.8	45.1	42.4	44.1	48.2	48.1
Potassium (mg %)	278.6	284.3	285.7	284.4	287.6	287.4	279.1	282.4	285.7	285.3
Calcium (mg %)	42.7	49.3	47.2	47.8	45.1	46.2	44.6	45.7	48.3	47.4
Phosphorous (mg%)	8.8	8.4	9.4	8.1	9.2	8.8	8.2	8.8	8.7	8.2
Iron (mg%)	114.7	112.3	115.1	114.8	112.7	115.2	116.1	115.3	113.7	114.3
pH	3.4	3.7	3.4	3.7	3.8	3.6	4.2	3.4	3.8	3.6
Acidity (mg%)	122.7	124.1	125.2	125.7	124.6	124.2	125.1	125.2	125.8	125.7
Magnesium (mg%)	12.4	10.2	11.3	12.6	11.8	12.1	12.7	10.1	11.5	10.2
Copper (mg%)	6.4	6.6	7.7	5.4	6.5	7.4	6.6	5.8	7.6	7.1
Chloride (mg%)	101.1	100.5	99.4	100.2	99.2	101.2	105.4	102.6	100.7	99.1
Sulphate (mg%)	8.3	7.4	6.6	7.5	7.6	7.2	6.8	7.1	9.5	8.5

### Conclusion

The results show that many parameters in all samples of tender coconut water from the study area exceed the permissible limits [31] for drinking water. The values of calcium, magnesium, chloride and sulphate in all tender coconut water samples from the study area are below the permissible limits for drinking water. The pH values of all tender coconut water samples from the study area are below the permissible level of drinking water.

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### REFERENCES

1. Nathanael WRN. The sugars of coconut water, Ceylon Cocon Q. 1952;3:193.
2. Ediriweera ERHSS. Medicinal uses of coconut (Cocos nucifera Linn), Cocoinfo. Int. 2003;10:11.
3. Munir MMI. Coconut water as one of the optional oral electrolyte solutions. Paediatr Indones. 1980;20:38.
4. Bourdeix R, Konan JL, N'Cho YP. Coconut: A guide to traditional and improved varieties. Montpellier: Editions Diversiflora, cop. 2005.

5. Nanda Kumar TB. Tender Coconut water: Nature's finest drink. *Indian Coconut J.* 1990;21:14.
6. Verallo-Rowell VM, Dillague KM, Syah-Tjundawan BS. Novel antibacterial and emollient effects of coconut and virgin olive oils in adult atopic dermatitis, *Dermatitis.* 2008;19:308.
7. Mandal S, DebMandal M, Pal NK, Saha K. Synergistic anti-*Staphylococcus aureus* activity of amoxicillin in combination with emblica officinalis and nymphae odorata extracts. *Asian Pacific J Trop Med.* 2010;3:711.
8. Koschek PR, Alviano DS, Alviano CS, Gattas CR. The husk fiber *Cocos nucifera* L. (Palmae) is a source of anti-neoplastic activity. *Braz J Med Biol Res.* 2007;40:1339.
9. Effiong GS, Ebong PE, Eyong EU, Uwah AJ, Ekong UE. Amelioration of chloramphenicol induced toxicity in rates by coconut water. *J Appl Sci Res.* 2010;6:331.
10. Nevin KG, Rajamohan T. Virgin coconut oil supplemented diet increases the antioxidant status in rats. *Food Chem.* 2005;99:260.
11. Mini S, Rajamohan T. Influence of coconut kernel protein on lipid metabolism in alcohol fed rats. *Indian J Exp Biol.* 2004;42:53.
12. Ibrahim AI, Obeid MT, Jouma MJ, Moasis GA, Al-Richane WL, Kindermann I, Boehm M, Roemer K, Mueller-Lantzsch N, B. C. Gartnerindermann BC. Detection of herpes simplex virus, cytomegalovirus and Epstein-Barr virus DNA in atherosclerotic plaques and in unaffected bypass grafts. *J Clin Virol.* 2005;32:29.
13. Ogbolu DO, Oni AA, Daini OA. *In vitro* antimicrobial properties of coconut oil on *Candida* sp. In: Ibadan, Nigeria, *J Med Food.* 2007;10:384.
14. Abate MA, Moore TL. Monoctanoin use for gallstone dissolution. *Drug Intell Clin Pharm.* 1985;19:708.
15. Winarsi H, Purwanto A. Virgin coconut oil (VCO) enriched with Zn as immunostimulatory for vaginal candidiasis patient, *Hayati J Biosci.* 2008;15:135.
16. Chidambaram S, Singaraja C, Prasanna MV, Ganesan M, Sundararajan. M. Chemistry of tender coconut water from the Cuddalore coastal region in Tamil Nadu, India. *Nat Resour Res.* doi:10.1007/s11053-013-9203-y.
17. Anurag P, Rajamohan T. Cardioprotective effect of tender coconut water in experimental myocardial infarction, *Plant Foods Hum. Nutr.* 2003;58:1.
18. Massey LK. Dairy food consumption, blood pressure and stroke. *J Nutr.* 2001;131:1875.
19. Majeed M, Prakash L. The nourishment factor cococin support hydration and healthy cell growth, Sabinsa Corporation, US Patent. 2008;87:300.
20. Alaban CA. Studies in optimal conditions for the "nata de coco" bacterium on "nata" formation in coconut water, *Philipp. Agric.* 1962;45:490.
21. Mantena SK, Jagadish SR, Badduri KB, Siripurapu KB. Unnikrishnan, *in vitro* evaluation of antioxidant properties of *Cocos nucifera* Linn. water, *Nahrung* 2003;47:126.
22. Prades A, Dornier M. Pain, Coconut water uses, composition and properties: a review, *Fruits.* 2012;67:87.
23. Dhillon SK, Dhillon KS. Zinc adsorption by alkaline soils. *J Ind Soc Soil Sci.* 1984;32:250.
24. DaFonseca M, Monte FJ. Coconut water (*Cocos nucifera* L)-A new biocatalyst system for organic synthesis. *J Mol Catal B: Enzym.* 2009;57:78.
25. a) Uphade BK, Shelke SS, Thorat DG. Studies on some physico-chemical characteristics of coconut water near sugar and chemical factory, Kopergaon (M. S). *Int J Chem Sci.* 2008;6:2052.  
b) Uphade BK, Gadhave AG, Gaikar RB. Removal of copper (II) from aqueous solution by modified agricultural waste materials. *Asian J Res Chem.* 2016;9:409.

26. Vogel AI. A Text Book of Qualitative Inorganic Analysis. 3<sup>rd</sup> Edition, Longmans, London. 1961.
27. Giridharan L, Venugopal T, Jayaprakash M. A comprehensive environmental study of metals on the soil-water-plant system at West Chrompet Area, Chennai, India. Int J Chem Sci. 2007;5:728.
28. Jeganathan M. Nut water analysis as a diagnostic tool in coconut nutrition studies, Commun. Soil Sci Plant Anal. 1992;23:2667.
29. da Silva RA, Cavalcante LF, de Holanda JS, Pereira WE, de Moura MF, Ferreira Neto M. Fruits quality of green dwarf coconut fertirrigation with nitrogen and potassium. Rev Bras Frutic. 2006;28:310.
30. Teixeira LAJ, Bataglia OC, Buzetti S, Furlani Jr E, Dos Santos Isepon J. NPK fertilization on dwarf green coconut (*Cocos nucifera* L)-Yield and fruit quality. Rev Bras Frutic. 2005;27:120.
31. Back ground document for development of WHO guidelines for drinking water quality, WHO. 2004.