EFFECT OF AGING TIME AND VACUUM DRYING ON PROXIMATE ANALYSIS AND AMINO ACID LEVELS OF GOAT MILK KEFIR
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EFEK WAKTU AGING DAN PENGERINGAN VAKUM PADA ANALISIS PROKSIMAT DAN TINGKAT ASAM AMINO DARI KEFIR SUSU KAMBING

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ABSTRACT
Goat milk kefir has high nutritional value, especially in protein and calcium content and has a low lactose content. Vacuum drying is an alternative to remove the water content in kefir so that it can extend the shelf life because it inhibits bacterial growth. This study determines the effect of aging time and drying time using vacuum drying method on the characteristics and amino acid composition of goat milk kefir (kefir and powder kefir). Fermented goat milk (24 hours) use kefir grains without aging and with aging times of 1, 2, 3, 4 (week). The total titrated acid and fat content were significantly different in kefir, but it is not significantly different in powder kefir. The yield, moisture, ash, protein, fiber, and fat in both kefir and powder kefir did not show significant differences. The best treatment based on the exponential comparison method for both powder kefir and kefir was 3 weeks of aging time. Therefore, the amino acid components in powder kefir and kefir underwent changes. The highest total amino acids in kefir was kefir without aging. The highest amino acid of powder kefir was obtained after 2 weeks of aging time.

ABSTRAK
Kefir susu kambing memiliki nilai gizi tinggi terutama pada kandungan protein dan kalsium serta memiliki kandungan laktosa rendah. Pengeringan vacuum drying merupakan salah satu alternatif untuk menghilangkan kadar air pada kefir sehingga dapat memperpanjang lama waktu simpan karena mampu menghambat pertumbuhan bakteri. Penelitian ini bertujuan untuk mengetahui pengaruh waktu aging dan waktu pengeringan dengan metode pengeringan vakum terhadap karakteristik dan komposisi asam amino kefir susu kambing (kefir dan kefir bubuk). Susu kambing fermentasi (24 jam) menggunakan butiran kefir tanpa waktu aging dan dengan waktu aging 1, 2, 3, 4 (minggu). Kandungan total asam dan lemak yang dititrasi berbeda nyata pada kefir, namun tidak berbeda nyata pada kefir bubuk. Rendemen, kadar air, abu, protein, serat, dan lemak baik pada kefir maupun kefir bubuk tidak menunjukkan perbedaan yang nyata. Perlakuan terbaik berdasarkan metode perbandingan eksponensial untuk kefir bubuk dan kefir bubuk adalah waktu aging 3 minggu. Oleh karena itu, komponen asam amino pada kefir bubuk dan kefir mengalami perubahan. Total asam amino tertinggi pada kefir tanpa aging. Komponen asam amino bubuk kefir tertinggi diperoleh setelah waktu aging 2 minggu.

INTRODUCTION
Milk is a food with high nutritional content. Milk has a very high-water content, which is around 87.5% and is equipped with 5% sugar (lactose) content, 3.5% protein and 3-4% fat (*Suhartanti & Septian, 2014*). The protein content in milk is very rich in lysine, which is an important amino acid that cannot be produced by the human body (*Nyakayiru et al., 2020*). In addition, milk also contains calcium, phosphorus and vitamin A which are very beneficial for the body (*Woźniak et al., 2022*).

Among the various types of milk, goat milk can be consumed directly (*Nayik et al., 2021*). Every 100 g of goat milk contains higher essential and non-essential amino acids than cow's milk, namely Thr, Ileu, Leu, Lys, Met, Cys, Phe, Tyr, Val, Arg, His, Ala, His, Asp, Glu, Gly, and Pro (*Raynal-Ljutovac et al., 2008*). Goat milk has natural antiseptic properties, has a mild laxative effect and contains easily digestible fat (*Clark & Mora García, 2017*). Even though it has many health benefits, goat milk is less desirable because of the distinctive bad aroma and the goaty flavor it has (*Nayik et al., 2021*).

