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Azhagiamandapam, Thiruvithancode, Kanyakumari District, Tamil Nadu, S. India - 629 174.

PG & RESEARCH DEPARTMENT OF NUTRITION AND DIETETICS

National Seminar on

RECENT TRENDS IN NUTRITIONAL SECTOR

NUTRISECTOR-2K23



This is to certify that Dr. / Mr. / Mrs. / Ms.

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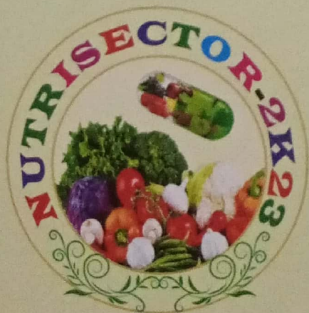
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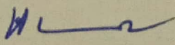
KOMBUCHA - A PROBIOTIC FUNCTIONAL FOOD and

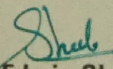
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RECENT TRENDS IN NUTRITIONAL SECTOR

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EDITOR

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NUTRITIONAL AND PHYTOCHEMICAL ANALYSIS OF KOMBUCHA –A PROBIOTIC FUNCTIONAL FOOD

T. Sherin Mary*, Azna.S** & Nazeema Beevi.M***

*Assistant Professor, PG & Research Department of Nutrition and Dietetics, Muslim Arts College, Thiruvithancode, Affiliated to Manomanium Sundaranar University, Tirunelveli
** & ***I M.Sc Students, PG & Research Department of Nutrition and Dietetics, Muslim Arts College, Thiruvithancode, Affiliated to Manomanium Sundaranar University, Tirunelveli

Abstract

In this busy world of junk food the value of medicinal based products now has a greater impact to the society. Kombucha is an ancient medicinal beverage which is now one of the rising marketing products in the United States as a part of Global functional beverage. Kombucha (kombu-seaweed, cha-tea) is nothing but a fermented beverage (an ancient probiotic) consisting of black or green tea which is a substratum and by providing excessive sugar, it prompts a synergistic relationship between bacteria and yeast, later resulting in the formation of a zoogloal matrix. It was once considered as a controversial topic due to the side effects caused by consuming kombucha but now, it is weighed as a topic of research due to some hidden beneficial health effects. In the present study Kombucha was prepared using standard procedure. Phytochemical analysis of Kombucha revealed the presence of phenols and flavonoids. Nutrients such as vitamin C, carbohydrate, sodium, potassium, phosphorus and iron were analysed. Sensory evaluation of Kombucha was done by 20 selected panel members using a score card. The keeping quality of Kombucha was also done to find out its storage behaviour.

Keywords: kombucha, substratum, zoogloal

Introduction

All foods are essentially functional to a certain level because they provide the energy and nutrients needed to maintain life. However, there is evidence of the existence of bioactive food components that are not considered nutrients but can provide beneficial health effects (Crowe & Francis, 2013; Kaur & Singh, 2017; Shimizu, 2012; Tur & Bibiloni, 2016). Functional foods are those that have scientifically proven their beneficial effects in the organism, in one or more of its functions, providing optimal health and well-being, regardless of their nutritional value (Kaur & Singh, 2017).

Kombucha tea is a non-alcoholic, naturally carbonated beverage prepared by fermenting a solution of sweetened tea with a kombucha culture

containing bacteria and yeast. It is believed to have originated in North East China over 2000 years ago, with the consumption of kombucha first recorded in 220 BC in Manchuria (Soares *et al.*, 2021). Following this, it is reported to have travelled to Russia and Eastern Europe in the 1800s and beyond this to Western Europe and North Africa during World War II (Greenwalt *et al.*, 2000). Kombucha is known by several names including haipao, teakwass, tea fungus, Manchurian mushroom and kombucha (Kim *et al.*, 2020).

