Psychochemical and Organoleptic Characteristics of Colostrum Kefir as Antibacterial

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Psychochemical and Organoleptic Characteristics of Colostrum Kefir as Antibacterial

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Abstract. This study aims to create and analyze psychochemical, and organoleptic characteristics of colostrum kefir as an antibacterial. Colostrum kefir is made using a three-factor completely randomized design method with three replications. Psychochemical characterization includes pH, specific gravity, lactic acid content, and alcohol content, while the aspects of organoleptic testing by panelist include color, aroma, taste, texture, and viscosity. This study has succeeded in making colostrum kefir under the optimum condition, at 20% grain kefir, with 48-hour fermentation at 28 °C with the characteristics as follows; pH 3,31-3,65; lactic acid content 1,96-2,83 %; alcohol content 0,38-0,59 %; and Specific gravity 1,030-1,046 mg/mL. Moreover, the results of organoleptic testing show that the colostrum kefir obtained is yellowish orange, sour, rather soft and thick and has a rather typical kefir aroma.

1. Introduction

Recently, there has been a trend toward the increase in demand for functional food globally, along with the rise in awareness to reduce the risk of disease and improve the quality of health (1). Demand for functional food in Europe was reported to reach 14%, the United States 38%, while Japan as first ranks by 40% (2). Indonesia itself listed as one of the most significant functional food markets in Southeast Asia (1). Several types of functional food have been distributed to the community, including dairy products, probiotics, yogurt, kefir, and koumiss (2). Milk kefir has long been believed to have various health benefits (3) from its antioxidant (4), anticancer (5), antidiabetic (6), antihypertensive (7), antimicrobial (8), and anti-odor (for petai) (9) activity to its skin care properties (10). Nowadays, there is even increasing attention to milk kefir, including its production at industrial scale (11).

The types of ingredients used as milk kefir include cow milk, soy milk (12), goat milk (13), and camel milk (14). However, there has been no report to date about colostrum kefir namely colostrum milk fermented with kefir probiotics. Whereas, colostrum has many features including very high protein content (15) mainly composed of immunoglobulin (16), lactoferrin (17), casein, growth factors, enzymes, cytokines, nucleosides, nucleotides, vitamins, minerals, and lipids (15). The benefits of colostrum for health include its ability to modulate the body immune system (18), and its antiviral (19) and antimicrobial activities (20).

However, colostrum is very susceptible to microbial contamination (21) and also not resistant to heating due to its high protein content (15). Therefore proper treatment is required so that its function can be utilized optimally for human health. One of the efforts possible to make is to ferment colostrum using kefir probiotics. Hence, this study studies further regarding the optimum fermentation condition

and psychochemical and organoleptic characteristics of colostrum kefir as the materials for testing its antibacterial properties.

2. Methods

2.1. Colostrum material collection

The raw material of colostrum obtained from cattle farms around the foot of Manglayang Mountain, namely the first milk colostrum (P1), 24 hours after postpartum.

2.2. Kefir grain collection

Kefir grain obtained through purchases from activists of Indonesian Kefir Community in Bandung. This kefir grain has been previously identified in the UNPAD Microbiology Laboratory, Jatinangor, to determine the type and number of microbes composing the grain.

2.3. The making of colostrum kefir using kefir grain as the starter

The making of kefir colostrum was done by modifying the previous work (22). Briefly, 250 mL of P1 colostrum is fermented by inoculating kefir grain 10%, 15%, and 20%, respectively in food grade plastic fermenters then stirred slowly using a stainless stirrer until homogeneous. Next, it is incubated for 24, 48, and 72 hours, with occasionally stirring after 12, 24, and 48 hours. The optimum fermentation condition is determined using three-factor completely randomized design with three replications based on kefir grain concentration and fermentation time. The first factor is the starter dose of kefir grain, namely 10%, 15%, and 20% and the second factor is the fermentation time, namely 24, 48, and 72 hours. The result of this stage is in the form of data of the optimum time and concentration of kefir grain to produce colostrum kefir.

2.4. Determination of the characteristics of fermented colostrum kefir

The psychochemical characteristics of colostrum kefir refer to the previous work (22), including pH, lactic acid content, alcohol content, and specific gravity. The organoleptic testing uses parameters including taste, aroma, color, texture, and viscosity (23).

3. Results and Discussion

3.1. The degree of acidity (pH)

The degree of acidity indicates the level of acidity (pH) of a product. The observations show that during the colostrum fermentation process there has been a change in pH as a sign of the fermentation process (7). The initial pH of Cow colostrum as a raw material in this fermentation is 5.25, and then after fermentation with the starter, i.e., kefir grain, 10%, 15%, and 20%, it decreases to 3.31 and 3.65. The formation of Lactic acid causes the acidity of kefir as the product of milk/lactose sugar decomposition (7) by lactic acid bacteria contained in kefir grains. The result of the average pH of colostrum kefir produced from each treatment presented in Table 1.

3.2. Lactic acid content

As previously stated, lactic acid contained in kefir is produced from the decomposition of lactose by lactic acid bacteria. This also causes milk kefir in general and colostrum kefir in this work to be acidic indicated by pH ranging from 3.35 to 3.65. Furthermore, the Lactic content is calculated based on the titration results of each sample using NaOH 1N. In this study, the highest content of Lactic acid is produced by colostrum kefir sample F, i.e. 2.83% while sample A i.e. 1.96% produces the lowest content. Meanwhile, the quality requirement of kefir according to CODEX-STAN 243-2003 is at least 0.6% (24), meaning that the colostrum kefir obtained has met the criterion.