Even though milk has excellent nutritional content, not everyone can get the good benefits from milk (*Santoso et al., 2020*). This is caused by lactose intolerance and protein intolerance. In addition, the durability of milk is very limited or easily damaged at room temperature (*Santoso et al., 2021*). To extend the shelf life, usability and increase the economic value of milk, it is necessary to apply a processing technique, one of which is through the fermentation process (*Santoso et al., 2023*). The fermentation process can lower the lactose content by hydrolyzing lactose to galactose and lactose (*Yamamoto et al., 2021*).

In the post-Covid-19 pandemic era, people tend to pay more attention to a healthy lifestyle, including the consumption of healthy foods (*Timpanaro & Cascone, 2022*). The shift in the paradigm of this society causes the need for functional food ingredients to increase. Functional food ingredients are food products that not only have nutritional value, but also provide health benefits. One of the functional food products is kefir (*Sulmiyati et al., 2019*). Kefir is a dairy product produced from the alcoholic acid fermentation of milk using kefir seeds (*Kesenkaş et al., 2017*). Kefir has many health benefits such as increasing body immunity and overcoming various diseases (*Aryanta, 2021*). In addition, kefir-derived exopolysaccharides have significant anti-obesity effects which may be due to their involvement in changes in the gut microbiota (*Lim et al., 2017*).

Based on previous research (*Sulmiyati et al., 2018*), it showed that goat milk kefir has better quality compared to kefir made from cow's milk. Goat milk kefir has high nutritional value, especially in protein and calcium content and has a low lactose content (*Satir & Guzel-Seydim, 2023*). The superiority of goat milk which contains short-chain fatty acids and easily digestible protein makes the quality of goat milk kefir also better. In addition, yeast in kefir has proteolytic activity which is used to support the growth of lactic acid bacteria by releasing peptides and amino acids (*Ferreira et al., 2010*).

Kefir amino acid levels are affected by the milk used (*Nurliyani et al., 2014*). The fact that the total amino acid content of goat milk was higher when compared to cow's milk, especially in the levels of valine, isoleucine, leucine and lysine (*Nayik et al., 2022*).

Long shelf life is one of the important factors in the provisions of production standards. Based on previous research (*Putri et al., 2020*), at cold temperatures (5-10°C) kefir can be stored for up to 24 days without damage to kefir. The aging requires low temperatures so the consistency of kefir quality can be maintained. Based on these problems, powder kefir was developed to extend the shelf life of kefir at room temperature.

Powder kefir can be produced through several methods. Previous research *(Nurwantoro et al., 2020)* has carried out kefir drying using the freeze drying, spray drying, and cabinet drying methods with the best treatment obtained by using spray drying method. However, spray drying method still requires a relatively long time (36 hours) and is carried out at high temperatures, so it can cause denaturation of protein compounds and reduce protein levels. Besides, spray drying method is less economic. As an alternative, vacuum drying method is a potential method which is mild operation temperature and takes less time than conventional drying (*Kresnowati et al., 2018*). Vacuum drying promotes a hermetic seal to prevent leakage, so external contamination is prevented from penetrating into the oven. Previous studies, vacuum drying was applied for production of fermented cassava flour (*Kresnowati et al., 2018*). Vacuum drying also used to get butterfly-pea milk powder (*Hariadi et al., 2023*). The studies reveal that vacuum drying does not significantly remove the valuable content of the products.

This study aims to determine the chemical characteristics and composition of amino acids with different aging times and to determine the effect after being dried using vacuum drying method. The effect of aging time and using vacuum drying is evaluated for improving the product value. Determination of amino acid composition is carried out in order to evaluate the change of amino acid contents.

