

# THE EFFECT OF VARIOUS STARTER DOSAGES ON KEFIR QUALITY

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## Abstract

The effect of various starter dosages on kefir quality had been studied. Kefir samples were prepared using of 5, 10, 15, 20 and 25% (v/v) kefir grains; with incubation times of 24 hours. The objectives of this study were to find the effect of various starter dosages to kefir quality (pH) and optimal starter dosages for kefir preparation. This study used Completely Randomized Design (CRD) with five treatments (starter dosages are 5, 10, 15, 20 and 25% v/v) and each treatment was replicated four times. The variables observed are pH and percentage of starter weight gain. Result indicated that pH of kefir using 10% starter are 3.95 and for starter weight gain also from 10%, that gain 3.190%. So the best results for pH and percentage of starter weight gain was obtained from cow milk kefir prepared with 10% (w/v) kefir grains and incubation time of 24 hours.

**Key words:** cow milk, kefir grain, pH and percentage of starter weight gain.

## INTRODUCTION

In the production of kefir, special kefir grains which consist of yeasts, lactobacilli and streptococci are used as starter. Different types of yeast and lactic acid bacteria have been found in kefir. The dominant yeasts seem to be *Saccharomyces kefir* and *Torula kefir* but several other species have been isolated. The lactobacilli are mainly *Lactobacillus caucasicus* together with several types of streptococci and leuconostoc [7]. The changes to the carbohydrates in a substrates by microorganisms can be used to classify fermentations into those in which the main products are organic acids and those in which ethanol and carbon dioxide are the primary products. There are a large number of cultured milk products. Differences in flavor are due to the rate of production and concentration of lactic acid, volatile aldehydes, ketones, organic acids and diacetyl. The changes in texture are due to production of lactic acid from lactose, which causes a reduction in charge on the casein micelles [3].

Kefir is acidic and mildly alcoholic fermented milk which originated in the Caucasian mountains [5]. It is the product of fermentation by a mixed group of microflora confined to a matrix of discrete “kefir grains” [6]. The function of the microorganisms constituting the kefir grains which consist of lactobacilli, lactococci, leuconostoc, acetic acid bacteria and yeasts may include production of lactic acid, antibiotics and bactericides, which inhibit the growth of undesirable and pathogenic microorganisms in kefir milk [1]. The naturally occurring bacteria and yeast in kefir make it a complex symbiosis of beneficial bacterias and yeasts that combine to give superior health benefits when consumed regularly. Kefir is a sour-tasting, gassy drink because there are CO<sub>2</sub> content, are mainly consumed in the Caucasus. In the preparation, kefir grains the particles of curdled milk carrying the microorganisms necessary for fermentation, are added to milk as the starter. The lactobacilli and streptococci associate with a lactose-fermenting yeast to induce acidification and the formation of alcohol, of which kefir can contain up to 1%. Industrial manufacture of Kefir from pasteurized milk is becoming more and more important [7]. Milk Kefir grains are a live culture that will last forever provided they are well cared for.

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In a short period of time well cared for kefir grains will multiply. Kefir contains beneficial live bacteria that can colonize the intestinal tract and beneficial yeasts that dominate, control and eliminate destructive yeasts in the body. The small curd size of kefir makes it easy to digest and it also contains lactase, the enzyme needed to digest lactose as well as many vitamins and minerals including calcium, phosphorus, magnesium, Vitamin B2 and B12, vitamin K, vitamin A and vitamin D. It also contains Tryptophan, and essential amino acid known for its relaxing effect on the nervous system. Kefir is a cultured (fermented) milk drink. It is a complex symbiosis of more than 30 microflora that form grains or cauliflower-like structures in the milk. In addition to beneficial bacteria and yeast it is rich in amino acids, vitamins, minerals, and enzymes. Particularly calcium, phosphorus, magnesium, B2 and B12, vitamin K, vitamin A and vitamin D. It also has numerous antioxidant and therapeutic properties. These grains have been grown in pasteurized milk and will successfully ferment any fresh, raw or pasteurized, cow's or goat's milk into a healthy kefir drink packed with some strains of beneficial bacteria and yeasts.

## **MATERIAL AND METHOD**

The pasteurized cow milk samples contain fat 3.43%, protein 4.72%, lactose 4.30%, titratable acidity number expressed as lactic acid content 0.13% and pH value of 6.70.

