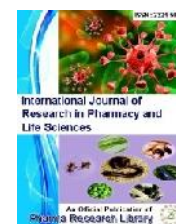




International Journal of Research in Pharmacy and Life Sciences

Journal Home Page: www.pharmaresearchlibrary.com/ijrpls



Review Article

Open Access

Incredibility of Revitalizing Kombucha Tea for Fascinating Hilarity & Vivacious Demeanor

Bina Rani¹, Upma Singh², Piyush Panwar³, Raaz K Maheshwari*⁴

¹Department of Engineering Chemistry & Environmental Engineering, Poornima College of Engineering, Sitapura, Jaipur, Rajasthan, India

²Department of Applied Chemistry, School of Vocational Studies & Applied Sciences, Gautam Buddha University, Greater Noida, UP, India

³Department of Biotechnology, University of Rajasthan, Jaipur, Rajasthan, India

⁴Department of Chemistry, MDSU's Govt PG College, Nagaur, Rajasthan, India

ABSTRACT

Kombucha is a beverage packed with mineral-replenishing electrolytes. It's an energizing tonic, which makes it a healthy alternative to popular drinks that are often packed with caffeine and refined sugar. Kombucha contains regenerative enzymes, bacteria and organic macromolecules that support intestinal flora stimulate the immune system and balance the endocrine system. This supports and increases the body's natural ability to heal itself. It's to be the secret to longevity, health, merriment and virility. It aids strengthening the immune system; cell detoxification, balance of the intestinal flora. All of which can help with: digestive problems (including obesity and lack of appetite), pH-balance, high blood-pressure; rheumatism and arthritis; stress (work-related & other), chronic fatigue syndrome, insomnia, psoriasis, eczema, allergies, abscesses, ulcers, hair-loss; PMS (pre-menstrual syndrome) and irritability! The Kombucha culture is a mix of a variety of yeasts (similar to those used in beer) and bacteria (similar to those used in yogurt) and a gelatinous cake called the symbiot. This culture acts like a veritable biochemical storehouse, transforming simple sugars into a multitude of highly beneficial substances viz. several types of enzymes and good bacteria; organic acids (acetic, lactic, D-gluconic, citric, usnic, malic, butyric, oxalic and some others); vitamins C, B1, B2, B3, B6, B12, amino acids; antioxidants, polyphenols, and < 0.5 % alcohol.

Keywords: *Scoby, Fermentation, Osmophilic yeast strains, Gluconic acid, Prebiotics, AAB, Antioxidants, Polyphenols*

ARTICLE INFO

CONTENTS

1. Introduction	297
2. Probiotic Content	299
3. Preparation Mode	299
4. Conclusion	300
5. References	300

Article History: Received 09 October 2014, Accepted 2 December 2014

*Corresponding Author

Dr Raaz K Maheshwari
Department of Chemistry,
MDSU's Govt. PG College,
Nagaur, Rajasthan, India
Manuscript ID: IJRPLS2365



PAPER-QR CODE

Citation: Bina Rani, et al. Incredibility of Revitalizing Kombucha Tea for Fascinating Hilarity and Vivacious Demeanor. *Int. J. Res. Pharm, L. Sci.*, 2015, 3(1): 296-301.

Copyright© 2015 Bina Rani, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

1. Introduction

Kombucha is an ancient drink, made for centuries and celebrated for its many health benefits. Kombucha can be traced back to ancient China where it was worshipped as a remedy for immortality. According to lore, the beverage was introduced to Japan by a Korean physician named Dr. Kombu around 415 AD who gave the bacteria-laden liquid to a Japanese emperor as a healing tonic. Throughout the years, the “Manchurian” made its way into Russia, Germany, India and other parts of the world propelled by its purported curative properties and mystical appeal. It is said to have originated in China during the Tsin dynasty, where it was nicknamed the “the remedy for immortality.” With the extension of the trade routes it spread to Russia and India through travelers and traders. Kombucha resurfaced in Japan after a Japanese visitor to Kargasok (Russia) found this fermented drink responsible for their astonishing health, longevity and well-being. Kombucha is a fermented drink made with , sugar, bacteria and yeast. Although it's sometimes referred to as kombucha mushroom , kombucha is not a mushroom it's a colony of bacteria and yeast. Kombucha

