

Review Article

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## Preparation of a Nutritious and Healthy RTD (Ready to Drink) Beverage Enriched with Natural Anti Oxidants

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### ABSTRACT

Over the past few years, the Beverage Industry has evolved and innovated itself to meet the demands of the consumers and the present market. Earlier people had only water and milk as a beverage. Water is considered to be a source of hydration while milk is considered as “complete food”, but the advancements in the food sector has led to the manufacture and processing of many beverages, either alcoholic or non-alcoholic. Apart from alcoholic drinks, the trend is readily shifting towards RTD (Ready to Drink) beverages. These are low-fat drinks that are thirst-quenching, refreshing, and nutritionally superior and provide instant energy. Drinks infused with herbal extracts can be a potential source of anti-oxidants, vitamins, minerals and fibres. This paper focuses on RTD beverage made primarily from coconut water, coriander leaves extract and cumin powder. Coconut water is a primitive tropical beverage whose demand and popularity in the market is elevating continuously. It has been characterized as a “sports beverage”. It has low matter content comprising mainly of sugars and minerals. Coriander leaves are the source of essential oil, Linalool. Besides, the leaves possess anti-microbial, anti-fungal, anti-mutagenic and anti-oxidant properties and help to cure indigestion, depression and lowering cholesterol levels. Cumin is a dried ripe food with a strong aromatic flavour. It has high medicinal value as well as possessing anti-microbial and anti-oxidant properties.

#### Keywords

Drinks, Cumin,  
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### Introduction

Drinks are referred to as beverages that are appetizing, easily digestible, thirst-quenching that people consume all over the world to satisfy their needs in terms of energy, nutrition, hydration, and refreshment. Fruit beverages include natural and sweetened juices, squash, cordial, nectars, concentrates, citrus juices, barley water, RTD beverages, etc. (Sudheer and Indira, 2007). Soft drinks

and juices are nutritionally superior above the synthetic beverages and help to replace the lost salts of the body. There are two sets of regulations for the Beverage Industry: Soft Drink Regulation, 1964 and Fruit Juices, and Fruit Nectars Regulation, 1977. Both the set of regulations are responsible for monitoring and checking the composition, description and the class of the food material. In today's era, RTD beverages are growing consistently and innovating itself to newer trends to meet

the demands of the consumers. Nowadays, people are more concerned for their health and well-being, therefore, the newer trend of the Beverage Industry is readily shifting towards the natural extracts that are being infused in the drinks and juices (mint extract, ginger extract, etc.). Such herbal beverages and natural beverages improve the mineral content, vitamins, functional properties as well as the organoleptic properties of the drink (De *et al.*, 2007).

The present paper discusses RTD beverage comprising of tender coconut water, coriander leaves extract and cumin. The perfect blend of these ingredients would result in a healthy, refreshing and nutritionally superior drink over other carbonated and aerated beverages, also it will be a potential source of vitamins, minerals, energy, amino acids, and sugar.

The endosperm is the edible part of the coconut fruit. During cellularization process, the embryo isn't filled completely leaving a liquid behind mainly called "Coconut Water" (Janick and Paull, 2008). Tender coconut water is a refreshing, rehydrating and thirst-quenching liquid. It contains sugars, vitamins, minerals, growth hormones, proteins and amino acids (Shaw and Shrivastava, 1963). It is a source of plenty of minerals like sodium, potassium, zinc, copper, boron, chloride, phosphorus, zinc, manganese, etc. the major minerals present in coconut water serving as body electrolytes too are sodium and potassium. Coconut water is generally consumed and is prescribed against gastritis, indigestion, hiccups, and bladder infections. It also acts as the source of calcium for lactating mothers.

Among the oldest herbs, Coriander (*Coriandrum sativum* L) belongs to the Apiaceae family and comes in mainly two varieties: vulgar and microcarpum (Burdock and Carabin, 2009). They are used primarily in garnishing the foods and also have

medicinal value (Opkyde, 1973). The essential oil content of the leaves is about 1% comprising of linalool, comprising the main component (Wichtl, 1994). The leaves are reported to have a moisture content of 87.9%, protein content of 3.3%, carbohydrate content (total sugar) of 6.5% and a total ash content of 1.7% (Ganesan *et al.*, 2013). It is extensively advantageous in curing deficiencies of iron and vitamins. Like all green leafy vegetables, it is a good source of vitamins, minerals, beta-carotene, and dietary fibre. It is referred to as "Dhania" in Hindi and is recommended for treating digestive tract disorders, urinary tract disorders, and respiratory tract disorders.

