Texture Profile and Sensory Characteristics of Kefir with Colostrum Addition

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Abstract. This study aims at knowing the effect of using raw material combination (cow milk and colostrum) in making kefir on texture profile and sensory characteristics. This study used 6 combinations of treatment; P1 = 100 % cow milk; P2 = 80 % cow milk + 20 % colostrum; P3 = 60 % cow milk + 20 % colostrum; P4 = 40 % cow milk + 60 % colostrum; P5 = 20 % cow milk + 80 % colostrum and P6 = 100 % colostrum. The result shows that hardness and cohesiveness were not influenced by the combination of raw material, gumminess however was influenced by the combination of raw material (p<0.05). The mean of gumminess of kefir was 1.76±1.16 to 4.86 ±0.77 G. The sensory characteristics i.e. flavour, colour, texture, and overall preference were significantly influenced (p <0.05) by the combination of raw material (cow milk and colostrum) used. The score of flavour was 2.47 – 3.10 (less fresh- more acidic); Aroma was 2.43 – 3.20 (acidic but not fresh– rather sour). Colour was 1.3 – 4.93 (white–yellow), texture was 1.80 – 4.73 (smooth- rather rough). Score given by the panellists was 3.20 with scoring criteria “like”. The mean score of “like” was 3.20 (like) - 4.20 (rather like).

Keywords: kefir, colostrum, texture profile, sensory, cow milk

1. Introduction
Physical characteristic is one of factors that influence customer’s acceptance on product, including fermentation product. Kefir is produced using kefir grain which functions as a starter in the process of fermentation [1]. Kefir tastes sour and contains a little ethanol. Levels of acidity, aroma, texture and preference are determined by the composition of lactic acid bacteria and yeast contained in kefir grain [2] [3]. Metabolites produced by kefir are lactic acid, diacetyl and acetone acid which produce typical aroma of kefir. The metabolite result of kefir will influence the flavour and typical aroma of kefir i.e. lactic acid, carbon dioxide, ethanol, acetaldehyde, diacetyl and acetone acid [4].

Lactic acid bacteria in kefir grains is heterofermentative, and the metabolites resulted are more complex than the other fermentation products such as yogurt. The sour taste produced by kefir is a synergetic work of LAB (Lactic Acid Bacteria) contained in kefir grain and yeast [5]. Low pH value is obtained from the changes in lactose substrate contained in milk [6]. The raw material used in the production of kefir is one of the factors that influence the physical characteristics and customer’s acceptance level on the product. Kefir resulted from cow milk has physical difference with kefir from...
buffalo milk [1]. Cow milk and colostrum have different colour, pH and aroma. Yellow colour in colostrum is caused by carotene in colostrum fat after delivery. Colostrum colour is related to colour index with β-carotene at 65 % (Calderon., 2007). This study aims at knowing the effect of using raw material combination (cow milk and colostrum) in making kefir on texture profile and sensory characteristics.

2. Methodology
Kefir is made from cow’s milk and colostrum comes from Limpakuwus, Baturaden livestock groups. Kefir grains collection of the Faculty of Animal science laboratory, Unsoed.

Procedure of making kefir
Procedure of making kefir according to [7]. Cow milk and colostrum were pasteurized at 72 °C for 15 second, then were cooled to 28 °C. Kefir grains were added and incubated at 28°C for 24 hours to allow fermentation process. Milk kefir was separated from kefir grains by using a fine plastic strainer and ready for further treatment. Kefir grains were placed in a plastic container and ready for another batch of fermentation

Measurement of texture profile using TPA
Colostrum kefir texture is measured using TPA (Texture Profile Analysis) (TAT X Plus, stable micro system, UK). According to the method [8], TPA is performed using probe in size 20 mm. Probe is input up to 20 mm depth with speed of 1 mm/s. The instrument is connected to computer and programmed using algorithm fracture TPA. The measurements recorded are the level of (1) hardness determined as the final power needed to achieve stable deformation, (2) gumminess counted as the multiplication of hardness and compactness, and (3) cohesiveness counted as the surface of result field shown by equation curve.

Sensory testing using scoring method
The sample of kefir colostrum was tested by 30 semi-trained panellists, consisting of 15 females and 15 males. Panellists tested the sample using scoring method by giving score in the worksheet. The testing was carried out in the testing chamber with fairly bright lighting and at 11.00 WIB. Before performing the test, the panellists were given guidance how to test and score. They were also given descriptions about the products tested. The next step was preparing product sample at 16 ml relevant with the number of the products tested. The samples were prepared in cup and given 3-digit number randomly. The samples, which were tested, consisted of 6 samples.

