KOMBUCHA AND ITS THERAPEUTIC EFFECTS - A REVIEW

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ABSTRACT

Kombucha is a beverage made by fermenting tea (Camellia sinensis) that has been cultured with the SCOBY strain of bacteria and yeast. The ingredients used to make the traditional beverage or even different ones that give it a unique character; chemical and microbiological composition and variations; the traits, the potential advantages associated with Kombucha consumption. To comprehend the significance of Kombucha Tea's impacts on health intricate mechanisms that promote health are summarized.

KEYWORDS: Kombucha, SCOBY, Fermentation, Therapeutic effects, Health.

INTRODUCTION

The development and application of technology in contemporary medicine are evidence that people are continuously looking for ways to enhance their general health and well-being. In recent times, scientific societies and public demand have been furnishing a new definition of beverages. More number of information’s has been published concerning the effects of tea and its major constituents on human health.

Tea was primarily introduced in the European countries from China by Portuguese and Dutch explorers as a medicinal herb. This Kombucha tea beverage has been consumed in many countries for a very long time, whereas the interest towards KT is growing because scientific reports indicate that tea could bring benefits for health and may help prevent chronic diseases. (Hollman, et al., 1996). Tea is the second most popular beverage in the world after water (Yang &Wang, 1993).

Kombucha beverage is a naturally fermented beverage that is acquired from sugary tea with a dependent Symbiotic Culture of Bacterium and Yeast (SCOBY) C. (M. Hasler and A. C. Brown,2009) via a fermentation process usually lasting for 7–10 days. Kombucha, one of the popular drinks of recent years, is a fermented product that first became widespread in China, traditionally using black or green tea [Camellia sinensis (L.)] as substrates. When it started to become popular in Japan, it was named "kombucha" and created with the combination of the word "kombu" and "cha", meaning algae and tea, respectively. Kombucha found non-alcoholic and low-alcohol versions (less than 0.5% (v/v) of alcohol) on the market, or even alcoholic versions (Nummer, 2013). In the current commercial market, Kombucha is sold as a tea-type beverage (Oz H.S et. al., 2017),

The consortium is a symbiotic system of viable yeasts (such as Saccharomyces cerevisiae, S.ludwigii, S. apiculate, Schizosaccharomyces pombe, Torulosporadelbrueckii, Brettanomyces bruxellensis, B.lambicus, B. custerii, Candida krusei, C. albicans, Zygosaccharomyces bailii, Z.rouxii, Z. kombuchaensis, Kluyveromyces africanus, Pichia membranaefaciens, P.fermantans, Kloeckeraapiculata, Torulopsis sp., Dekkera sp.) and acetic acid bacteria (Acetobacter xylinum, A.xylinoides, A. ketogenum, A. suboxydans, A. pasteurianus, A. aceti, A. acetiformis, Gluconobacterliquefaciens, G.oxydans, Bacterium gluconicum,) which varies depending on the climatic and geographic conditions (Velic´anskiet al.2013; De Filippiset al. 2018)

Kombucha contains different chemical components such as metallic elements (e.g., Fe, Mn, Ni, Cu, and Zn); carbon dioxide; organic food acids; polyphenols; many water-soluble vitamins like vitamin C; amino acids such as lysine; fiber; sugars; antibiotic substances; different types of vitamin B; hydrolytic enzymes; and ethanol. Several benefits, such as antioxidant activity and anti-inflammatory potential, make Kombucha popular as a functional beverage or food (S. A. Villarreal‐Soto, et al., 2018)

The type of tea used and the conditions during the fermentation determines the chemical composition of kombucha. The health benefits of different tea leaves are attributed to their high content of phenolic which has been described as a potent antioxidant. (Cardoso et al. 2020).

Kombucha has the potential to improve gut health as a probiotic drink. Probiotics are microorganisms that provide health benefits to the host when given in sufficient concentrations (Bergström, H. 2018). Now-a -days the use of raw materials such as coffeeberry, leaves, fruits, milk, vegetables, by-products as an alternative for the fermentation process of Kombucha has been proposed by researchers.