The non-leafy part of the plant (bud, bark, seed, fruit, etc.) is referred to as a spice. They are used to season foods, acts as a preservative and may also be used as herbal medicine. They are composed of ash, fibre, carbohydrates, and essential oils. Cumin (*Cuminum cyminum*) is a flowering plant in the family Apiaceae. The essential oil present in cumin is responsible for its characteristic aroma and flavour. The spice is an important ingredient of Indian sub-continent and is reported to be popular in the Roman cuisines (Peter, 2001; Raghavan, 2007). It has preservative (Peter, 2001) and anti-oxidant properties as well (Thippeswamy *et al.*, 2005). It is used in the treatment of wounds, flatulence, dyspepsia, diarrhoea, and indigestion. Spices are an excellent source of antioxidants, and some of them even outperform the synthetic antioxidants and are safer also from the health point of view.

### **History of beverages**

Juices are consumed all over the world as a beverage or along with food to add flavour. It has become possible to preserve the juices and beverages without fermentation (for wine, beer, etc.) with the invention of pasteurization. Hence, the trend of natural and non-alcoholic beverages has entered the

market. The earliest evidence for juice production is grape pits of 8000 BCE. However, it is impossible to distinguish whether these grapes were used for wine production or juice production (Johnson, 1989). During the 16<sup>th</sup> century, the first produced juice was lemonade in Italy. Soon after orange juice emerged the market in the 17<sup>th</sup> century (Emmins, 2000). Later “sharbat” was also in the mid 17<sup>th</sup> century. They were cool and refreshing drinks that came from Turkey (Emmins, 2000).

Over the past 100 years, innovations have been made in the Fruit Juice Industry that has introduced fruit juice concentrates and the use of Pasteurization. For the very first time, pasteurization was applied to preserve the juices in 1869 by Dr. Thomas B. Welch, allowing a longer shelf life to the juices without fermenting them. Welch started this process on juices just a few years after it was invented but years before it was applied to milk regularly (Welch’s Company history).

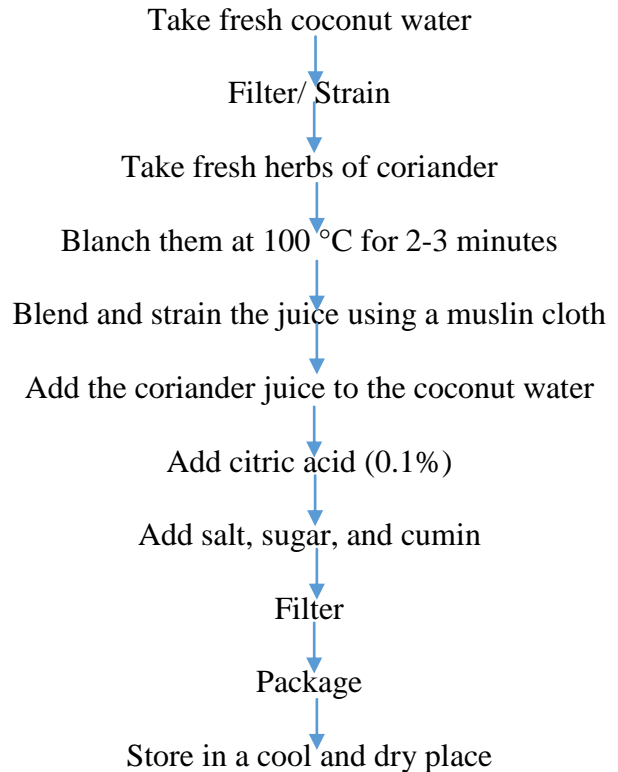
Juice concentrates came during World War II for providing instant energy to the troops. Many fortified drinks and juices are replacing the soft drinks in the market. Along with vitamins and minerals, *Spirulina*, blue-green algae, and herbs such as Echinacea are also being incorporated in the juices (Nicholl, 1998).

The first masticating juicer was invented in the mid-1950s, the Champion Machine. It worked on the principle of heating the juice to kill the enzymes by making use of a high-speed centrifuge (4000rpm). Most of the nutrients were also lost during the process due to the heat formed.

In 1993, the world’s first twin gear extractor called The Green Power Juicer was produced. It worked on the principle of pressing and extracting the maximum amount of juice

along with the nutrients without losing them to heat.