Kombucha is made from fermented sweet that is usually consumed for its purported health properties. made from a mushroom, but kombucha tea starts with cultured colony of bacteria and yeast that resembles a wide, flat, rubbery fungus. In the kombucha brewing arena, this starter colony is known as "the mother." Adding sugar and green or black tea to the mother, and about a week later the fermented results in a clear, amber, slightly effervescent liquid with a large number of organic acids the American Cancer Society lists ethyl acetate, acetic acid, and lactate -- as well as some B vitamins and alcohol. Some of the positive impacts ascribed to kombucha include improved memory, reduced symptoms and signs of premenstrual syndrome, rheumatism, aging, anorexia, AIDS, cancer and hypertension, and improved T-cell counts, immune system and metabolism. Some of these purported improvements actually might be attributable to the tea that's used for fermentation of the culture, rather than properties of the "mother" itself [1-3].

Kombucha uses a combination of yeast and bacterial cultures to produce an end product that is only slightly alcoholic and mildly acidic. Because most of the alcohol is further fermented into acetic acid, kombucha is considered a non-alcoholic beverage. Many claims regarding kombucha's effect on mental and physical health have been made, although none have been proven scientifically. Many claims surround kombucha's effect on digestive health because of the bacterial and enzyme content. Every batch of kombucha will have a slightly different content, although International Journal of Research in Pharmacy and Life Sciences

is made by adding the colony to sugar and allowing the mix to ferment. The resulting liquid contains vinegar, B vitamins and a number of other chemical compounds. The ingredients used to produce kombucha consist of a probiotic culture, water and sugar (Figure 1).



Figure 1: Refreshing Kombucha

most contain a variety of acids, enzymes, and B vitamins. Kombucha is a sweetened tisane produced through fermentation. Plain kombucha has an acidic, vinegar-like flavor in addition to the original sweet flavor. Kombucha is a naturally carbonated, fermented. While pasteurization and irradiation kill bacteria and yeast, fermentation actually uses live bacteria and yeast, as well as a sugar source, to create its end products, which include naturally fermented sauerkraut, kimchi, sourdough bread, beer and wine, yogurt, and yes, kombucha. Kombucha is not as fermented as wine or beer it only has a tiny percentage (~0.5) of alcohol.

Kombucha contains multiple species of yeast and bacteria along with the organic acids, active enzymes, amino acids, and polyphenols produced by these microbes. The precise quantities vary between samples, but may contain: Acetic acid, ethanol, gluconic acid, glucuronic acid, glycerol, lactic acid, usanic acid and B-vitamins. It was also found that Kombucha contains about 1.51 mg/mL of vitamin C [2-4]. Also known as a SCOBY, for symbiotic colony of bacteria and yeast, the Kombucha culture is a pancake-like mass of probiotics living together in a cellulose matrix. Also called a mushroom, the Kombucha culture ferments over a period of weeks to months, during which time it replicates to produce a daughter mushroom. The daughter can be separated and given away, or it may remain attached to the mother Kombucha and allowed to undergo additional fermentation. The liquid in which Kombucha ferments is a mixture of tea, water and sugar. The may be either green or black , or a mixture of the two.

The should be caffeinated, as the Kombucha derives nourishment from the caffeine. This reduces the amount of caffeine present in the finished brew. As most herbal s are decaffeinated, herbal is not generally used. Sugar is the primary energy source for the Kombucha culture during fermentation. White sugar, preferably organic, is recommended, although brown sugar and molasses may also be used. Due to its antimicrobial properties, honey may harm the culture and is generally not used. During the 2-week period of fermentation, the Kombucha culture metabolizes the sugar to produce a variety of organic acids and CO₂. These provide the carbonation and a tart flavor that many Kombucha aficionados enjoy. The Kombucha beverage contains little sugar, as the sugar is consumed by the fermentation process. The beverage contains some alcohol as a result of fermentation. Longer brew times reduce both the sugar and alcohol content [4]. The drink is fairly acidic with high levels of lactic acid and other acids, so experts advise moderation. Kombucha is a mysterious concoction made of live bacteria and yeast and it's becoming all the rage among the same health-seeking crowd that just last year was guzzling pomegranate and açai berry juices. Some call it “mushroom ,” although there are no real mushrooms in it, just some slimy sludge floating near the bottom of the bottle. Kombucha is the latest elixir to elicit claims of a stunning array of health benefits, everything from improving digestion and immunity to lowering cholesterol and fighting cancer [5-7].