2.50 L milk was pasteurized at 72°C for 15 minutes, and then was cooled until 23°C. The milk then divided into 20 beaker glass (125 ml in each beaker glass). The starter were used 5, 10, 15, 20 and 25% (v/v) was added into the milk. Each treatment was four times repeated. The starter was mixed carefully, so the starter was mixed into the milk; and fermented for 24 hours at 27°C

(room temperature). And then the kefir was washed with 1 L cooked cold water each.

Acidity are denoted by the term pH or by an actual measure of the strength of the particular fluid. The pH may be measured electrometrically or by means of dyes that changes color at different pH values. All bacteriological media must be adjusted for pH. A medium that is too acid frequently inhibits bacterial growth. The kefir percentage gain, was study by weighing the kefir starter before inoculate with milk. After 24 hours fermentation, the starter was washed with cool cooked water, and then straining the liquid through a stainless-steel sieve, and then weighed. To get the percentage of starter kefir percentage gain, the weight after fermentation was divided with the weight before fermentation multiplied by 100%.

## **RESULTS AND DISCUSSIONS**

### **1. Kefir pH**

In the production of kefir, special kefir grains which consist of yeast, lactobacilli and streptococci are used. Proper treatment of the curd, is an important step in producing cultured milk products of the stirred type. The curd must never be broken up before the pH is down below 4.7. Kefir is product that milk was fermented with mesophiles and yeast. During fermentation, the different types of cultured milk products receive their specific characteristics as a result of coagulation of the milk, formation of acid and flavor components specific to the starter cultured used [2].

In batch culture, the pH of an actively growing culture will not remain constant for very long. In most process there is need for pH measurement and control during the fermentation, if maximum yield of a product is to be obtained [10].

In Table 1, there is the kefir pH from different treatments.

Table 1 Kefir pH from some dosage of kefir starter

Replication	Treatments				
	D-1 (5%)	D-2 (10%)	D-3 (15%)	D-4 (20%)	D-5 (25%)
I	4.4	4.0	3.8	3.6	3.5
II	4.3	3.9	3.7	3.7	3.4
III	4.4	3.9	3.7	3.5	3.6
IV	4.5	4.0	3.8	3.6	3.5
Total	17.6	15.8	15.0	14.4	14.0
Average	4.40	3.95	3.75	3.60	3.50

From Table 1, the pH of the kefir, will more acid when the percentage of the dosage of starter used more higher. Kefir with 5% starter is 4.40 and the kefir with 25% starter is 3.50. When the dosage of starter is higher, the acidity of the kefir will more acid. Irigoyen *et al.* (2005) in their study reported that kefir produced from cow, goat, sheep and buffalo milk had the following chemical characteristics such as pH about 4.0, alcohol from 0.55 to 2.0%, fat content depends on the type of milk used, and this fermented milk have an acid, prickly and slightly yeasty taste. Proper treatment of the kefir is an

important step in producing cultured milk. A prolonged shelf life of cultured milk products, be achieved by subjecting the finished product to heat treatment. Due to the low pH existing in cultured milk, it will have a shelf life of several weeks at room temperature. The important conditions are pH, the yeasts and fungi are able to tolerate more acidic conditions. The mild conditions used in food fermentation produce few of the deleterious changes to nutritional and sensory quality.

## 2. Kefir percentage starter weight gain

Table 2 Kefir percentage of starter weight gain (%)

Replication	Treatment				
	D-1 (5%)	D-2 (10%)	D-3 (15%)	D-4 (20%)	D-5 (25%)
I	1.32	3.25	2.85	2.00	2.06
II	1.28	3.15	2.74	2.46	2.00
III	1.48	3.20	2.17	2.22	2.10
IV	1.82	3.16	2.04	2.40	2.06
Total	5.90	12.76	9.80	9.08	8.22
Average	1.475	3.190	2.450	2.270	2.055

In Table 2, there are the kefir percentage of starter weight gain, from different percentage of kefir starter. The kefir starter consists of white clusters of grains containing casein and a variety of microorganisms. The main organisms are lactose-fermenting bacteria and *Torula* and *Saccharomyces* yeasts. The highest starter weight gain, were get from 10% starter, and the smallest were from 5% starter, even the percentage starter between 15% to 25% were smaller than the 10% starter weight. Many factors can inhibit or stimulate the growth of the starter in kefir production. Starter culture can be prepared using stock cultures which are transferred

from the plain culture of kefir. According <sup>[11]</sup> the inoculums are between 3 – 8% of moist kefir grains. That's why in this study, the most kefir percentage of starter gain are from 10% starter.

## CONCLUSIONS

Using 10% starter, will get the best result for kefir pH (3.95) and starter weight gain (3.190%).

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