

ANTIOXIDANT ACTIVITY AND SENSORY EVALUATION OF MILK KEFIR

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ABSTRACT

In this study, milk kefir was prepared by using 20g of milk kefir grains and milk kefir starter culture for one liter of milk. Fermentation was carried out by changing the fermentation time such as 0hr, 6hr, 12hr, 18hr, 24hr, 30hr, 36hr, 42hr and 48hr. For the results obtained, 24hr fermentation time was found to be the most suitable condition for the preparation of milk kefir due to pH, taste and texture of prepared milk kefir. It was also found that antioxidant activity of milk kefir using milk kefir grains at 40% concentration was higher than that of using milk kefir starter culture.

INTRODUCTION

Kefir is a fermented dairy product originating from the Caucasus Mountains. In traditional kefir production, milk is fermented with a starter culture of small, irregularly shaped and gelatinous yellowish grains. It has a slightly sour, acidic taste and is creamy in consistency. Kefir has become a popular drink in many parts of the world, from Japan to eastern and northern Europe. Its popularity is mainly based on its nutritive content and health benefits. Kefir has numerous benefits to human health, such as improving lactose digestion and tolerance in adults as well as antimicrobial, antitumoral, antioxidant, antimutagenic, and antiapoptotic effects [1].

Kefir is widely made from different milks, such as bovine, goat, and ovine. In addition, ewe, soy, coconut, and rice milk can be used for producing kefir. Choice of culture and milk type is important for kefir characteristics [2].

MATERIALS AND METHODS

In this research, milk samples were collected from Kyaukse Township, Mandalay Region. Milk kefir grains were obtained from Water Kefir and Milk Kefir Grains Sharing Group, No.331, 28th street, between 85x86 street, Chan Aye Thar San Township, Mandalay Region. Milk kefir starter culture was purchased from Amazon Company L'td., Singapore.

Preparation of Milk Kefir

Pasteurized and homogenized milk (1liter) was added to a sterilized glass container and 20g of milk kefir grains was added to the milk and held at room temperature (27°C) for 0 - 48 hours. At the end of the incubation, kefir grains were separated via a sieve to obtain milk kefir. Then the prepared milk kefir samples were taken into high-density polyethylene bottles and stored at refrigerated temperature (4°C).

The same procedure was carried out by using 20g of milk kefir starter culture.

Determination of pH

It was determined by using a Pen type pH meter. 1g of prepared milk kefir was put in a beaker and mixed with 100ml of distilled water. The pH meter was inserted into the solution and the data was recorded.

Determination of Titratable Acidity

10g of sample was mixed with 90 mL of distilled water to prepare a solution. 10ml of solution was put into a conical flask and 2 drops of phenolphthalein indicator was added into the solution. The solution was titrated with 0.1N NaOH solution until a permanent pink color was obtained. Then, titrant volume was recorded and percentage of acidity was calculated as follows [3]:

$$\%, \text{ Titratable Acidity} = \frac{N \times \text{mL of NaOH} \times 90.08}{\text{Weight of sample} \times 10}$$

Determination of Antioxidant Activity

The antioxidant activity of milk kefir was determined by the DPPH free radical scavenging assay according to Lee *et al.* The samples were dissolved in DMSO (10mg/ml) and diluted with 50% EtOH for various concentrations. Briefly, the reaction mixture containing 50 μ L of diluted test sample of various concentrations and 50 μ L of DPPH (300 μ mol) dissolved in methanol, was taken in a 96-well micro-titer plate and kept standing at 37°C for 30min. The absorbance was measured at 517nm by using 96-well microplate reader (Spectrostar Nano, BMG Labtech Microplate reader). Ascorbic acid was used as a standard. 50%EtOH was used as the control and added to the 96-well plate instead of sample. Percent Radical Scavenging Activity (% RSA) was calculated by using the following formula [4]:

$$\% \text{ RSA} = [1 - (\text{OD test compound} / \text{OD control})] \times 100$$

Sensory Evaluation of Prepared Milk Kefirs

Prepared milk kefir was evaluated the following standard general procedure of sensory evaluation as described by the Tand and Mabesa (1998). Panel of judges consisting of 20 students/staff who had classroom training and are always involved in sensory test, evaluated the sensory attributes of the prepared milk kefir. The panels of judges were asked for preferences to sourness, smell, taste, mouth feel, acerbity and overall acceptability using a score sheet with scale of 1 to 5, where Sourness: 1 = Extremely not sour, 5 = Extremely sour; Smell: 1 = Dislike extremely, 5 = Like extremely; Taste: 1 = Dislike extremely, 5 = Like extremely; Mouth Feel: 1= Extremely not like, 5=Extremely like; Acerbity: 1 = Extremely not acerbity, 5 = Extremely acerbity; and Overall acceptability: 1 = Extremely unacceptable, 5 = Extremely acceptability [5].

RESULTS AND DISCUSSION

Effect of fermentation time on pH and titratable acidity of milk kefir using milk kefir grains and milk kefir starter culture were shown in Figures (1) and (2).