Kombucha helps to relieve PMS. B vitamins help to break down and flush out excess estrogen from the body (a condition called estrogen dominance). This can help to reduce PMS symptoms. Part of the reason for kombucha's shaky claims might be that, like some other nutritional medicinals, it is technically classified as a nutritional supplement. As with any organics, there have been reports of allergic reactions, as well as toxicity to the lungs, liver, and blood clotting factors. Another concern about kombucha is its high potential for contamination with pathogenic micro-organisms such as aspergillus and anthrax. The basic safety questions, such as high contamination risks, are what cause health practitioners to stop short of recommending kombucha , especially for children. Because of the risk for contamination, its acidic nature, its caffeine and alcohol content. If immune support or B vitamin supplementation is the goals, there are safer ways of achieving them. Kombucha generally is not the best for children, especially those younger than 7. A child's digestive system is immature and the acids, sugars, caffeine, alcohols and bacteria found in the various brews may be too much for the young gut to handle. Frequently, too, kombucha is brewed with honey, which should not be given to babies under the age of 12 months due to the botulism risk. The cellulogic pennicle formed by *Acetobactor xylinium* during the fermentation of the beverage has been used as a temporary skin substitute on burns and in other skin injuries. In a recent study, the antibiotic activity of kombucha against *Helicobacter pylori*, *Escherichia coli*, *Staphylococcus aureus* and *Agrobacterium tumefaciens* mainly related to the acetic acid produced

Therapeutic Importance & Health Benefits

Kombucha gets its name from the microorganisms that mingle on top and form a flat, pancake-like structure that resembles a mushroom. The gelatinous, floating pancake is known as a SCOBY (for symbiotic colony of bacteria and yeast). Our immune system is in our gut. Most of us have grown up on antibiotics and other drugs that kill off our beneficial bacteria. Kombucha's fermentation process encourages the growth of beneficial bacteria. One of the main jobs of the good bacteria in your gut is to detoxify. By adding more beneficial bacteria to your gut, you're getting the job done faster. Kombucha promotes detoxification. Regular consumption of kombucha also supports liver function In addition to beneficial bacteria, kombucha contains B vitamins and enzymes. B vitamins provide support for the body's metabolic functions including overall energy, utilization of carbohydrates, heart health, and healthy hair, skin, and nails. Adequate intake of B vitamins can reduce stress, anxiety and depression, boost memory, and relieve PMS. Kombucha is the original energy drink. This is not an artificial jolt of caffeine or sugar but a natural energy booster. Because kombucha helps the body detoxify, there is less burden on your system, and as a result, you get more energy (Fig. 3a,b,c,d). As stated above, kombucha is also rich in B vitamins, which gives the body energy. Enzymes boost metabolism. In addition, all the beneficial bacterial and enzymes in the kombucha help your body work better and take the burden off of its functioning [6-8].

during the fermentaion. [4] The ancient drink ‘Kombucha’ has been prepared since centuries. It originated in China during the reign of the Tsin dynasty. Because of its manifold health benefits it was named the “elixir of life”, meaning the one that elongates life. Later it became popular in Russia and the United States. Kombucha tea has loads of organic acids that improve the functioning of the organs, especially the pancreas, kidneys and liver. Warm kombucha tea should be consumed before bedtime so that it can work its magic overnight. It also contains glucaric acid that helps the immune system fight cancer cells in the body. Once the system is cleansed through frequent urination, the organs can function properly and focus on more important activities. This prepares the body to fight against diseases and infections more effectively. Clogs and blockages are cleared with regular intake of Kombucha tea. This makes the body more active and the metabolic processes in the body are triggered. Glucosamine is one of the main ingredients of Kombucha tea. This is helpful in strengthening the bones and joints. It provides the joints with moisture, flexibility and lubrication, and relieves a person of serious joint problems and inflammation. Weight loss happens in more than one way with the use of Kombucha tea. Firstly, since overall functioning is improved one feels healthier and the effectiveness of exercising is increased. Secondly, it detoxifies the system and burns unhealthy fats. Kombucha tea is a good healer for eczema. It clears the skin internally and relieves it from problems like acne and pimples. The tea makes the skin look younger and brings out an inner glow. Skin problems can also be traced back to stomach problems that