MATERIALS AND METHODS

The used materials were goat milk kefir, gum arabic, NaOH 0.1 N, phenolphthalein indicator, methylene blue indicator, methylene red indicator, selenium mixture, H_2SO_4 p.a. (Sigma Aldrich), aquades, NaOH p.a. (Sigma Aldrich), H_2SO_4 0.1 N, H_2SO_4 0.3 N, NaOH 1.5 N, filter paper, and acetone. The used tools were Erlenmeyer, Biuret, clamp, stative, pipette, measuring cup, digital balance, petri dish, porcelain cup, glass stir bar, vacuum drying, oven, desiccator, exicator, hotplate, chemical glass, heather extract, Buchner funnel, Fatex-S, and Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS) (of LPPT II UGM). Waters AcquityH UPLC® Class Quaternary Solvent Manager and Xevo TQD MS (Waters, USA) were employed for analysis.

Producing Goat Milk Kefir

Pure goat milk 1 L was pasteurized at 70 ℃ for 15 seconds (steam sterilizer, Tomy S-500). It was cooled down to 40 ℃ then mixed with 3% kefir grain. As incubation, goat milk was fermented at room temperature for 24 hours (Incucell). It was then followed by the aging process at 4 ℃ in refrigerator. Two methods of milk treatment were used, the first included an aging stage of 1-4 weeks, while the second involved processing without aging. The kefir was then mixed with 5% (w/v) gum arabic, stirred until it became homogeneous, and then vacuum-dried at 65 °C for 4 hours. The processes of aging and drying of goat milk kefir are shown in Figure 1.

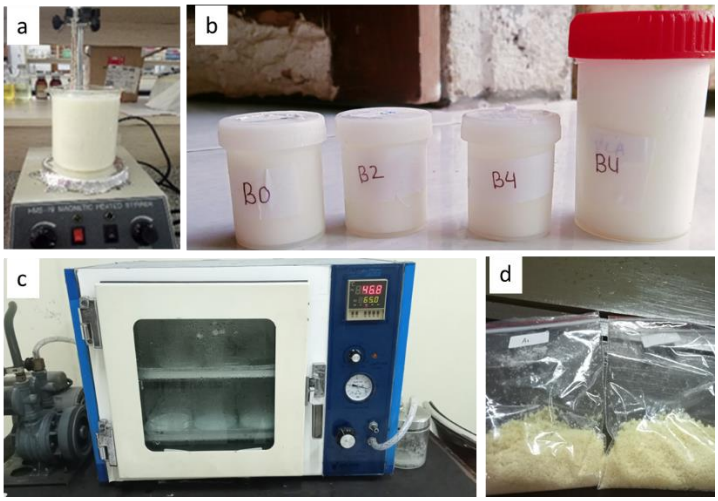

Fig. 1 - Producing of goat milk kefir
a – local goat milk, b – mixing kefir, c – vacuum drying, d – powder kefir

Proximate Analysis of Kefir and Powder Kefir

After producing, kefir and powder kefir were characterized as below. All data in this characterization was processed using the Statistical Package for the Social Science (SPSS) application.

Calculation of Total Titrated Acid Content

1 mL of kefir and powder kefir sample were each put into Erlenmeyer and added 2-3 drops of phenolphthalein indicator. Then the sample was titrated using 0.1 N NaOH solution until it turned pink.

Moisture content test

The sample was weighed and then dried for 24-48 hours at 40 – 60 ℃. After drying, the sample was weighed again as much as 5 grams. The cup was heated in an oven at 105 ℃ for ± 1 hour and cooled in a desiccator and then weighed. The sample was placed into the cup. Samples were put in an oven at 105 ℃ for ± 4-6 hours. The sample was then cooled in desiccator and weighed.