KOMBUCHA AS A PROBIOTIC

Kombucha is a fermented beverage that is popular among traditionally fermented foods (Villarreal-Soto, et al., 2018). A symbiotic relationship between bacteria and yeast, as well as their effect on the human microbiota of kombucha, has to be validated. (Reva et al., 2015)

ANTIDIABETIC

Antioxidant-rich foods have been researched as a defense against diabetic oxidative stress, and it has been found that some antioxidants are crucial in the reduction of oxidative stress in diabetes mellitus (B A Nummer, 2013).

The pancreatic, renal, cardiac, and hepatic tissues of diabetic animals were found to contain higher levels of glutathione, lipid peroxidation end products, protein carbonyl content, and antioxidant enzyme activities after kombucha tea administration (Chakravorty et al., 2019). According to Chakravorty et al. (2016), it was also discovered that KT's antiglycation activity increased with fermentation time.

HEPATOPROTECTIVE

Hepatoprotection is the ability to prevent damage occurring to the liver by toxic substances. Studies relevant to the cell lines and animal models represents that the hepatoprotective activity of Kombucha Tea against several environmental pollutants and toxins such as carbon tetrachloride cadmium chloride, TBHP (tertiary butyl hydroperoxide), trichloroethylene, acetaminophen, aflatoxin B1 (Jayabalanet al., 2010), and paracetamol (Pauline et al., 2001).

The harmful effects of these liver toxins can be effectively mitigated by kombucha tea. According to Dufresne and Farnworth (2000), the enzymes, bacterial acids, and other secondary metabolites created by the microorganisms during the fermentation of Kombucha have the power to detoxify the body. According to studies, the presence of glucuronic acid, which can bind to liver toxins and encourage their removal from the body, is primarily responsible for the detoxifying properties of kombucha tea (Nguyen et al., 2014).

ANTIBACTERIAL

Kombucha tea has been classified as an antimicrobial source and many researchers have studied its inhibitory capacity against various pathogenic microorganisms. Studies have shown increased antibacterial action against both Gram-positive and Gram-negative bacteria, including Escherichia coli, Salmonella choleraesuis serotype typhimurium, and Agrobacterium tumefaciens. Gram-positive bacteria include Staphylococcus aureus and Bacillus cereus. Green tea has the highest antimicrobial potentia when it comes to combating a variety of human pathogenic microorganisms, including Gram-positive Staphylococcus epidermidis, S. aureus, Micrococcus luteus, and Listeria monocytogenes, as well as Gram-negative E. coli, P. aeruginosa, S. Typhimurium (LT2), and KT. Kombu tea is made by fermenting both black and green tea for 21 days. (Chou et.al., 1999).

ANTIFUNGAL

According to Sreeramuluet al. (2001), KT made from black tea has an inhibitory effect on Candida albicans but not Z. bailii. According to Chou et al. (1999), KT from both green and black tea fermented for 21 days reduced the growth of Candida krusei as well as Candida albicans, Candida tropicalis, Candida parapsilosis, Candida glabrata, Candida dubliniensis, and Candida sake.

ANTIINFLAMMATORY

Male Sprague-Dawley albino rats treated with chromate (VI) showed markedly increased oxidative stress in response to KT produced from black tea fermentation. Dawley albino rats increase levels of antioxidant enzymes implicated in glutathione depletion and increase glutathione peroxidase activity while decreasing lipid peroxidation (MDA levels) and DNA damage (Dipti et al., 2003). In male albino rats, KT derived from black tea also had a protective effect against nephrotoxicity produced by trichloroethylene (Gharib, 2009). KT's numerous phenolic components and flavonoids are primarily responsible for its anti-inflammatory properties (Banerjee et al., 2010; Tamer et al., 2021).

ANTICANCER

Kombucha Tea purported anticancer properties have been supported by testimonials and observations. According to a recent study, lyophilized KT extract made from fermented black tea significantly decreased the survival of the prostate cancer cell line PC-3 by lowering the expression of factors that stimulate angiogenesis, including human inducible factor-l α, cyclooxygenase-2, matrix metalloproteinase, endothelial growth factor, and interleukin-8 (E. Zubaidah et al., 2019). As a result, KT can change how different angiogenic stimulators are expressed, which will limit angiogenesis (Srihari et al., 2013). The anticancer qualities of Kombucha Tea may be attributed to the presence of numerous substances like polyphenols, glucuronic acid, gluconic acid, lactic acid, vitamins such (vitamin C), and d-saccharic acid-1,4-lactone (DSL) (Sinir, G. et al., 2019).