3. Result and Discussion

Texture profile of milk kefir
The addition of colostrum modifies the profile texture of milk kefir, as shown in Table 1. Hardness, cohesiveness and gumminess were calculated based on curve plotted as the measurement result of physical characteristics using TPA tool. Table 1 shows that the hardness of kefir colostrum is 4.15 to 6.26 N tested using TPA. The combination of raw material used in making kefir did not influence the hardness level of kefir gel measured (p>0.05). Fermentation product uses lactic acid bacteria which functions to lower pH, and increases consistency so that protein aggregate is formed which creates gel and the hardness is measured using TPA. The other factor is fat content in the product tested [9].

Gel cohesiveness formed by the combination of raw material is relatively the same (p>0.05) for each treatment. The highest score of cohesiveness is on the treatment of 100% cow milk and the lowest cohesiveness score is on the kefir with 100% colostrum as the raw material. The texture of fermentation milk is influenced by the composition, processing, ratio between casein and whey [10, 11]. Cohesiveness of milk fermentation product is more influenced by total compactness than the use of additional material such as whey protein concentrate [12].
Table 1. Texture profile of milk kefir added with colostrum

| Treatment                                      | Hardness (N) | Cohesiveness | Gumminess (G)     |
|-----------------------------------------------|--------------|--------------|-------------------|
| Milk kefir (100% whole milk)                 | 5.48±2.589   | 1.11±0.66    | 2.71±1.94         |
| Milk kefir with 20% colostrum                 | 6.26±0.259   | 0.78±0.14    | 3.15±2.85         |
| Milk kefir with 40% colostrum                 | 4.15±0.352   | 0.73±0.14    | 1.76±1.16         |
| Milk kefir with 60% colostrum                 | 4.00±1.490   | 0.56±0.40    | 3.00±0.39         |
| Milk kefir with 80% colostrum                 | 4.78±2.151   | 0.54±0.39    | 4.86±0.77         |
| Colostrum kefir (100% colostrum)             | 4.99±1.594   | 0.53±0.36    | 4.41±2.46         |

Means with different superscript in the same column differ significantly (P<0.05).

Gumminess of kefir with raw material combination of cow milk and colostrum is about 1.76 to 4.86 G, with the biggest gumminess of kefir using colostrum 80% and insignificantly different from kefir made with 100% colostrum. Combination of raw material influences the gumminess of kefir (p<0.05). The gumminess of kefir in this study is smaller than the previous research [8] at 25.3 – 38.7 G. Gumminess is influenced by gel that is formed during the fermentation process of kefir. The use of colostrum above 80% creates more gumminess on product than others. The decrease in pH makes the product thicker and the formation of protein gel creates protein aggregate more compact, thus the gumminess increases [13].

**Sensory characteristics**

The sensory characteristics of milk kefir with different proportion of colostrum are shown in Figure 1. The mean of the flavor of kefir tested by 30 semi-trained panellists is 2.47 to 3.10 with assessment criteria (less fresh – more sour). The result of the assessment shows that the use of raw material combination has significant effect (p<0.05) on the flavour of rasa kefir. The use of 100% cow milk as the raw material of kefir creates the smallest score with criteria (sour but less fresh). Cow milk contains lower lactose (4.57 – 4.66%) than colostrum (6.42 – 6.49%) (data are not published). Colostrum has higher lactose, so that more lactose substrate is changed by lactic acid bacteria and thus the decrease in pH is lower and the production of lactic acid is higher [14, 15]. The aroma of kefir made using different combination of raw materials is relatively the same. The score is 2.43 – 3.20 with criteria (sour but not fresh – rather sour). The product tested generates apparently indifferent score of aroma (p>0.05).

Kefir is heterofermentative product, that produces lactic acid metabolite, diacetyl and acetone acid that creates typical aroma of kefir. The result of kefir metabolite will influence the flavour and aroma of kefir i.e. lactic acid, carbon dioxide, ethanol, acetaldehyde, diacetyl and acetone acid [4]. The panellists assessed the colour of kefir using scoring method and the score was 1.30 to 4.93 with criteria (1.30 = milky white) and (4.93 = yellow). The result shows that the use of raw materials combination generates significant difference (p<0.05) on kefir colour.
Figure 1. Effects of colostrum on sensory characteristics of milk kefir

Kefir made with 100% cow milk has the lowest score and was milky white. Texture of kefir produced using different combination of raw material generates mean 1.80 (smooth) to 4.80 (rather rough). The panellists suggest that the use of raw materials and their combination influence significantly the texture of kefir (p<0.05). The heating process of colostrum, however, makes the protein easy to clot. It happens because 60% increase in colostrum makes the texture of kefir rather rough. Another factor that influences the texture of kefir is the concentration of kefir grain [2].

4. Conclusion
Kefir produced with raw material combination (cow milk and colostrum) generates different physical characteristics and sensory. The texture profile has relatively the same hardness and cohesiveness with the increase in gumminess. Sensory characteristics of flavour, aroma, colour and texture of kefir are influenced by the combination of raw materials used.
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