Ash Content Analysis

The crucible was heated in a furnace at 400-600 ℃ and cooled in a desiccator. Weigh the cup (X). 5 grams of sample was weighed and put in a cup and weighed (Y). The sample was burned on a hot plate until it is not smoking. It was put in the furnace and then cooled. It was then weighed (Z).

$$\%A = \frac{Z - X}{Y} \times 100\% \quad (1)$$

where:

$\%A$ - ash content; Z - weigh of cup + final sample; X - cup weight; Y - weigh of cup + initial sample

Analysis of Crude Protein Levels

0.3 grams sample was added with 1.5 grams of selenium mixture catalyst. It was then put in a Kjeldahl flask and added 20 ml of concentrated H_2SO_4. The destruction was carried out until the color of the solution became yellowish green – clear and then cooled for ± 15 minutes. 300 ml of distilled water was added and then cooled again. After adding 100 ml of 40% NaOH (technical), distillation was carried out. The distillation results were collected with 10 ml of H_2SO_4 which had been added with 3 drops of mixed indicators, namely methylene blue and methylene red. It was then titrated with 0.1 N NaOH until the color changes from purple to blue-green. The blank was determined as follows: 10 ml of 0.1 N H_2SO_4 was added to 2 drops of phenolphthalein indicator and then titrated with 0.1 N NaOH. The crude protein content was calculated as follows:

$$\%CP = \frac{V_b - V_s \times N \times 14 \times 6.25}{g} \times 100\% \quad (2)$$

where: $\%CP$ - crude protein; V_b - volume of blank (mL); V_s - volume of sample (mL); g - sample weigh (mg).

Analysis of Crude Fiber Content

1 gram sample (x) was put into the heather extract tool. Then, it was added 50 ml of 0.3 N H_2SO_4, boiled for 30 minutes. Then, it was added 25 ml of 1.5 N NaOH, boiled for 30 minutes. The filter paper that has been heated in an oven at 105 ℃ for 1 hour was weighed on a digital balance (a). The mixture was filtered using a Buchner funnel. Filtering was carried out with a suction flask connected to a vacuum pump. It was then washed using 50 ml of hot water, 50 ml of 0.3 N H_2SO_4, 50 ml of hot water and 25 ml of acetone. The filter paper and its contents were dried in an oven at 105 ℃ for 1 hour. The sample was then cooled using a desiccator and weighed (Y). After cooling, the cup was put into the furnace (400-600 ℃). Furthermore, the cup was cooled and then weighed (Z). The calculation of crude fiber content was as follows:

$$\%CF = \frac{Y - Z - a}{x} \times 100\% \quad (3)$$

where: $\%CF$: crude fiber, Y: weigh of cup + initial sample, Z: weigh of cup + final sample, a: filter paper weigh, x: sample weigh.

Analysis of Crude Fat Content

The filter flask filled with boiling stones was heated at 105-110 ℃ and then cooled in a desiccator. The filter flask (a) was weighed. 1 gram sample (x) was weighed. It was put in a filter sleeve and covered with non-fat cotton. The filter sleeve was inserted into the Soxhlet and filtered using petroleum benzene. The extractor was connected to the condenser. This process was performed using the FATEX-S. The filter flask was removed from the FATEX-S apparatus and then dried in an oven at 105-110 ℃ for 4-6 hours. The sample was cooled and weighed the final weight (b). Crude fat content was calculated as follows:

$$\%CL = \frac{b - a}{x} \times 100\% \quad (3)$$

where: $\%CL$: Crude Fat, b: weigh of flask + final weigh, a: weigh of flask + initial sample, and x: sample weigh.

Determination of amino acid composition

Samples of powder kefir ± 2 g and kefir ± 4 g were taken. The sample was put in a 50 mL screw tube. 20 mL of 6N HCl was added. It was then hydrolyzed in an autoclave at 110 ℃ for 12 hours. Next, it was neutralized with 6N NaOH. With 100 mL, it was filtered with a 0.22 µm filter. Finally, 5 µL sample was injected in LC-MS. The LC-MS was carried out at condition: capillary of 3.5kV, desolvation temperature of 500℃, dissolvation of 1000 L/h and collision energy of 15V. The used mobile phases were 0.1% PDFOA (pentadecafluorooctanoic acid) of 99.5 % : 0.5 % water/CH_3CN with 0.1 % formic acid and 0.1% PDFOA, 10%: 90 % water/CH3CN with 0.1 % formic acid by the flow of 0.6 mL/min (*Puspita et al., 2020*). The obtained data was analyzed by MassLynx V4.1 software. The obtained data were compared with the library of the software.