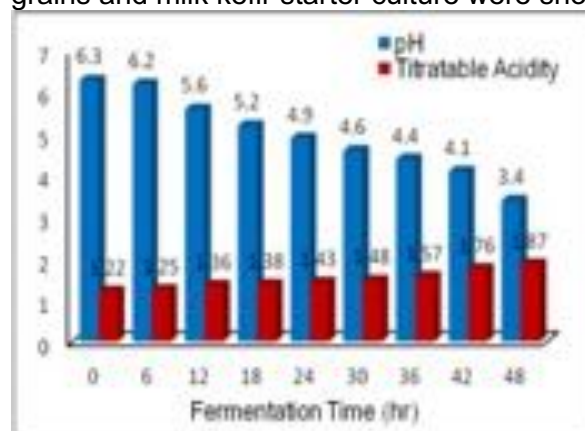


Figure (1) Effect of Fermentation Time on pH and Titratable Acidity of Milk Kefir using Milk Kefir Grains

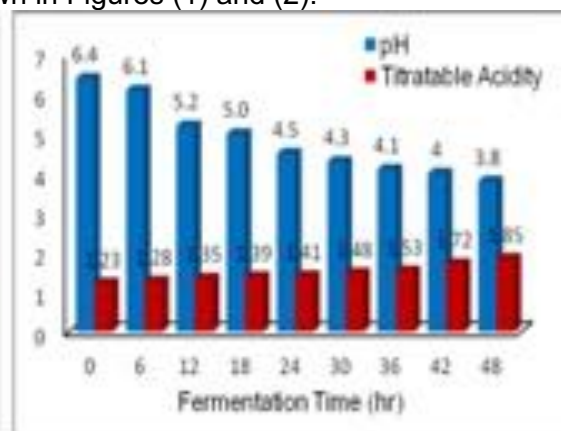


Figure (2) Effect of Fermentation Time on pH and Titratable Acidity of Milk Kefir using Milk Kefir Starter Culture

The important parameter for kefir is pH. According to *Simova et. al (2002)*, the pH of milk kefir is 4.5 at fermentation time 24hr. At fermentation time 24hr, the pH of the prepared milk kefir using milk kefir grains was 4.9 and using kefir starter culture was 4.5, respectively. The taste and texture of milk kefir depends on several factors including fermentation time and room temperature [6].

Antioxidant activity of prepared milk kefirs was shown in Table (1). It was found that higher the concentration of milk kefir, the greater the antioxidant activity of milk kefirs. Antioxidant activity of milk kefir using milk kefir grains (MKG) at 40% concentration was 84.41 ± 0.36 and antioxidant activity of milk kefir using milk kefir starter culture (MKS) at 50% concentration was 84.00 ± 2.13 . Therefore, antioxidant activity of milk kefir using kefir grains at 40% concentration is higher than that of using milk kefir starter culture.

Table (1) Antioxidant Activity of Prepared Milk Kefirs

Sample Concentration (%)	% DPPH Scavenging activity of milk kefir										Method
	10	20	30	40	50	60	70	80	90	100	
MKG	33.74 ± 1.78	65.54 ± 2.46	76.41 ± 0.94	84.41 ± 0.36	>100	>100	>100	>100	>100	>100	DPPH Radical Scavenging Assay
MKS	38.26 ± 0.36	41.95 ± 4.97	57.92 ± 2.16	61.44 ± 3.16	84.00 ± 2.13	>100	>100	>100	>100	>100	

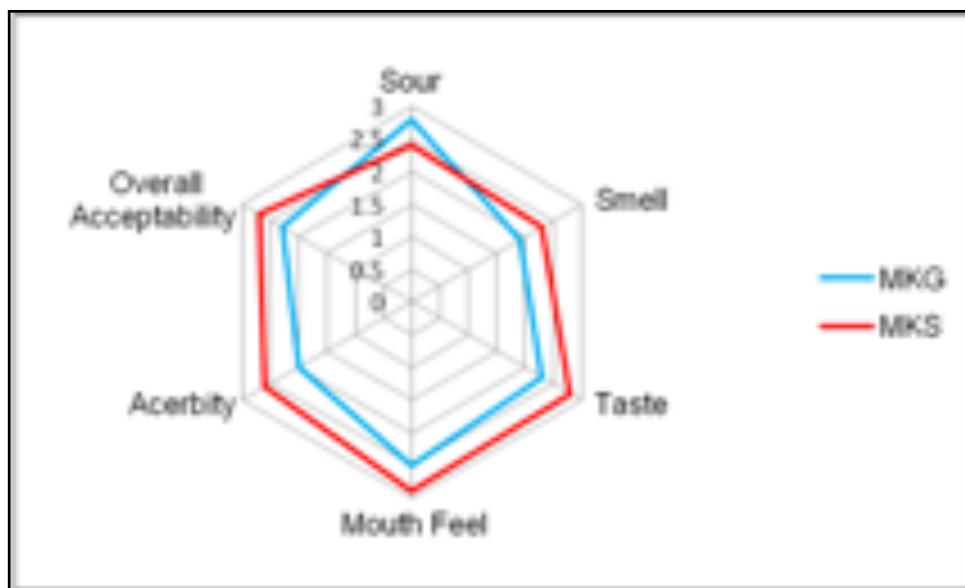


Figure (3) The Spider Diagram for Sensory Evaluation of Milk Kefir

The spider diagram for the sensory attribute of prepared milk kefir was shown in Figure (3). It was observed that the prepared milk kefir using starter culture showed with maximum overall acceptance (2.7). As a result, the prepared milk kefir using starter culture was superior in the sensory characteristics of sour, smell, taste, mouth feel, acerbity and overall acceptability. According to the diagram, the lowest value is in inner shell and highest value is in outermost shell.

CONCLUSION

In the preparation of milk kefir, pH of milk kefir was decreased and titratable acidity was increased during fermentation. At 24hr fermentation time, pH of prepared milk kefir using milk kefir starter culture was 4.5. Antioxidant activity of milk kefir using kefir grains at 40% concentration is higher than that of using milk kefir starter culture. Milk kefir using starter culture was superior in the sensory characteristics of sour, smell, taste, mouth feel, acerbity and overall acceptability.

ACKNOWLEDGEMENTS

I would like to acknowledge my gratitude to Dr. Khin Mar Mya, Director and Dr. Khine Zar Wynn Myint, Assistant Director, Medical Biotechnology Laboratory, Biotechnology Research Department, Kyaukse District, Mandalay Region.

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