OTHER THERAPEUTIC PROPERTIES

The fermented beverage known as KT is thought to have other medicinal properties in addition to the formerly outlined health benefits. It has been suggested that KT consumption provides anti-stress benefits (Pauline et al., 2001). According to Yang et al. (2009), KT was also discovered to have hypocholesterolemic effects since it was able to reduce low-density lipoprotein (LDL) and total cholesterol in hypercholesterolemic mice. In the small intestine, KT can block the action of pancreatic alpha-amylase, which aids in the breakdown of starch and the absorption of net glucose. Specifically, the entirety of the evidence validated KT's health benefits and established its status as a functional food. (Chakravorty et al., 2019).

Conclusion

Kombucha has received more recognition across the globe due to its health benefits, which may be easily acquired on the market or homemade. Different tea sugar concentrations, SCOBY strains, and a range of temperatures and weather patterns can be used to make the beverage, resulting in Kombucha with a variety of properties. Kombucha Tea procedure differences suggest the chemical and microbial makeup, determining the beverage's useful characteristics. No systematic human trials employing Kombucha tea have been done, according to the literature. The establishment of this beverage as a functional food may require further study in this area. Although there are a few safety concerns, the safe manufacturing and consumption of this beverage can support its claim to be a carbonated beverage substitute.

Reference

Banerjee, D.; Hassarajani, S.A.; Maity, B.; Narayan, G.; Bandyopadhya, S.K.; Chattopadhyay, S. Comparative healing property of kombucha tea and black tea against indomethacin-induced gastric ulceration in mice: Possible mechanism of action. J. Funct. Foods 2010, 1, 284–293.

Bergstrom, H., (2018). The effect of the fermented tea beverage kombucha on the gut microflora, a double-blind placebo-controlled study.(2018) KLGM10 20181. Retrieved from https://lup.lub.lu.se/student-papers/search/publication/8954225.

C. M. Hasler and A. C. Brown, "Position of the American Dietetic Association: functional foods," Journal of the American Dietetic Association, vol. 109, no. 4, pp. 735–746, 2009.

Cardoso, R.R.; Neto, R.O.; Dos Santos D'Almeida, C.T.; Nascimento, T.; Pressete, C.G.; Azevedo, L.; Martino, H.S.D.; Cameron, L.C.; Ferreira, M.S.L.; de Barros, F.A.R. Kombuchas from green and black teas have different phenolic profile, which impacts their antioxidant capacities, antibacterial and antiproliferative activities. (2020) Food Res. Int., 128, 108782

Chakravorty S, Bhattacharya S, Chatzinotas A, Chakraborty W, Bhattacharya D, Gachhui R (2016) Kombucha tea fermentation: microbial and biochemical dynamics. Int J Food Microbiology 220:63–72.

Chakravorty, S., Bhattacharya, S., Bhattacharya, D., Sarkar, S., & Gachhui, R. (2019). Kombucha: a promising functional beverage prepared from tea. In Non-alcoholic beverages (pp. 285-327). Woodhead Publishing.

Chou, C. C., Lin, L. L., & Chung, K. T. (1999). The antimicrobial activity of tea is affected by the degree of fermentation and manufacturing season. International journal of food microbiology, 48(2), 125-130.

De Filippis F, Troise AD, Vitaglione P, Ercolini D (2018) Different temperatures select distinctive acetic acid bacteria species and promote organic acids production during kombucha tea fermentation. Food Microbiol 73:11–16.

Dipti, P., Yogesh, B., Kain, A. K., Pauline, T., Anju, B., Sairam, M., ... & Selvamurthy, W. (2003). Lead induced oxidative stress: beneficial effects of Kombucha tea. Biomedical and environmental sciences: BES, 16(3), 276-282.

E. Zubaidah, C. A. Afghani, U. Kalsum, I. Srianta, and P. J. Blanc, "Comparison of in vivo antidiabetes activity of snake fruit Kombucha, black tea Kombucha, and metformin," Biocatalysis and Agricultural Biotechnology, vol. 17, pp. 465–469, 2019.