RESULTS

Yield of goat milk kefir

The yield of goat milk kefir from the initial treatment until 2 weeks increased with the length of aging time. However, the aging time did not show a significant difference (P>0.05) to the amount of yield produced. Based on Figure 2, it can be seen that the highest yield is after 2 weeks of aging time. The lowest yield value is treatment without aging.

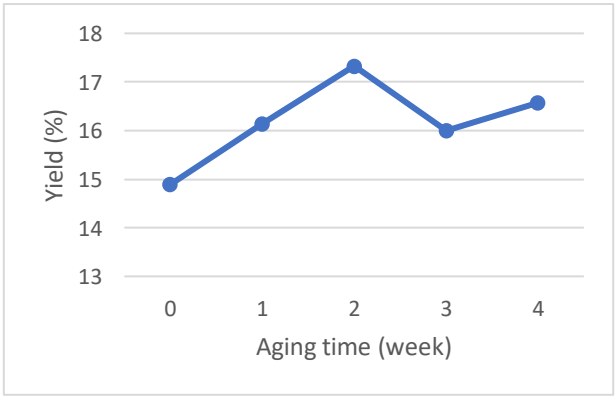

Fig. 2 - Yield of goat milk kefir toward aging time (zero (0) of aging time equals to "without aging")

The higher yield value was affected by the addition of gum arabic as filler. Fillers added in the manufacture of instant beverage products will cause a larger volume and increase the total solids, so the yield will also increase (*Yuliwaty & Susanto, 2015*). The higher the yield, the higher the economic value. Next, proximate analysis was carried out as listed in Table 1.

Table 1

Proximate analysis of goat milk kefir based on aging time

Kefir Type	Aging time	Total of titrated acid	Moisture	Ash	Protein	Fiber	Fat
	Week	%	%	%	%	%	%
kefir	Without aging	1.55	87.93	6.47	19.92	3.23	38.30
	1	1.73	87.73	6.25	19.32	2.81	38.53
	2	1.89	87.93	5.83	16.86	4.33	40.79
	3	2.18	87.66	6.24	19.36	5.98	44.65
	4	2.00	87.57	6.09	19.06	4.26	42.14
Powder kefir	Without aging	1.10	10.27	5.69	18.07	2.01	28.60
	1	1.11	11.68	5.64	18.94	1.45	26.86
	2	1.10	12.01	5.87	18.29	1.42	25.20
	3	1.03	9.34	5.48	17.40	1.84	27.66
	4	1.05	10.57	5.55	16.90	0.89	28.30

Based on Table 1 of total titrated lactic acid, lactic acid levels have increased, with the highest lactic acid levels shown by kefir after 3 weeks of aging time, i.e.: 2.18%. However, powder kefir after 3 weeks of aging time obtained the lowest lactic acid content, i.e.: 1.03%. So, powder kefir has lower levels of lactic acid when compared to kefir (*Zakaria et al., 2013*).

The total lactic acid in kefir showed a significant difference ($P<0.01$) to the length of time it was stored at refrigerator temperature. However, the lactic acid content of kefir only meets the SNI standard until 2 weeks of aging time, where the SNI for yogurt which is also set for kefir standardization is between 0.5 – 2.0%. The longer the aging, the more decreased the pH of kefir. Low pH is a good environment for the growth of lactic acid bacteria (*Mal et al., 2013*). After the vacuum drying process, the total lactic acid in powder kefir did not show a significant difference ($P>0.05$) to the length of aging time. Total acid depends on the supply of nutrients, temperature, time, water and oxygen availability (*Setiawati & Yunianta, 2018*). However, the lactic acid content during aging complies with SNI standards.

Based on Table 1 of moisture content, powder kefir after 3 weeks of aging time showed the lowest moisture content, i.e.: 9.34%. Kefir with the highest moisture content was shown by treatment without aging, which was 87.93%. Then, the moisture content of kefir is much higher than powder kefir. The uses drying method causes a decrease in moisture content due to the evaporation of water in kefir (*Atalar & Dervisoglu, 2015*).

