

# PREPARATION AND HEALTH BENEFITS OF KEFIR: A REVIEW

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## Abstract

Kefir is becoming increasingly common as a consequence of recent research into its health benefits. Because of the different health benefits of probiotic diets, the importance of probiotics in the food industry is rising. Kefir has a long track record of health benefits. Kefir microorganisms generate vitamins, degrade protein and hydrolyse lactose, resulting in a meal that is highly nutritious and digestible. The health advantages of this drink is due to the presence of sufficient nutritional quality in the final product. Injection of Kefir increases human digestion and lactose resistance. It is often offered to patients in hospitals and is recommended for babies and the infirm. Kefir's microbiological and chemical structure suggests that it is a very complex probiotic, with the prevalent microorganisms which include in species *Lactobacillus*. The present review focuses on the kefir and discuss about probiotics, shape and size of kefir grain, health benefits of kefir, nutritional content of kefir grain, chemical composition of kefir, nutritional characteristic of kefir, microbial characteristic of kefir, and the method of production of kefir.

**Keyword:** kefir, probiotic, fermentation, yeast.

## 1) Introduction

Now a days, fermented products has a strong effect on human health. Fermented milk products have a good health benefits and various properties which is showing good effect on human body. Researchers have been working on fermented milk products for enhancing the quality of products (John and Deeseenthum, 2015). Kefir is a probiotic drink which is made up of milk. Kefir is also known as a fermented dairy product which is popular in European countries. Basically, this product is originated from the Caucasian mountains (Tratnik et al., 2006). Kefir grains were firstly described by the Russian tribes which is lived in Caucasian mountain. Basically, people who lived in Caucasian mountain, they considered that kefir is gift from Allah. People used this kefir for their family wealth from generation to generation (John and Deeseenthum, 2015). Kefir is made up of kefir grain which is small in size, yellowish in colour and gelatinous and shaped like cauliflower (Suriasih et al., 2012). Kefir means good feeling which is derived from the Turkish word keif. Kefir grains are good source of Acetic acid bacteria, Lactic acid bacteria, and yeast. Kefir is a fermented dairy product which is reached in amino acid, vitamins, carbon dioxide, alcohol and oils (Ahmed et al., 2013). Kefir is recently observed immunological and antitumor impacts on humans (Alter and Tu, 2000). At the time of production of kefir, there are three types of fermentation take place. First is lactic fermentation then alcoholic fermentation, and lastly acetic fermentation. This fermentation takes place by the microorganism group which is present in the kefir (Schwan et al., 2015). Probiotic milk products shown to be a good health benefits, and now a day's probiotics have a great interest to the food industry. In this present study, I discussed about the product, and its health benefits, about probiotics, product manufacture, nutritional, chemical, and microbiological characteristics and other aspects.

## 2) Probiotics

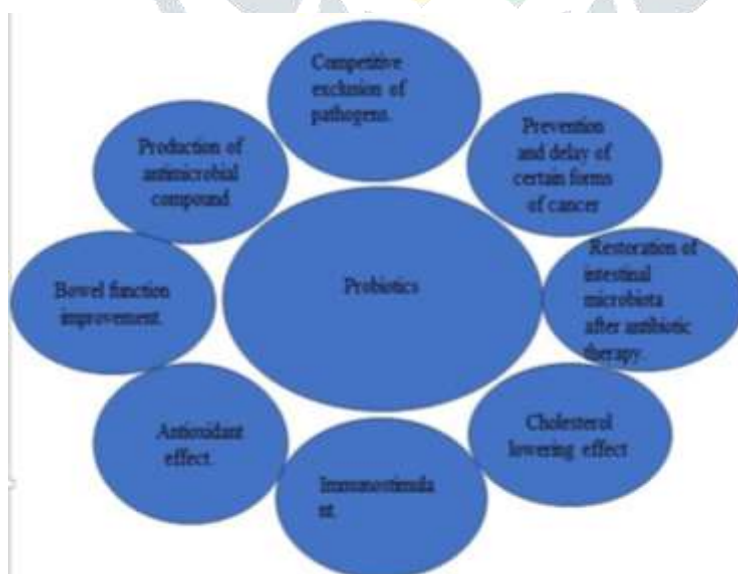
German scientist Werner Kollath introduced "probiotics" word in 1953 to identify "good substances" which are necessary for a safe existence. Probiotic word is the combination of Latin and Greek words (Pro from Latin and bios from Greek literally meaning "for life") (Gasbarrini et al., 2016). In 1965, this word was used by scientist Lilly and Stillwell to describe substances secreted by one organism that stimulate another's development (Abraham and Quigley, 2018). In 1992, Fuller described probiotics as a live microbial feed supplement that has beneficial effects on the host animal by improving its microbial bowel balance (McFarland, 2015). At the beginning of the 1900s the modern development of probiotics started with the