### Process of the RTD beverage



### Properties

#### Coconut water

Coconut water comprises of 95.5% water, 4% sugars, 0.1% fat, 0.02% calcium, 0.01% phosphorous, 0.5% iron, considerable amounts of amino acids, mineral salts, vitamin B complex, vitamin C and cytokines, etc. (Vigliar *et al.*, 2006). It is a rich source of magnesium, potassium and vitamin C, which are known to reduce the risk for coronary heart disease (Anurag and Rajamohan, 2003). It is a major source of the free amino acid L-arginine, which has vasodilator function (Boger and Bode-Boger, 2001). The anti-oxidant properties on four samples of coconut water obtained by hydro distillation and by solvent extraction using petroleum ether at

different concentrations were assessed (Fonseca *et al.*, 2009).

S.No.	Sample	Mode of Extraction	Concentration (µg/µl)	Antioxidant Activity (%)
1.	A	Hydro-distillation	1	79.4
			0.50	76.6
			0.25	64.8
			0.125	41.2
2.	B	Hydro-distillation	1	83.5
			0.50	79.3
			0.25	67.2
			0.125	32.5
3.	C	Solvent extraction	1	31.5
			0.25	16.4
4.	D	Solvent extraction	1	34.9
			0.25	27.7

### Coriander leaves

The leaves of coriander are a source of protein, vitamins, minerals (calcium, phosphorus, iron, etc.), fibers and carbohydrates. The leaves seeds contain an essential oil (EO) which provides a characteristic flavour to the leaves and also acts as a preservative (Kalemba, 2003). Ganesan *et al.*, reported that coriander leaves are rich in moisture (87.9%), protein (3.3%), carbohydrates (total sugar 6.5%) and total ash 1.7%. The coriander seed essential oil is also used as a food supplement within limitable amounts of 600 mg/day (EFSA Panel on Dietetic Products).

The coriander seed essential oil helps in controlling blood glucose level and held promising for being used as an anti-hyperglycemic agent (Gallagher, 2003).

### Anti-microbial properties of coriander

The essential oil of the coriander seeds and leaves inhibit anti-bacterial properties against gram (+ve) and gram (-ve) food spoilage

bacteria (Delaquis *et al.*, 2002). It has been studied that coriander leaves exhibit inhibitory effects on potential food spoilage bacteria such as *Klebsiella pneumonia*, *Bacillus megaterium*, *Pseudomonas aeruginosa* (Keksin *et al.*, 2011). The anti-bacterial properties of coriander could be due to the presence of linalool, an important component of essential oil which has been reported to have an anti-bacterial effect against many strains (Ates *et al.*, 2003). An anti-microbial peptide containing 26 amino acids namely *Plantaricin C. sativum* has been isolated from coriander leaf extract is reported to exhibit anti-microbial properties against gram (+ve) and gram (-ve) bacteria with Minimum Inhibitory Concentration (MIC) of 71.55 and 86.4 µg/ml respectively against *K.pneumoniae* and *P.aeruginosa* (Zare-Shehneh *et al.*, 2014). The Total Phenolic Content (TPC) in coriander leaves was found to be 1.12 mg GAE/100ml. The phenolic compounds are beneficial against chronic diseases (Forester and Warehouse, 2009). Such beneficial effects of coriander are due to the anti-radical and anti-oxidant properties of its phenolic compounds (Lurton, 2013). The anti-oxidant assays found to be in coriander leaves is 26.82%.

### Anti-oxidant properties of coriander

Coriander like all other spices inhibits anti-oxidant properties which increases the shelf-life of food. The radical scavenging activity (RSA) of coriander seed essential oil (CSEO) (500 µg) was 66.48% while that of coriander leaves essential oil was 56.73% (Shahwar *et al.*, 2012). (Sriti *et al.*, 2011) reported that the RSA of the methanolic extracts of coriander leaves was higher than the synthetic anti-oxidants frequently used in industries, i.e., BHA and BHT. The CSEO and CLEO can be used as a natural source of anti-oxidants in lipid-containing food as well (Ramadan *et al.*, 2003). The extracts possessing a high level of amino acids can be used to prevent oxidative

deterioration of food (Wangensteen *et al.*, 2004).

