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CHEMICAL AND FUNCTIONAL PROPERTIES OF KEFIR—A REVIEW

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ABSTRACT

Kefir is a fermented dairy product. Fermented milk and milk products are strongly influence on health. It is also considered to be beneficial with therapeutic properties. Kefir can be prepared by inoculating milk with kefir grains with a combination of bacteria and yeasts in a symbiotic food. Kefir is known by the various properties such as antimicrobial, anti-carcinogenic, probiotic and prebiotic. Kefir has been considered as good for health. The consumption of kefir is beneficial in mitigating the symptoms of chronic constipation.

Key words : Kefir, functional properties, health, probiotic, prebiotic, fermentation.

The kefir word is derived from the Turkish word 'keif' means 'good feeling' (Kaufmann, 1997). Kefir is a fermented dairy product. Fermented milk and milk products are strongly influence on health. It is also considered to be beneficial with therapeutic properties. Kefir can be prepared by inoculating milk with kefir grains with a combination of bacteria and yeasts in a symbiotic food. Kefir is produced by the fermentation of lactic acid bacteria and alcohol by mesophilic bacteria and yeasts, respectively (Ahmed *et al*., 2013). Most microorganisms present in kefir are non-pathogenic bacteria, such as *Lactobacillus sp*. and yeasts. Kefir is supplemented with amino acid, vitamins, carbon dioxide, alcohol and essential oils which have been revealed to have health benefits. Kefir is known by the various properties such as antimicrobial, anti-carcinogenic, probiotic and prebiotic. Kefir has been considered as good for health (Liu *et al*., 2006 a). Guven *et al*. (2003) reported that an alternative suggestion as to how kefir protect tissues. They found that mice exposed to carbon tetrachloride and the kefir by gavage showed decreased levels of liver and kidney malondialdehyde, indicating that kefir was acting as an antioxidant. Many studies have reported to use of probiotic foods like kefir in the treatment of gastrointestinal disturbances (Reid *et al*., 2003). One example is diarrhea, which may be caused by a variety of conditions. Probiotics food can help to preventing diarrhea and in reducing its duration; they also alleviate conditions like such infant's diarrhea, irritable bowel syndrome, colitis, gastroenteritis, and traveler's diarrhea (Heyman, 2000). The consumption of kefir is beneficial in mitigating the symptoms of chronic constipation (Maeda *et al*., 2004).

Source of Kefir

Kefir is a known to popular traditional Middle Eastern beverage. Kefir consumption leads to a 'good-feeling'. It mainly originated in the Caucasus Mountains in Central Asia and also has been consumed for thousands of years (Libudzisz and Piatkiewicz, 1990). Kefir grains were first designated by the tribe people in the Northern Caucasian Mountain region of Russia (Seydim, 2001). Traditional kefir can be prepared by culturing fresh or pasteurized milk with kefir grains all over the world (Roberts *et al*., 2000).

Functional Properties of Kefir

Kefir has many functional properties. Some of the functional properties of kefir are described below:

1. Anti-carcinogenic properties

The definition of an anti-carcinogenic is to 'tending to inhibit or prevent the activity of a carcinogen or the development of carcinoma'. Sarcoma tumors are derived from connective tissues like bone, fat, and cartilage (Kuby, 1994). The effects of freeze-dried kefir, produced from soy milk and cows' milk with kefir grains, to the growth of tumors in mice (Liu *et al*. 2002). On the study on induced breast cancer in mice, De Moreno *et al*. (2006) observed that mice receiving two days cyclical feeding with both kefir and a cell-free fraction of kefir over 27 days had a reduced tumor growth and increase in the IgA(+) cells. Topuz *et al*., (2008) suggested the first study on the effect of oral kefir consumption on serum proinflammatory cytokines and on CT induced oral mucositis in humans with cancer.

2. Antimicrobial properties

Kefir has an antibacterial effect against many pathogenic organisms due to intrinsic formation of organic acids, hydrogen peroxide, carbon dioxide, acetaldehyde, and bacteriocins. For example, 3.5 kDa

bacteriocin was identified from the Lactobacillus plantarum ST8KF in kefir (Powell *et al*., 2007). The hydrogen peroxide is to metabolite produced by bacteria as an antimicrobial compound. Yuksekdag *et al*. (2004a) reported that all 21 isolates of lactic acid bacteria from Turkish kefir produced hydrogen peroxide (0.04-0.19 µg/ml). Later on, they reported that 11 out of 21 strains of kefir Lactococci produced to hydrogen peroxide (Yuksekdag *et al*., 2004). All Lactococci strains were effective in preventing the growth of *Streptococcus aureus*, while less effective against the *Escherichia coli* NRLL B-704 and *Pseudomonas aeruginosa*. Ahmed *et al*. (2011) observed that the kefir suspension, kefiran, and kefir grains showed antibacterial activity against the unicellular bacterial species and new antifungal activity against filamentous fungal species. Medrano *et al*. (2008) observed that kefiran, an exopolysaccharide produced from kefir grains, it protected against *Bacillus cereus*. Beyza *et al*. (2007) also revealed that the kefir has a good antimicrobial agent in food technology for food safety.