ground breaking experiments of the future Nobel laureate Elie Metchnikoff, a Russian scientist employed at the Pasteur Institute in Paris. The microorganisms responsible for the fermentation cycle, first described by Louis Pasteur; while Metchnikoff first attempted to figure out the potential impact of such bacteria on human safety. He correlated Bulgarian rural people's improved survival with the daily intake of fermented dairy items, such as yogurt. He related this to the Bulgarian bacillus discovered by a Bulgarian physician, Stamen Grigorov, who was 27 years old, and later proposed that lactobacilli could mitigate the putrefactive effects of gastrointestinal metabolism that led to disease and aging (Hill et al., 2014).

Probiotics are living microorganisms which is useful for production of fermented beverage, include drugs, dietary supplement and food products. The meaning of probiotic is “For life” defined by expert committee. Probiotic microorganism is very useful for human body. They improve digestive system in human body (Song et al., 2012). Dairy product manufacture by probiotic microorganism as a functional food which is provide health benefits to the human body to protect the body from the certain diseases (Table 1) (Phillips et al., 2006). In recent year, there are very growing interest in probiotic living microorganism to manufacture the good dairy product which is highly beneficial to the human body (Akin, 2005). Probiotic have been used in dairy product which is having numerous health benefit to human body, animal body, and plant product health also. Probiotic having a long effect of lactose intolerance protection against intestinal infection, inflammatory bowel disease (Fig. 1). For animal fortified food product are manufacture like human. These fortified food play very important role in normal digestive system of animal. Probiotic improve the intestinal balance in animal (Song et al., 2012).

**Table 1: Health benefits of probiotics.**

Organism	Health benefits
<i>Lactobacillus GG</i>	Restores natural balance of intestinal microbiota, boost immune system
<i>Lb. acidophilus</i> , <i>B. bifidum</i> , <i>B. longum</i>	Promotes healthy intestinal function
<i>Lb. plantarum</i>	Reduces bloating, gas, and intestinal discomfort
<i>Lactobacillus</i> , <i>Bifidobacterium</i>	Helps to maintain healthy intestinal biota, nutritionally supports immune function
<i>Lb. casei</i> <i>Immunitas</i>	Antibiotic-associated diarrhea and immune system function
<i>Lb. rhamnosus</i> , <i>Lb. reuteri</i>	Maintain the microbiota important to overall vaginal health in females



**Figure 1: Mode of action of probiotics.**

### 3) Shape and Size of kefir grain:

Irregularly has been reported in the shape and size of kefir grain by different scientist. Rosa stated that, the shape of kefir grain is like a Cauliflower; however Zaheer reported that it's like a cooked rice (Ahmed et al., 2013; Rosa et al., 2017). Schwan said that, the kefir grain are irregular in shape, small in size and in the form of hard granules (Schawn et al., 2015). Kefir grains have soft and gelatinous white biological mass (Gao and Li, 2016). Mei stated that, the outer surface of kefir grain is smooth and shiny with naked eye (Mei et al., 2014). Schwan also reported that the colour of kefir grain is yellowish white while they are white in colour shown by Plessae (Plessas et al., 2007).

Size of kefir grain have been irregular in shape varying with diameter. Zaheer reported that, the size of kefir grain is 10 to 30 mm but Rosa said that, the size of kefir grains is from 0.3 to 3.5 cm in diameter while Nejati reported that, its size is 2.0 to 9.0 mm in diameter (Ahmed et al., 2013; Rosa et al., 2017; Nejati et al., 2020).

### 4) Nutritional Content of kefir grain:

Kefir grain have been reported good source of protein, vitamins, minerals, fat, ash with a content of protein (34.3 %), fat (4.4 %), ash (12.1 %), mucopolysaccharide (45.7 %), vitamins B and K, calcium, phosphorous and magnesium is present in kefir grains (Marshall and Cole, 1985).