### Food preservation and anti-spoilage

The oxidation of lipids causes rancidity which is characterized by off-odour, unpleasant taste and also changes the nutritional value of the food (Iqbal-Bhanger *et al.*, 2008). BHA and BHT are used as antioxidants to prevent oxidation (Reddy *et al.*, 2005) but they have been reported for their carcinogenic properties and causes serious illness like liver damage (Nanditha *et al.*, 2008). *C. sativum* possess excellent anti-microbial, anti-fungal, and anti-oxidant properties. EO plays a great role in food preservation. *C. sativum* is stable at high temperatures and can be used as a substitute for BHA and BHT. An Italian processed food, Salami, with coriander essential oil, remained stable during the entire period of storage maintain Peroxide Value and TBARS value as compared to product without coriander essential oil, the coriander essential oil had a stronger effect on the product as compared to BHT on retardation of lipid oxidation and thus increasing the shelf life (Marangoni *et al.*, 2011).

### Cumin

The most common spice cumin belongs to the Apiaceae family and is used as a flavouring agent in many cuisines. Spices have been proven to be an evergreen source of anti-oxidants, anti-microbial and for their medicinal value (Raghavan, 2007). The tremendous anti-microbial properties of cumin have been well known since ancient times. Researches have concluded that the seed extracts inhibit the growth of *E. coli*, *B. subtilis*, *S. feacalis* (Saxena and Vyas, 1986).

### Anti-oxidant properties of cumin

Spices are most popularly known for their anti-oxidant properties. Studies reveal that the methanolic extracts of cumin showed higher

anti-oxidant properties as compared to the aqueous extracts (Thipperswamy and Naidu, 2005).

The anti-oxidant and phenolic compounds vary in cumin according to the maturity of the seeds. The Radical Scavenging Activity (RSA) of the cumin's essential oil showed greater value than BHA and BHT at a concentration of 240µg/ml the inhibition percentage reached 85.4%, this might be due to the presence of antioxidant compounds present in cumin such as cuminal, γ-terpinene, pinocarveol, earatol and linalool (El-Ghorab *et al.*, 2010; Rahman *et al.*, 2015).

Depending upon the solvent used for extraction, the Total Phenolic Compounds (TPC) in cumin seeds varies from 9 to 35.3 mg of gallic acid per gram of the dry weight (mg of GAE/gm of dry weight) while the Total Flavonoid Content (TFC) in cumin varies from 0.4 to 5.6 mg catechin equivalent per gram of the dry weight (mg of CE/gm of the dry weight). The percent antioxidant activity at different time periods for cumin, BHA and BHT were as follows (Sayed-Ahmad, B. *et al.*, 2017):

Antioxidant Agent	% Inhibition			
	30 min	60 min	90 min	120 min
<b>Cumin</b>	9.27 ±0.2	36.67± 0.2	36.5± 0.46	50.13± 0.4
<b>BHT (1mM)</b>	12.67± 0.18	35.12± 0.28	33.60± 0.21	49.90± 0.49
<b>BHA (1mM)</b>	21.77± 0.28	41.99± 0.28	42.95± 0.25	57.72± 0.32

The phenol component of cumin essential oil was reported to be 0.21± 0.01 µg of GAE/mg (Milan *et al.*, 2008) while the total phenolic content of cumin reported being 75±1 µg GAE/mg extract solids (Ho *et al.*, 2008).

## The anti-bacterial effect of cumin

The anti-bacterial effect of cumin extract was analyzed against some food spoilage pathogens, *E. coli*, *S. aureus*, and *S. faecalis* while *Pseudomonas* and *Klebsiella* species were resistant against cumin extract. After analyzing the complete death time on the exposure of cumin oil on *E. coli*, *S. aureus* and *S. faecalis* for 30, 90 and 120 minutes respectively it was concluded that *E. coli* is the most pregnable micro-organism and *S. faecalis* is least pregnable. After determining the minimal inhibition concentration (MIC) and minimal bactericidal concentration (MBC), it was observed that *E. coli* is the most sensitive micro-organism with the lowest MBC value (1µl/ml). Greater the ratio of the duration of time (min) to the zone inhibition (mm), greater is the resistance of the micro-organism to the lethal effect of the cumin extract.

In conclusion, talking about the health of people today, suffering from various diseases like hypertension, diabetes, gastrointestinal disorders, thyroid, etc. that are more inclined toward the chemically processed food, makes it a concern for the food industry for their use of synthetic and artificially produced products. Ready to drink beverages are a high source of energy, minerals, and vitamins, they are highly refreshing. Drinks infused with herbal extracts and natural products are highly replenishing, source of anti-oxidants and many essential oils. This paper shows that the final RTD comprising of coconut water, coriander extract, and cumin would prove to be efficiently effective to health by possessing anti-bacterial properties, anti-oxidant properties and a source of a number of vitamins and minerals. RTD beverages with other herbal extracts and the use of natural products will provide the food industry and beverage industry with new possibilities.

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