3. Lowering of cholesterol level

Kefir consumption reduces the serum cholesterol is limited level. Some researcher found that a decrease in total serum cholesterol and phospholipids, in rats fed with a high cholesterol diet supplemented with kefir. It was reported that the high density lipoprotein (HDL) and serum triglycerides were unaffected by kefir consumption (Rattray and Connell, 2011). Liu *et al*. (2006) observed that the milk kefir and soy milk kefir lowered the serum triacylglycerol and total cholesterol level in hamsters. They reported that the increase in the cholesterol-lowering effect of soy milk kefir as compared with soy milk, it might be attributable to hypo cholesterolaemic compounds other than genistein present in the kefir but absent from the soy milk. Brashears *et al*., (1998) and Tamai *et al*., (1996) suggested that reduced serum cholesterol concentration to induced by kefir could be attributed to the deconjugation of bile acids by Lactobacillus spp. Reynier *et al*., (1981) reported that deconjugation of bile acids reduced serum cholesterol levels by increasing the formation of new bile acids needed to replace those that have escaped the enterohepatic circulation. Kalavathy *et al*. (2009) reported that cholesterol removal from the growth medium by the Lactobacillus strains may be strain dependent. Maeda *et al*. (2005) reported that kefiran-fed rats had a serum cholesterol lowering effect in 2 rat models which were loaded with cholesterol and given orotic acid.

4. Improving lactose tolerance

Lactose maldigestion is the inability to completely digest lactose, is the major carbohydrate all mammalian milks. Lactose maldigestion affects is about 75% of adults in the world and occurs most often as the result of a genetically programmed decrease in intestinal lactose activity after the age between 3 to 5 years (Sahi, 1994; Swaggerty *et al*., 2002). Hertzler and Clancy (2003) observed that a kefir produced from a starter culture containing bacteria and yeast, it was equally as effective as yoghurt in reducing breath hydrogen in adult lactose maldigestors. Rattray and Connell (2011) observed that kefir with a diverse microbial population invariably has some degree of -galactosidase activity, that converts lactose into glucose and galactose, which can then be easily digested. Steven *et al*. (2003) found that kefir might improve lactose digestion in a manner similar to yogurt, there is a lack of research to support such a claim. Kefir contains different starter culture microorganisms from yogurt and bile acid sensitivity, galactosidase activity, or lactose transport of these organisms may be different. Chena *et al*. (2008) and Kyoung *et al*. (2007) observed that the anti-inflammatory properties of polysaccharide present in kefir extract may also be influential in the process of wound healing. Kamila *et al*., (2005) study on rats, treating them with a simple kefir formulation made from dried grains.

5. Prebiotic and Probiotic Properties

Kefir has been found nutritionally beneficial, it has also been proven to inhibit a number of food-borne pathogens and spoilage microorganisms (Paucean and Carmen, 2008). Most of the probiotic products have been formulated and that contain small numbers of different bacteria. The chemical and microbiological compositions of kefir indicated that it is a much more complex probiotic. There are bacteria and yeasts present in kefir grains have undergone a long association, and it resultant the microbial population exhibits many similar characteristics, it making isolation and identification of individual species difficult. Many of these associated microorganisms are identified by using advanced molecular biological techniques (Edward, 2006). Santos *et al*., (2003) reported that several strains of *Lactobacillus spp*. isolated from kefir in various countries have good adhesion to Caco-2 cells. The prebiotics are considered non-digestible but fermentable oligosaccharides, involving health promotion for the host (Barbosa *et al*., 2011). These compounds are considered to provide improvements in nutritional status and health benefits such as protection against carcinogenesis, mutagenesis, prevention of injuries caused by free radicals, control of intestinal flora, and gastrointestinal resistance. The kefir is able

to produce peptide and sugar prebiotics like lactacin, bacteriocins, and kefiran (Schneedorf and Anfiteatro, 2004).

6. Benefits of Kefir for Nursing and Pregnant woman

By the National Kefir Association, pregnant and nursing women can consume kefir for health improvement. This also helps the absorption of nutrients, increases immunity, helps the body adjust to hormonal changes and prevents infections such as yeast overgrowth. Also, the consumption of kefir by pregnant women can helps the overgrowth of a bacterium called group *B* of *Beta Streptococcus*.

CONCLUSIONS

Kefir is a complex probiotic, which is a combination of bacteria and yeasts. Kefir has many functional properties like antimicrobial, anti-carcinogenic, probiotic and others benefit. It also provides healthful benefits to the lowering effect of cholesterol and also improved lactose tolerance in humans. Kefir appears to a great potential and it should inspire researchers to carry out further studies on kefir in order to analyze the more information to therapeutic and functional properties which have not been revealed to till date.

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