Kombucha tea takes care of. Tea, coffee, sodas and energy drinks are in major demand amongst the youth these days. These are meant to provide an energy boost. Kombucha tea is a natural and safe way to boost up energy levels in the body. It keeps your system energized and active at all times. PMS is common in women during the menstrual period. Kombucha tea benefits in clearing periods and getting rid of these symptoms. For those who take the tea regularly, the symptoms reduce over time. Kombucha tea is very rich in

2. Probiotic Content

Main ingredient found in all fermented foods and beverages are probiotics which are beneficial bacteria necessary for adequate digestion and absorption of nutrients. They are viable microorganisms that improve gut microflora by secreting enzymes, organic acids, vitamins, and nontoxic anti-bacterial substances once ingested. Kombucha also provides a source of prebiotics, which helps fuel the growth of helpful microorganisms in your digestive track. The black and green in kombucha also offers some beneficial antioxidants and polyphenols — although you could get the same with a simple bag. The drinks do contain sugar, but not nearly as much as some sweetened s, fruit drinks and sodas. It's warned about this wonder drink that too much can be toxic for people with weak immune systems. Some reports have linked kombucha with serious complications, including liver damage, toxicity and metabolic acidosis — an abnormal increase of acid levels in body fluids. Other problems can include allergic reactions and nausea. Probiotics have also been shown to improve metabolism and treat antibiotic associated symptoms such as diarrhea. In a recent study, alternative diets such as probiotics, green extract and Kombucha were fed to broiler chickens to measure the effects of growth and immunity. The chickens fed with Kombucha showed an increase in protein digestibility. Conclusively, adding Kombucha (20 % concentration) to wet wheat-based diets improved broiler performance and had a growth-promoting effect. Probiotic

Vitamin B, organic acids, amino acids, active enzymes and polyphenol anti-oxidants. Organic acids like butyric acid, acetic acid, oxalic acid, lactic acid and gluconic acid keep the body fit and active. Kombucha tea, with all its goodness, is light on the stomach and facilitates the digestion of food. It helps release gastric juices that make the work of the stomach easy. In addition, the pro-biotic bacteria and yeast make way to the gut and prevent the buildup of worms and parasites in the stomach [7].

diets also resulted in enhanced growth and performance, but to a lesser extent [6-10].

3. Preparation Mode

Kombucha is the result of a strong symbiotic relationship between bacteria (viz. *Acetobacter xylinum*; *A. xylinoides*; *A. aceti*; *A. pasteurianus*; *Bacterium gluconicum*) and osmophilic yeast strains (*Schizosaccharomyces pombe*; *Saccharomycodes ludwigii*; *Saccharomyces cerevisiae*; *Kloekkera apiculata*, *Zygosaccharomyces bailii*; *Brettanomyces bruxellensis*; *B. lambicus*; *B. custersii*; *Candida sp.* & *Pichia sp.*). Kombucha can be made from any variety of teas, most often black, green, oolong, or yerbe mate. The beverage is sweetened with sugar to provide fuel for fermentation. Honey, which has antimicrobial properties is generally not suitable for making kombucha (Fig. 2a,b,c.). A bacterial "mother," or culture starter, is added to the beverage to begin fermentation. The brew is left to ferment for 1 or 2 weeks, during which time the culture grows and ferments within the liquid. The liquid is then tapped and consumed. The yeast in the culture ferments the sugar into alcohol, which is then further fermented by the bacteria into acetic acid. The alcohol level in kombucha generally stays below 0.5%, which is considered nonalcoholic by beverage standards. The acetic acid production usually keeps the acidity of the beverage around a pH of 3.0 [9-11].



Figure 2a,b,c: Making of Kombucha

The alcohol and pH of kombucha are usually enough to prevent contamination from undesired bacteria, mold, and fungus. If the batch does become contaminated, the beverage as well as the culture starter must be discarded. The bacteria and yeast culture forms a slime-like clump of cellulose within the beverage, which can then be transferred to the new batch of kombucha to continue the fermentation process. These bacterial cellulose clumps can be seen inside

bottles of commercially sold kombucha. Although edible, the slime clump is usually avoided simply because of the undesirable texture. The flavor of kombucha will rely heavily on the type of from which it is made, the type of sugar added to fuel fermentation, and the unique blend of bacterial and yeast cultures (Fig. 4). In general, kombucha is slightly tart from the acetic acid content and tends to be slightly effervescent due to the production of CO₂ during

yeast fermentation. Optimum temperature of a kombucha ferment is 74F - 84 F (21° C – 29° C). Below 70F produces inconsistent brews and diminishes the *Acetobacter*, *Lactobacillus* and some yeasts may thrive even in the Low 60's but the gluconic acid will not be produced. Low

temperatures also give an opportunity for wild and airborne microbes to take hold and alter the ferment. Low temperatures always takes longer and produce a lighter color and taste ferment. Higher temperatures produce faster ferments and a darker thicker taste [8-11].