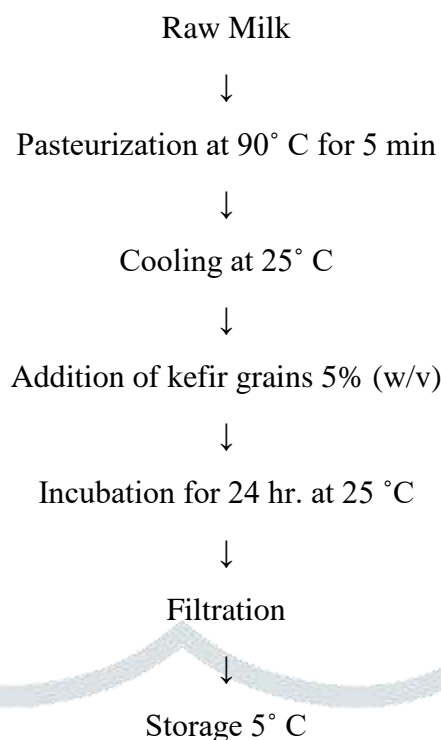
Indigenous kefir grain have also been reported that include yeast and lactic acid bacteria. Arslan Scher reported that, kefir grain include yeast and lactic acid bacteria (LAB) (Arslan, 2015). Yeast are collaborate with casein and complex sugar in a polysaccharide matrix. Pogacic said that, the peripheral portion of the kefir grain is consist of bacteria and in centre of the kefir grain yeast is present (Pogačić et al., 2013). As per the Kurman, lactic acid bacteria form the species of kefir grain is named according to kefir product. In kefir grain include  $10^9$  lactococci,  $10^7$ - $10^8$  Leuconostoc species,  $10^4$ -  $10^5$  yeast,  $10^7$ -  $10^8$  thermophile lactobacilli and  $10^4$  –  $10^5$  acetic acid bacteria (Kurman et al., 1992).

### 5) Different types of milk

For the production of kefir different types of milk is used. Researchers used all the types of milk for find out the different parameters form different kefir sample. This is useful for knowing which milk is better for production of kefir. Basically, milks used from cow, goat, sheep, buffalo and camel. These all types of milks having their own different different nutritional qualities. Raw milk has been traditionally used. According to Tratnik, cow milk has less digestibility than goat milk. Goat milk has better sensory properties than cow milk. He said that, in his paper about the taste and aroma of goat milk. Consumer dislike the taste and aroma of goat milk but they like cow milk. He analysed both cow milk and goat milk at the time of his work. He found different reading of different parameters (Tratnik et al., 2006). Gueguen said that, cow milk has lower mineral level than goat milk they are magnesium, chlorine, potassium. From these, tastes of goat milk rather salty. He also stated that, the acidity level of cow milk is lower than goat milk. Goat milk's pH value is down marginally (Gueguen, 1997).

### 6) Kefir production

Now a day's researchers used both traditional process and industrial process for production of kefir (John and Deeseenthum, 2015). It is made up of whole milk, skimmed pasteurized cow milk, buffalo milk, camel milk, sheep milk and also goat milk. From these all types of milk, cow milk is most common example for production of kefir (Rosa et al., 2017). Milk is heat on  $90^{\circ}$  C for 5 min (Tratnik et al., 2006). Cool the milk and add 5 % (w/v) kefir grain and seal the milk into the glass bottle and incubate at room temperature for 24 hr. (Fig. 2) (Schawn et al., 2015).



**Figure 2: Flow chart for kefir production.**

## 7) Kefir health benefits

Kefir is the fermented milk beverage which is produced by mixture of microorganism having a slight acidic in taste. Kefir having a various health benefits which is useful for, maintenance of human body. Kefir is useful to improve human digestion system. Main benefit of kefir is for lactose intolerance. Consumption of kefir helps to maintain diabetes disease. In developed countries kefir is regular distributed in hospital to patients for maintain the body. Like this, kefir is also regular consumption in schools. In kefir, there are wide range of microorganisms which is easily digested into diet (Kardakova and Ghoddusi, 2018).

Kefir is useful for skin diseases mainly in skin cancer. It is also play important role in anti-allergic, antifungal, antibacterial, anti-inflammatory, anti-microbial, anti-carcinogenic, gastrointestinal tract health, immune modulation and also mental health. Kefir is also use for improve gut, lower serum cholesterol levels and also a reduction hypertension (Slattery et al., 2019).