Table 1. Psychochemical characteristics of colostrum kefir

Sample[a]	Parameter			
	pH	Lactic acid(%)	Alcohol (%)	Specific gravity (g/mL)
A	3,65	1,96	0,39	1,030
B	3,62	1,97	0,38	1,033
C	3,61	1,98	0,38	1,038
D	3,35	2,64	0,50	1,041
E	3,40	2,50	0,55	1,046
F	3,31	2,83	0,46	1,040
G	3,40	2,52	0,57	1,043
H	3,41	2,50	0,52	1,043
I	3,40	2,46	0,57	1,042

[a] A=d1w1, B= d2w1, C= d3w1, D= d1w2, E= d2w2, F= d3w2, G= d1w3, H= d2w3, I= d3w3

3.3. Alcohol content

Alcohol contained in kefir is produced from the decomposition of glucose by the *Saccharomyces cereviceae* yeast contained in kefir grain. Based on Table 1, in this study, the highest alcohol content is produced by colostrum kefir samples G and I, i.e., 0.57% while samples B and C provides the lowest content, i.e., 0.38%. It means that the amount of yeast in the sample with 20% concentration of kefir grain is more than the other two concentrations. According to CODEX STAN 243-2003, kefir contains at least 10^4 CFU/g (24). The existence of Alcohol in kefir is a typical sign, distinguishing it from other fermented dairy products such as yogurt.

3.4. Specific gravity

Specific gravity is one of the physical parameters in milk fermentation. Based on Table 1, the specific gravity of kefir colostrum resulted in ranges from 1,030-1,046 g / mL. The colostrum kefir sample E shows the highest specific gravity, i.e., 1,046 g / mL while the lowest Specific gravity is demonstrated by sample A, i.e., 1,030 g / mL. Compared with the specific gravity of colostrum material used, i.e. 1,029 g / mL, the colostrum kefir resulted after fermentation in this study has a higher specific gravity than before fermentation. The data in Table 1 show that the lower the pH, the higher the specific gravity of the colostrum kefir produced. The previous report (25) states that the psychochemical characteristic of kefir products was determined by the condition of the growth of the kefir starter.

3.5. The organoleptic testing results of colostrum kefir

The organoleptic testing results of colostrum kefir done by seven panelists presented in Table 2. Based on the results of the testing, the panelists generally state that all colostrum kefir samples are yellowish orange, sour, slightly soft and thick and have a somewhat typical kefir aroma.

Table 2. Organoleptic testing of colostrum kefir

Assessment criteria		Sample								
		A	B	C	D	E	F	G	H	I
Color	Very orange	0	2	0	0	0	0	0	0	0
	Yellowish orange	4	5	4	5	6	5	4	5	4
	A little orange	1	0	2	2	1	2	2	1	1
	Orange	2	0	1	0	0	0	1	1	2
	Yellow	0	0	0	0	0	0	0	0	0
Aroma	Very typical of kefir	1	2	0	0	0	0	1	1	0
	typical of kefir	0	2	2	0	1	1	1	1	1
	rather typical of kefir	5	3	3	6	4	5	5	4	6
	Typical of Milk	1	2	1	1	2	1	0	1	0

	Rather typical of butter	0	0	1	0	0	0	0	0	0
	Typical of butter	0	0	0	0	0	0	0	0	0
Taste	Very sour	0	0	0	0	0	0	0	1	1
	A little sour	1	2	2	1	2	1	1	1	1
	sour	5	4	3	5	4	6	5	4	5
	rather sour	1	1	2	1	1	0	1	1	0
	Not sour	0	0	0	0	0	0	0	0	0
	Not very sour	0	0	0	0	0	0	0	0	0
Texture	Very soft	0	0	0	0	0	0	0	0	0
	soft	3	0	1	0	1	1	0	0	0
	Rather soft	3	6	5	4	4	5	5	6	6
	Medium	1	0	1	2	1	1	2	1	0
	Rather hard	0	1	0	1	2	0	0	0	1
	hard	0	0	0	0	0	0	0	0	0
	Very hard	0	0	0	0	0	0	0	0	0
Viscosity	Very thick	0	0	3	1	1	2	1	1	2
	Thick	1	4	4	4	5	4	5	6	5
	Rather thick	2	3	0	2	1	1	0	1	0
	Medium	3	0	0	0	0	0	1	0	0
	A little thin	0	0	0	0	0	0	0	0	0
	thin	1	0	0	0	0	0	0	0	0
	Very thin	0	0	0	0	0	0	0	0	0

Compared with Indonesian national standards (SNI) for similar fermentation products, namely yogurt (SNI 2981: 2009), the organoleptic characteristics of colostrum kefir produced indicates criteria that meet the standard. Considering that there is no SNI for kefir and its derivatives to date, this study uses SNI for similar products namely yogurt. The comparison of colostrum kefir obtained in this study with the criteria for quality requirements of SNI 2981: 2009 presented in Table 3.

Table 3. Comparison of characteristics of colostrum kefir with SNI 2981:2009

Assessment criteria	colostrum kefir	SNI 2981:2009
Appearance	thick	Viscous liquid - Solid
odor / aroma	Rather typical of kefir	normal/typical
Taste	sour/typical	sour/typical
Consistency	homogeneous	homogeneous
Lactic acid content (%)	1,96-2,83	0,50-2,00

Furthermore, based on the results of this study, the bioactivity of the colostrum kefir obtained is tested as an antimicrobial, both for bacteria and for pathogenic fungi.

4. Conclusion

This study has succeeded in making colostrum kefir meeting the criteria for CODEX STAN 243-2003 and SNI 2981:2009 with the characteristics as follows: pH 3,31-3,65; Lactic acid content 1,96-2,83 %; Alcohol content 0,38-0,59 %; Specific gravity 1,030-1,046 mg/mL; and organoleptic attributes as follows: yellowish orange, sour, slightly soft and thick with a rather typical kefir aroma.

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