Gharib, O. A. (2009). Effects of Kombucha on oxidative stress induced nephrotoxicity in rats. Chinese Medicine, 4, 1-6.

Hollman, P. C. H., Hertog, M. G. L., & Katan, M. B. (1996). Analysis and health effects of flavonoids. Food Chemistry, 57, 43±46.

I.Shahzadi, R. Nadeem, M.A. Hanif, S. Mumtaz, M.I. Jilani, S. Nisar. (2017). Chemistry and biosynthesis pathways of plant oleoresins: Important drug sources. International Journal of Chemical and Biochemical Sciences. 12: 18-52.

Nguyen, N.K.; Nguyen, P.B.; Nguyen, H.T.; Le, P.H. Screening the optimal ratio of symbiosis between isolated yeast and acetic acid bacteria strain from traditional kombucha for high-level production of glucuronic acid. LWT 2015, 64, 1149–1155.

Nummer BA. Kombucha brewing under the Food and Drug Administration model Food Code: risk analysis and processing guidance. J Environ Health. 2013 Nov;76(4):8-11. PMID: 24341155. nutraceuticals for human health. Med. Hypoth. 67:833–838

Dufresne, C.; Farnworth, E. Tea, Kombucha, and health. Food Res. Int. 2000, 33, 409–421.

Oz, H.S., 2017. Chronic inflammatory diseases and green tea polyphenols. Nutrients 9, 561.

Pauline, T., Dipti, P., Anju, B., Kavimani, S., Sharma, S. K., Kain, A. K., ... and Selvamurthy, W. (2001). Studies on toxicity, anti-stress, and hepato-protective properties of Kombucha tea. Biomedical and Environmental Sciences: BES, 14(3), 207-213.

Reva, O. N., Zaets, I. E., Ovcharenko, L. P., Kukharenko, O. E., Shpylova, S. P., Podolich, O. 714 V., de Vera, J. P., &Kozyrovska, N. O. Metabarcoding of the kombucha microbial community 715 grown in different microenvironments. AMB Express 5, 1-8 (2015).

S. A. Villarreal‐Soto, S. Beaufort, J. Bouajila, J.-P. Souchard, and P. Taillandier, "Understanding kombucha tea fermentation: a review," Journal of Food Science, vol. 83, no. 3, pp. 580–588, 2018.

Sinir, G. Ö., Tamer, C. E., & Suna, S. (2019). Kombucha tea: A promising fermented functional beverage. In Fermented Beverages (pp. 401-432). Woodhead Publishing.

Sreeramulu, G., Zhu, Y., & Knol, W. (2000). Kombucha fermentation and its antimicrobial activity. Journal of agricultural and food chemistry, 48(6), 2589-2594.

Srihari, T., Karthikesan, K., Ashokkumar, N., & Satyanarayana, U. (2013). Antihyperglycaemic efficacy of kombucha in streptozotocin-induced rats. Journal of Functional Foods, 5(4), 1794-1802.

Srihari, T., Karthikesan, K., Ashokkumar, N., & Satyanarayana, U. (2013). Antihyperglycaemic efficacy of kombucha in streptozotocin-induced rats. Journal of Functional Foods, 5(4), 1794-1802.

Tamer, C. E., TEMEL, Ş. G., Suna, S., Karabacak, A. Ö., Özcan, T., Ersan, L. Y., and ÇOPUR, Ö. U. (2021). Evaluation of bioaccessibility and functional properties of kombucha beverages fortified with different medicinal plant extracts. Turkish Journal of Agriculture and Forestry, 45(1), 13-32.

Velic´anski SA, Cvetkovic D, Markov S (2013) Characteristics of kombucha fermentation on medicinal herbs from Lamiaceae family. Rom Biotechnol Lett 18:8034–8042.

Yang, C. S., & Wang, Z.-Y. (1993). Tea and cancer: review. Journal of the National Cancer Institute, 85, 1038±1049.

Yang, J., Martinson, T. E. and Liu, R. H. (2009). Phytochemical profiles and antioxidant activities of wine grapes. Food Chem. 116:332–339.