### 1) Lactose Intolerance:

Lactose intolerance is a psychiatric condition that, following ingestion of food substances containing lactose, a disaccharide, the inability to digest lactose, a component of milk and some other dairy product (Malik and Panuganti, 2019). Regular consumption of kefir which is useful for build the lactose intolerance of patient body. There are high amounts of lactose in milk and dairy products. The hydrolysis of this disaccharide and its subsequent absorption into the small-intestinal mucosa are needed for intestinal absorption of lactose. Verse said that, a large proportion of the world's population exhibits lactose absorption shortcomings due to inadequate intestinal  $\beta$ -galactosidase activity (De Vrese and Marteau, 2007). In kefir grain  $\beta$ -galactosidase enzyme is already present and this enzyme lowers the lactose content of kefir during fermentation, rendering the final product suitable for people with lactose intolerance (Ahmed et al., 2013). Operation of  $\beta$  galactosidase that convert lactose into quickly digestible glucose and galactose (John and Deeseenthum, 2015). Fermented drink like kefir are characterised by a delayed gastric emptying mechanism that leads to the digestion of lactose. Hertzler and Clancy observed that, the use of kefir, which is similar to yoghurt, was able to enhance lactose absorption and resistance. In this study they also found that, yoghurt and kefir were equally able to reduce the magnitude of milk-related flatulence by 54 percent to 71 percent Hertzler and Clancy, 2003). According to the (Alm, 1982) kefir has a 30 percent decrease in lactose content relative to unfermented milk after the fermentation process, providing greater relief for individuals with lactose intolerance. In addition, enzymes released from lysed micro-organisms can improve the intestinal digestion of lactose in a similar way to most LAB-containing probiotic preparations.

## 2) Pregnant women

Nutrition is a crucial factor in the life cycle that promotes health and development. In sustaining a balanced life, dietary patterns play a key role. Women's health, mainly because it is closely linked to the health status of families and culture, must be addressed, covered, and strengthened. For people at all social levels, nutrition is critical, but the most affected classes are women. The good diet status of women provides an indication of the well-being and growth of mainly families and community because issues resulting from the health and nutrition of women are passed from their children to the next generations. Although healthy health at all stages of life requires adequate and nutritious diet, breastfeeding is one of the unique periods when the need for proper nutrition increases (İrge et al., 2005). The mother's good nutrition and healthy life style during pregnancy are important. Uzdil said that, the goal of proper consumption of kefir during pregnancy is to fulfil physiological requirements, balance dietary supplements and provide the requisite energy. The published research on the use of probiotic foods during pregnancy found that there was no impact of probiotic use on caesarean section, birth week, or birth weight rates. However, several forms of probiotics have been found to decrease the risk of babies having atopic dermatosis, premature pregnancy, and the occurrence of bacterial vaginosis. Therefore, the delivery of such fatty acids to the foetus and cytokines was enhanced by probiotics, suggesting the beneficial influence of kefir on the mother's immune system in milk and blood (Uzdil and Özenoğlu, 2015). Sandra suggested that, consumption of kefir is useful for preventing infections such as yeast overgrowth and bacterium called group B Beta streptococcus. This bacterium is harmful and cause the infection such as pneumonia, meningitis and sepsis (Sandra, 2013).

## 3) Anti Diabetic effect:

Diabetes has been in existence since ancient times. Aretaeus of Cappadocia, a physician of Graeco-Roman origin, called the disease from the Greek word diabainein, meaning 'to go around' in the first century. A British doctor Thomas Willis added Mellitus in 1675, an adjective word of Latin origin meaning 'honey-sweet' (Karamanou et al., 2016). In diabetes patients, long-term injury, dysfunction, and loss of multiple organs, particularly eyes, kidneys, nerves, heart and blood vessels, is linked to chronic hyperglycaemia (Ostadrahimi et al., 2015). It is understood that diabetes mellitus consists of two forms. The Type I is insulin independent and Type 2 is non-insulin dependent. Form 1 has a frequency of about 5-10 percent due to the failure of the pancreas to secrete insulin, because of the loss of beta cells and form 2 has a frequency of about 90-95% due to poor insulin production or the body's failure to make use of the insulin produced (Kehinde and Sharma, 2020). The prevalence and incidence of type 2 diabetes continues to grow globally, with increased obesity and lifestyle improvements being closely correlated in developed countries in particular. Probiotic food has anti-diabetic property. Kefir is useful as an anti-diabetic drink. Nurliyani conduct one study and they stated that, in diabetic rats, three classes of kefir could decrease the amount of plasma glucose. The mixture of goat milk-soy milk kefir and soy milk kefir resulted in higher plasma glucose levels ( $p < 0.05$ ) relative to goat milk kefir in diabetic rats. The decrease in plasma glucose in the goat milk-soy milk kefir mixture was higher than in the soy milk kefir group. This suggested that the bioactive components of goat milk and soy milk in kefir had a synergistic effect, which could lower plasma glucose levels (Nurliyani, 2015). Another study of Ostadrahimi reported that, in type 2 diabetic patients, 600 ml of kefir (probiotic LAB-fermented milk) a day was supplemented for eight weeks. Compared to baseline and placebo, kefir supplementation dramatically decreased HbA1c levels, although no major differences were observed in triglyceride, total cholesterol, LDL, or HDL cholesterol levels. The study showed that, kefir can be used to treat diabetes as a supplemental nutritional supplement. From these studies we may infer that, kefir may be used as anti-diabetic drink, but to show such results, further studies are needed (Ostadrahimi et al., 2015).