According to food microbiologist kombucha is described as one the most ancient probiotic drink due to its unique symbiotic relationship between few strains of yeast and acetic acid bacteria which are so-called "friendly microorganism" that keeps the gut healthy. It is formed by the fermentation of black tea. Green, Oolong tea is also preferred and by providing sucrose leads to the formation of a thin biofilm (Leal *et al.*, 2018). The term kombucha, scientifically referred as *Medusomyces gisevii* primarily derived from the Japanese letter meaning "kelp tea" (Ernst, 2012). The most abundantly found bacteria in kombucha is *Acetobacter xylinum*, and in case of yeast *Kloeckera* spp., *Schizosaccharomyces pombe*. (Watawana *et al.* 2015) Yeasts that are present in the zoogloeal mat utilize sucrose to produce alcohol, an energy source for bacteria and convert it into acetic acid and gluconic acid that shields the yeast from contaminating microorganisms.

The fermentation and oxidation process starts, when the tea fungus is placed in a freshly prepared infusion of tea and sugar. When grown in sucrose medium, colonies of yeast break the sucrose in glucose and fructose, then produce carbon dioxide and ethanol, which are oxidized to acetaldehyde by bacteria of the colonies. The tea fungus produces many other substances, like gluconic acid and vitamins, which with the supply of tea nutrients, give the drink its unusual flavor and healing properties. The glucose is polymerized and produces cellulose and hemicellulose (Greenwalt *et al.*, 1998; Bauer-Petrovska and Petrushevska-Tozi, 2000). A wide range of flavor compounds, including alcohols, aldehydes, ketones, esters and amino acids have been identified from fermented broth (Teoh *et al.*, 2004).

Kombucha may contribute to the reduction of health disorders such as cancer, cardiovascular diseases, and neuro degenerative diseases. In general, Kombucha show positive effect on digestion and intestinal microbiota, relief against arthritis, possess antimicrobial activity, relief against hemorrhoids, detoxify body, show hepatoprotective effect, as well as reduce insomnia, relieve headaches, and positively impact a mood (Ahmed *et al.*, 2020). Chemical assays of kombucha beverage have indicated the presence of a variety of compounds, including organic acids, mainly acetic, gluconic, and glucuronic acid (GlcUA), citric, L-lactic, malic, tartaric, malonic, oxalic, succinic, pyruvic, and usnic acids may also be found; sugars (sucrose, glucose, and fructose), water soluble vitamins (B1, B2, B6, B12, C), amino acids, biogenic amines, purines, pigments, lipids, proteins, hydrolytic enzymes, ethanol, acetic acid bacteria and lactic acid bacteria, carbon dioxide,

polyphenols, minerals (manganese, iron, nickel, copper, zinc, plumb, cobalt, chromium, and cadmium), anions (fluoride, chloride, bromide, iodide, nitrate, phosphate, and sulphate), Disaccharic acid-1,4-lactone (DSL), and metabolic products of yeasts and bacteria (Jayabalan, Malbaša, *et al.*, 2014, Jayabalan, Malini, *et al.* 2010).

Materials and Methods

Selection of topic: The purpose of selecting this topic is nowadays probiotic foods play a major role in human wellbeing. Kombucha is a probiotic food and so to give awareness about its importance and health benefits to the public it was selected as the topic.

Collection of sample: The sample used for the study was Green tea. The sample and other ingredients were purchased from the nearby super market, Neyyattinkara.

Formulation of the product:

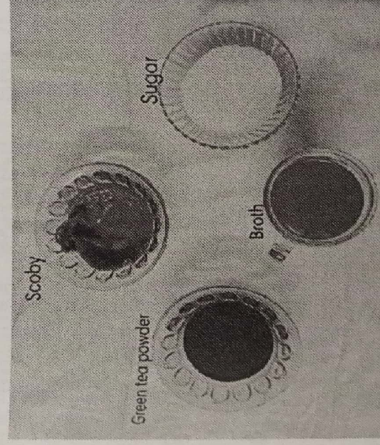
Green tea was selected for the preparation of kombucha. The kombucha was prepared using the following procedure.

Kombucha

Ingredients:

Green tea	-	2 tablespoons
Sugar	-	14 gm
Scoby	-	1
Water	-	500 ml

Ingredients



Kombucha



Procedure: Green tea was prepared by adding of green tea powder to distilled water and boiled for 5 minutes. It was then steeped for 20 minutes, filtered through a sterile sieve and poured into a sterile 1litre glass beaker. After cooling, sugar was added into the tea and the tea solution was then inoculated with a portion of freshly grown Kombucha biofilm. The beaker was then covered with sterile cheese cloth and secured properly and harvested after 20 days.