Figure 3a,b,c,d: Iced Kombucha



Figure 4: Various Types of Kombucha

4. Conclusion

One of kombucha's greatest health benefits is its ability to detox the body. It is rich in many of the enzymes and bacterial acids your body produces and/or uses to detox your system, thus reducing your pancreatic load and easing the burden on your liver. Kombucha is very high in glucaric acid, and recent studies have shown that glucaric acid helps prevent cancer. Kombucha contains glucosamines, a strong preventive and treatment all forms of arthritis. Glucosamines increase synovial hyaluronic acid production. Hyaluronic acid functions physiologically to aid preservation of cartilage structure and prevent arthritic pain, with relief comparable to NSAIDs (non-steroidal anti-inflammatory drugs) and advantage over glucocorticoids. Hyaluronic acid enables connective tissue to bind moisture thousands of times its weight and maintains tissue structure, moisture, lubrication and flexibility and lessens free radical

damage, while associated collagen retards and reduces wrinkles. Probiotics are good for gut, and good for immunity. Kombucha has a strong anti-microbial property along with its antioxidant potential which help to strengthen the organism by the kidney or the liver. Most properties of kombucha are attributed to the acid composition of the beverage. Its detoxifying property is presumably due to the capacity of gluconic acid to bind to toxin molecules and to increase their excretion from the organism by the intestines and in turn by kidneys providing the relief in gout, rheumatism, arthritis and kidney stones. Kombucha has probiotics and enzymes that promote detoxification. Kombucha also contains a risk of contamination since they are most often made in homes rather than in a sterilized environment. Side effects of kombucha include an upset stomach and allergic reactions.

5. References

1. Teoh, Ai Leng TA, Gillian H, Julian C. (2004). Yeast ecology of Kombucha fermentation. *Int. Journal of Food Microbiology* 95 (2): 119–26.
2. Rani B, Singh U, Maheshwari R. (2013). Natural antioxidants and their intrinsic worth for wellbeing. *Global Journal of Medical Research XIII (B-VII):* 54-69.
3. Maheshwari, R. K. and Rani, B. (2013). Augmentation of enzymatic antioxidants *in vitro*. *Bulletin of Environment, Pharmacology & Life Sciences*, 2 (5), pp.101-102.
4. Dufresne C, Farnworth E. (2000). Kombucha, and health: A review. *Food Research International* 33 (6): 409. Doi:10.1016/S0963-9969(00)00067-3.
5. Velicanski, Aleksandra; Cvetkovic, Dragoljub; Markov, Sinisa; Tumbas, Vesna; Savatovic, Sladjana (2007). Antimicrobial and antioxidant activity of lemon balm Kombucha. *Acta periodica technologica* (38): 165–72. Doi:10.2298/APTO738165V.

6. Bauer-Petrovska, Bilijana, Lidija Petrushevska-Tozi. "Mineral and water soluble vitamin content in the Kombucha drink." *International Journal of Food Science & Technology*. 35.2 (2000): 201-05.
7. Hesseltine CW. (1965). A Millennium of Fungi, Food, and Fermentation. *Mycologia* 57 (2): 149–97. Doi:10.2307/3756821.
8. Guttapadu S, Yang Z, Wieger K. (2000). Kombucha Fermentation and Its Antimicrobial Activity. *Journal of Agricultural and Food Chemistry* 48 (6): 2589–94. Doi:10.1021/jf991333m.
9. Guttapadu S, Zhu Y, Knol W. "Kombucha Fermentation and Its Antimicrobial Activity." *J. Agric. Food Chem* 48 (2000): 2589-594.
10. Nguyen, Vu Tuan; Flanagan, Bernadine; Gidley, Michael J.; Dykes, Gary A. (2008). Characterization of Cellulose Production by a *Gluconacetobacter xylinus* Strain from Kombucha. *Current Microbiology* 57 (5): 449–53. Doi:10.1007/s00284-008-9228-3.
11. Pal S. (2014). Kambucha – The Magical Drink. *Science Reporter* 10:11.