## 4) Anti allergic properties:

The term *food allergy* refers to an immune response directed toward food (Burks et al., 2012). Theoretically, all foods can cause allergic reactions, but a limited subset is actually responsible for food allergies. Allergic responses in children are most commonly associated with milk, eggs, wheat, fish, soy and peanuts. Allergies to fish, shellfish and certain fruits, in particular cherries, peaches, plums, apricots and oleaginous fruits (nuts, seeds) and peanuts are recorded in adults (Żukiewicz-Sobczak et al., 2013). Now a day's food allergy is a big problem like another allergic. Kefir has been reported as an anti-allergic agent by various scientist. A difference in the Th1 / Th2 cell ratio, resulting in a high IgE reaction, is one of the key mechanism behind food allergy. Consumption of dairy milk product kefir and soymilk-based kefir restrain the IgE and IgG1 response by the alteration of micro flora, we can achieve the prevention of

food allergy (Liu et al., 2006). Bourrie reported that, in - vitro tests of human monocyte reactions with a multi-LAB probiotic found that, exposure to these LABs resulted in a much higher IFN- $\gamma$  / IL-4 ratio, equivalent to what would be seen during a Th1 response. In addition to the in vitro experiments carried out, observed that in mice that had been sensitised to OVA (ovalbumin) and then fed a LAB mixture, both overall IgE and OVA-specific IgE were substantially lower than in control mice that had already been sensitised to OVA but did not obtain any LAB mixture. Studies like this suggest that kefir can help ease certain symptoms of allergies (Bourrie et al., 2016).

### 5) Skin:

In fair-skinned communities in many parts of the globe, skin cancer is the most prevalent form of cancer. The rate of prevalence, morbidity and mortality of skin cancers is growing and is thus a major public health issue. Skin cancers, including basal and squamous cell carcinomas (BCC and SCC, respectively), are primarily classified into melanoma and non-melanoma skin cancers (NMSCs). Melanoma is responsible for the majority of mortality associated with cancer, and NMSCs are usually characterised as having a more benign path with locally violent characteristics (Narayanan et al., 2010). It is estimated that, 132,000 new melanoma cases occur per year worldwide While 2-3 million cases of NMSCs occur per year worldwide (Foster et al., 2008). For Caucasians, prevalence rates are at least 16 times higher than for African Americans and 10 times higher than for Hispanics but it is very high in NMSC frequencies in the world's Caucasian populations (Gloster and Neal, 2006; Suárez et al., 2007). The WHO also "estimates that as many as 65,161 individuals die from malignant skin cancer worldwide (Foster et al., 2008). Primary skin cancer prevention is focused on growing public understanding of the dangers of exposure to the sun and offering individualised advice to patients (Rivers and Gallagher, 1995). Zhao reported that, Standard therapies for skin cancer, including surgery, radiation therapy and chemotherapy in contrast, photodynamic therapy (PDT) is a comparatively recent modality of treatment requiring the delivery and eventual activation of a photosensitizing drug by light to create reactive oxygen species that directly kill target cells. Like these all therapies, various scientist also noted that, skin cancer also be treated by consumption of kefir. Kefir is a probiotic fermented drink which is useful for skin diseases (Zhao and He, 2010). According to Sharifi, milk beverage probiotic drink kefir have a good potential for prevention and treatment of skin cancer. They stated that, kefir is the best therapeutic natural ingredients for cancer and best anticancer agent in the new future world (Sharifi et al., 2017). (Gaware et al., 2011) reported that, kefir is cultured milk beverage which is natural antioxidant. Kefir having a various preventive measure. They stated that, because of an antioxidant, it keeps skin youthful and glowing. The consumption of kefir daily, keeps you looking young for long time.