Phytochemical analysis

Qualitative phytochemical analysis: Qualitative analysis of the major constituents present in kombucha was determined using standard procedures. Phytochemicals such as phenols and flavonoids were analysed.

Quantitative Analysis: The phytochemicals which showed positive in qualitative analysis were subjected to quantitative analysis. Qualitative analysis showed the presence of phenols and flavonoids.

Nutritional analysis: The nutrients present in Kombucha such as vitamin C, carbohydrate, sodium, potassium, calcium, iron and phosphorus were analyzed.

Sensory evaluation: Kombucha was subjected to sensory analysis to find out its acceptability. The formulated products were organoleptically evaluated using a numerical score card. Sensory assessment was done on the quality description such as appearance, texture, taste, flavour, colour and overall acceptability. The sensory evaluation was carried out for Kombucha in three forms Kombucha concentrated, Kombucha mixed with honey and Kombucha mixed with jaggery. The products were evaluated by a panel of 20 semi trained panel members from the Department of Nutrition and Dietetics, Muslim Arts College, Thiruvithancode, Kanyakumari District.

Keeping quality: Keeping quality was done to find out the storage behaviour of the product they were kept both in room temperature and refrigerated storage for 2 months. They were examined microbial and organoleptically once in a week for a period of 30 days to find out the growth of microbes, off flavour and production of gases.

Statistical analysis: Statistical analysis such as arithmetic mean and percentage analysis were done for analyzing the data.

Result:

Characterization of phytochemical from kombucha

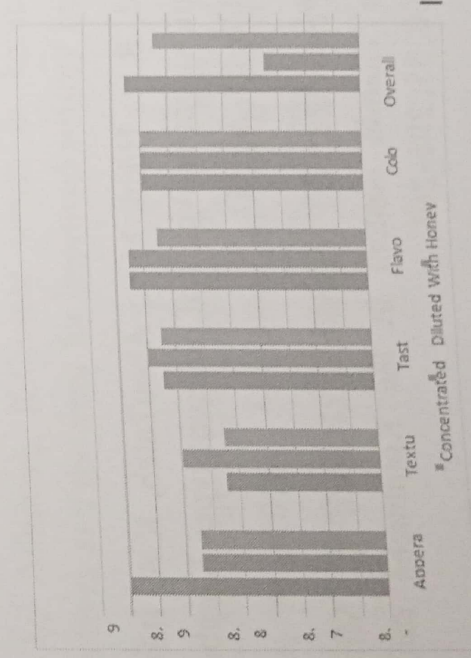
Test	Sample
Phenol	+
Flavonoids	+

Quantitative phytochemical analysis: The phenol content of kombucha is 95 µg/mg of sample at 1.256 OD at 750 nm. The flavonoid content of kombucha is 7.1 µg/ml of sample at 0.043 OD at 510 nm.

Nutrient analysis:

Nutrients	Amount µg/ppm/mg/ml
Carbohydrate	348.52
Vitamin C	15.06
Iron	0.003
Calcium	295.14
Phosphorus	13.36
Sodium	15.31
Potassium	99.87

Sensory evaluation:



Keeping Quality

The formulated Kombucha was kept in air tight container and stored both in room temperature and refrigerator storage and their behavior was studied. It was checked once in 15 days for a period of 30 days. It was stored for more than 30 days without any growth of microorganisms, development of off flavors and production of gas both in refrigerated storage and room storage.

Conclusion

Kombucha is a beverage traditionally obtained by the Fermentation technique of *C. sinensis* tea, with sugar, added by a scoby. Due to its supposed health benefits, this drink has gained popularity and has been perpetuated in several countries, and is currently consumed and sold worldwide. In addition to *C. sinensis*, the use of herbal infusions, coffee, fruit juices, milk, and soy, associated or not with green or black tea for fermentation with kombucha culture has also been reported. Kombucha can be considered a potentially expanding product for use and applications in food industries, which makes research on this product even more important. It is concluded that kombucha is very rich in Phytochemicals and Nutrients that are very active in exerting various health benefits from some pathogens and disease. This could be attributed to the fact that high amount of Phenol and Flavonoids compounds and Carbohydrate, Vitamin C, Iron, Calcium, Phosphorous, Sodium, Potassium were recorded in the sample. Further work is required to establish a component in phytochemical that might have contributed to high health benefits so far observed.

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