### 6) Kefir and breast cancer:

Other than non-melanoma skin cancer, breast cancer is the most prevalent cancer among women worldwide (Waks and Winer, 2019). For this, women cancer care and prevention is necessary. North America and Europe region, has been reported highest incidence of breast cancer in women. Nigerian studies show that, breast cancer has recently overtaken cervical cancer in Western and Eastern Nigeria as the most prevalent female malignancy. Ethnic prevalence patterns have moved in other parts of the world due to migration and the acceptance of 'Western' life-style (Anyanwu, 2008). In the United States, the average chance of having breast cancer is 12.4 percent, or one in eight women. 1, 67 million new breast cancer patients were reported globally in 2012, accounting for 25% of all cancers (Momenimovahed and Salehiniya, 2019). In certain aspects, the care of breast cancer patients in a curative condition is unique. A key component of the procedure is local rehabilitation with surgery and radiation therapy. In the last few decades, chemotherapy with taxanes, anthracyclines and, in some cases, platinum-based chemotherapy has been known with respect to systemic therapy (Kolberg et al., 2019). Like these all therapies, various scientist also noted that, breast cancer also be treated by consumption of kefir. Chen et al., in 2007 conduct a research on the impact of kefir extract on MCF-77 cell line and HMECs have shown that, kefir depressed in a dose dependent manner MCF-7 cell growth. In the review of cytokines that are prevention on the murine control, kefir experimental breast cancer kefir, cell free fraction modulatory power on immune response, it has been shown that, memory gland and tumour are demonstrated. Kefir extracts because apoptosis, interrupt the cell cycle and decrease the development of tumours in breast cancer cells, so it may be sufficient to avoid or cure breast cancer (Sharifi et al., 2017).

## 7) Kefir and leukaemia:

In every part of the world cancer is expected to become a significant cause of morbidity and mortality in the coming decades. In economically developed nations, cancer is actually the leading cause of death and the second leading cause of death in developing countries. Hematopoietic system malignant disorders include multiple diseases, some of which are bone marrow-related and others may be related to lymphatic system. Leukaemia, lymphoma myeloma and plasma cell abnormalities are three main forms of blood cancer (Koochi et al., 2015). Leukaemia accounts for 8 % of the total cases of cancer and includes all age groups with varying prevalence and occurrence rates in Iran and around the world, causing large death tolls and high testing and care process costs (Tahmasebi et al., 2006). A malignancy that arises in white blood cells that causes them to replicate continuously in the bone marrow is adult lymphoblastic leukaemia (ALL). Adult lymphoblastic leukaemia is common both in children and adults and, based on the amount of irregular T-cells in peripheral blood, is divided into acute or chronic subtypes. Symptoms of weakness, nausea, anaemia, weight loss, heavy bleeding, and knee pain are present in patients with Both owing to malfunctioning of their erythrocytes, leukocytes, and platelets (Armitage and Longo, 2005). Since the 1950s, numerous therapies have been developed for leukaemia (Pui and Evans, 2006). Like therapy various scientist conduct the study about kefir and blood cancer and they noted that leukaemia also be treated by consumption of kefir. The ingestion of kefir in leukaemia has resulted in increased apoptosis and Diminished proliferation of cells. Maalouf had shown a substantial decrease in cell proliferation in dosage- and time-dependent manners in CME and Jurkat (human T lymph tropic virus type I-negative malignant T lymphocyte lines) in 2011(Maalouf et al., 2011). By up regulating TGF- $\beta$ 1 and down regulating TGF- $\alpha$  expression, Kefir showed an anti-proliferative effect. The anti-proliferative effect of kefir on HuT-102 malignant T lymphocytes was seen in a study by Rizk and the proliferation decrease was substantial and also dose and time dependent (Rizk et al., 2009). Kefir, which is one of the cytokines, has induced down regulation of TGF- $\alpha$ , Inducing proliferation and reproduction of cells. The natural mixture composed primarily of Lactobacillus kefir P-IF strain is Probiotics fermentation technology (PFT) on kefir grain commodity. PFT's apoptotic effect on human multidrug-resistant myeloid leukaemia (HL60 / AR cell line) revealed that PFT caused dose-dependent apoptosis in the HL60 / AR cell line. Apoptotic induction was correlated with activation of caspase 3, down regulation Bcl-2 and lower polarisation of MMPP potential mitochondrial membrane (Sharifi et al., 2017).

## 8) Provide vitamins Protein:

Kefir is a highly beneficial to human health. Kefir having a rich number of vitamins which is beneficial for development of body. Vitamin K and vitamins B (B1, B2, B5), vitamin C are occurring in kefir with these, minerals also occurs like calcium and magnesium in kefir. These both are most important nutrient which is required by human body and disturbed all of the internal organ body (Gaware et al., 2011).The consumption of vitamin in kefir is determine by the form of milk and microbiological flora used in its manufacture. Vitamin B12 is provide by *Propionibacterium peterssoni* and *Propionibacterium pituitosum* while *Freudenreichii* subsp. More vitamin B6 production was encouraged by *Propionibacterium Shermanii*. Essential amino acid that are value for improving fitness the healing process and homeostasis. Kefir is high in threonine, serine, lysine, alanine, valine, methionine, isoleucine, tryptophan which play a critical role in the central nervous system. Kefir also involve partly digested protein such as casein that helps the body digested and consume it. Kefir abundant essential amino acid also control the synthesis of protein ,sugar, lipid and have a beneficial effect on body weight management , immune system preservation and energy balance . Amino acid avoid impairment and extend the stable life expectancy of the elderly and the branched chain amino acid present in kefir promote the neurological rehabilitation of patients with serious traumatic brain injury (Farg et al., 2020).

## 8) Chemical Composition of Kefir

The composition of Kefir is non-uniform and not well defined. Its visual, chemical and textural properties influence the form and amount of milk. Moreover, its properties are influenced by the composition of its grains and medium and the manufacturing process (Arslan, 2015). Researchers who work on kefir production, they observe chemical composition of kefir (Ahmed et al., 2013). Kefir contain protein, moisture, lipid, sugar, ash, lactic acid and alcohol (Arslan, 2015). In kefir, there are 3 %protein, 90 % moisture, 0.2 % of lipid, 6 % of sugar 0.7 % of ash, 1 % of lactic acid and 1 % Alcohol (Sarkar, 2007). The carbon dioxide content in kefir is 1.98 g per liter which is major component of formation of the aroma and

flavour (Beshkova et al., 2002). Suriasih studied the chemical properties of kefir made up from Bali cattle milk with different incubation period. They found that the chemical composition of kefir are follows in table no. 2 (Suriasih et al., 2012).

**Table 2: chemical composition of kefir made up from Bali cattle milk with different incubation period.**

	<b>24 hr.</b>	<b>48 hr.</b>	<b>72 hr.</b>
<b>Protein (%)</b>	5.68+- 0.27	5.99 +- 0.13	6.26 +- 0.27
<b>Lactose (%)</b>	4.67 +- 0.20	4.16+- 0.13	3.60+- 0.27
<b>pH</b>	4.35 +-0.08	3.82 +-0.06	3.38 +- 0.10
<b>TA (%)</b>	0.89 +- 0.03	1.28 +- 0.04	1.73+- 0.02

In another analysis of kefir development Tratnik stated that, bovine and caprine kefir enriched with whey protein concentration had an ethanol content of 0.32 and 0.35 % (Tratnik et al., 2006). Magalhães and team studied the properties of Brazilian kefir. They found that the chemical composition of kefir ranged from 3.91 % of protein, 2.34 % of fat, 0.22 % of calcium and 4.42 pH (Magalhães et al., 2011). Wszolek conduct another study in Scotland and Poland using bovine, caprine and ovine milk with distinct starter cultures and they found that, the chemical composition of kefir ranged from 3.8–4.7% for carbohydrate, 10.6% to 14.9% total solids, 0.7–1.1% for ash and 2.9–6.4% for crude protein (Wszolek et al., 2001).

Beshkova and Guzel-Seydim stated that, during the fermentation procedure, lactic acid, acetic acid, pyruvic acid, hippuric acid, propionic acid, butyric acid, diacetyl and acetaldehyde were produced. The flavour and scent of kefir are imparted by these compounds (Beshkova et al., 2002; Guzel-Seydim et al., 2002). Kesenkas recorded that, after 28 d of storage, the content of lactic acid, citric acid, pyruvic acid and acetic acid was 107.80-282.40, 1.79-5.08, 0.17-0.45 and 0.38-0.66 mg / kg (Kesenkas et al., 2011).

## 9) Nutritional Composition

### 1) Sugar Content:

Sugar is one of the nutritional composition which is present in kefir. According to the (Ozer and Ozer 1999) kefir means sugar which is present in kefir. There are near about 6 % of sugar present in the kefir. Kefir is useful for improve gel formation, rheology and viscoelastic characteristics in gels produced by acidified milks and forms gels at low temperature (Rimada and Abraham, 2006).

### 2) Vitamin Content:

At the time of research many researchers observed vitamin content during kefir fermentation process. Vitamins such as vitamins B12, vit. B1, vit. B2, vit B5 and vitamin C are observed at the time of fermentation (Arslan, 2015). Folic acid and pyridoxine and biotin are found at the time of kefir fermentation process (Kneifel and Mayer, 1991). Owing to vitamin A and vitamin K and carotene also in kefir [70]. With this vitamin vit. B5, vit. B2 and vit. B1 also contain by kefir (Liut Kevicius and Sarkinas , 2004).

### 3) Mineral Content:

Many researchers also observed the major and minor minerals in kefir. These include potassium, phosphorous, magnesium, calcium, cobalt, iron, zinc, copper (Liut Kevicius and Sarkinas, 2004). According to Kok – Tas ash is also present in kefir. The range of ash from 0.55% to 0.66% (Kok – Tas et al., 2012). According to Liut kevicus and sarkinas, 2004 reported that, various minerals are present in different concentration such as potassium 1.65 %, Phosphorous 1.45 %, Magnesium 0.30 %, calcium 0.86 %, cobalt 0.16 %, iron is 20.3 %, zinc is 92.7%, copper is 7.32 %.

### 4) Protein content:

Researchers Otles and cagindin reported that, protein is present in kefir and that are partially digested by the human body. In his study, they observed the changes in amino acid at the time of fermentation of milk (Otles and Cagindi, 2003). Sarkar 2007 stated that, kefir include other amino acid, they are isoleucine, valin,

lysine, tryptophan, methionine, and phenylalanine. These amino acids are present in different concentration. According to the (Liutkevicius and Sarkinas, 2004) observation isoleucine is 262 mg/ 100 g, valin 220 mg / 100g, lysine 376 mg / 100 g, tryptophan 70 mg / 100 g, methionine 137 mg/100g, and phenylalanine is 231 mg / 100 g of kefir. Kesenkas and Ozer stated that, tryptophan is one of the important amino acid present in kefir and they are very important in nervous system (Kesenkas et al., 2013).

## 10) Microbial Characteristic

Kefir product include many types of microorganisms useful for production of kefir. It including lactobacillus, lactobacillus Helveticas, lactobacillus acidophilus, lactobacillus casei, lactobacillus bulgaricus, lactobacillus planetarium, lactobacillus delbrueckii subsp. delbrueckii, lactobacillus rahmnosus, lactobacillus fructivorans, lactobacillus fermentum, lactobacillus brevis, leuconostoc mesenteroids subsp.cremosis, streptococcus thermophiles, Lactococcus lactis pedioeocux acidilactici, pediococcus dextrincicus (Arslan, 2015). Kefir has a consisting micro flora which is complex of undefined and defined living organism of bacteria and yeast. The composition of microorganisms is indigent on source. A symbiotic relationship was observed in microbial species in kefir grain (Ahmed et al., 2013). Abraham and Antoni reported that's population of higher microorganisms for process of fermentation and it is not less than 0.9 % of the weight of kefir (Abraham and De Antoni, 1999)

## 11) Conclusion:

Kefir includes a wide range of beneficial micro-organisms and bioactive compounds and, as a nutritional food, is considered a commodity of tremendous promise. As a probiotic drink, Kefir may be an intriguing option, as it is safe, can be made at home, has a low production cost, and can be easily introduced into the diet. The meaning of the symbiotic relationship between yeast and bacteria in Kefir it seems obvious that they are both essential in order to create health-beneficial components. Kefir's favourable health characteristics are due to nutrition, vitamins, minerals, enzymes, and some biogenic compounds. This gives safe benefits in reducing the effects of cholesterol, reduction the effect of diabetic, reduction of breast cancer, reduction of leukaemia and improving human lactose resistance. In order to analyse the latent medicinal and functional properties that have not been discovered to date, this fermented milk seems to have tremendous potential and this should inspire researchers to carry out further studies on kefir.

**Table 2: chemical composition of kefir made up from Bali cattle milk with different incubation period.**

	24 hr.	48 hr.	72 hr.
<b>Protein (%)</b>	5.68+- 0.27	5.99 +- 0.13	6.26 +- 0.27
<b>Lactose (%)</b>	4.67 +- 0.20	4.16+- 0.13	3.60+- 0.27
<b>pH</b>	4.35 +-0.08	3.82 +-0.06	3.38 +- 0.10
<b>TA (%)</b>	0.89 +- 0.03	1.28 +- 0.04	1.73+- 0.02

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