Statistical analysis of kefir and powder kefir was not significantly different ($P>0.05$) toward aging time. Based on the highest moisture content, kefir in this study was not much different from other study (*Setyawardani & Sumarmono, 2015*) where the moisture content in goat milk kefir stored at 6 – 10 ℃ for 30 days ranged from 87.572% to 88.108% . In food, moisture content is an important component that can affect appearance, texture and taste (*Pandiselvam et al., 2022*). The moisture content in yogurt according to SNI 2981:2009 is between 83% -84%. So, the texture of kefir is thinner than a yogurt. The different textures are made possible by different starters, where the kefir grains convert milk lactose into lactic acid, causing kefir to be thinner. Powder kefir has a higher moisture content than other study (*Rizqiati et al., 2021*), but does not meet SNI 01-2970-2006 (maximum 5%). High moisture content makes it easier for microbial growth to occur (*Rizqiati et al., 2020*).

Based on Table 1 of ash content, the ash content after 2 weeks of aging time showed opposite results. On 2 weeks of aging time, ash content of kefir showed the lowest levels. However, ash content of powder kefir showed the highest levels. Therefore, the average, ash content in kefir was higher than powder kefir.

Aging time had no significant effect (P>0.05) on the ash content of powder kefir or kefir. Kefir consisting of protein, fat and ash has relatively small variations during the aging period (*Setyawardani et al., 2017*). The average ash content of kefir was 6.18% and the average ash content of powder kefir was 5.64%.

In this study the ash content produced did not meet SNI 7552:2009, which is a maximum of 1.0%. On the other hand, this study shows that the used drying method can reduce the ash content of kefir.

Based on Table 1 on protein content, the average protein content of goat milk kefir is higher than powder kefir for treatment without aging, which was 19.92%. In this study, processing milk at high temperatures can cause protein denaturation resulting in a decrease in protein content (*Nurwantoro et al., 2020*). However, the difference in the levels of kefir and powder kefir in this study was not significantly different (P>0.05).

The results of statistical analysis showed that aging time had no significant effect (P>0.05) on the protein content of goat milk kefir and powder kefir, as an obtained result of other study (*Sarica & Coşkun, 2021*) where protein levels during 1–35 days of aging time ranged from 3.06 ± 0.003% to 3.10 ± 0.009%. When fermented for 24 hours, kefir microbes produce optimal biomass and increase protein availability (*Susanti & Utami, 2014*). The protein content of kefir up to 4 weeks of aging time still meets the international standard Codex Stand 243-2003, which is at least 2.7%. However, the protein content in powder kefir does not meet SNI 01-2970-2006 regarding powder milk, which is at least 23%.

Based on Table 1 of fat content, the fat content in kefir showed a significant difference (P<0.05). The highest fat content of kefir was obtained after 3 weeks of aging time. However, the fat content of powder kefir did not show a significant difference (P>0.05) toward aging time, where the highest fat content was obtained for treatment without aging. So, the fat content of powder kefir is lower than kefir.

The results of fat contents are in accordance with the international standards codex booth 243-2003 for fermented milk and SNI 01-2970-2006 regarding powder milk. The activity of lactic acid bacteria from kefir seeds will produce lipase enzymes which will affect the fat content. When lactic acid bacteria increase and produce more lipase enzymes, the hydrolyzed fat also increases, so the fat content decreases (*Dewi et al., 2020*). However, in this study, the lactic acid level is directly proportional to the fat level produced. It is possible that, during aging time, the release of lipase enzymes by lactic acid bacteria does not occur, so the fat content of kefir does not decrease (*Setyawardani et al., 2017*).

Fiber content is a compound that cannot be hydrolyzed by acids or bases and can be used as an index of dietary fiber content, because it usually contains 0.2–0.5 parts of dietary fiber (*Korompot et al., 2018*). From Table 1 of Fiber content, the highest fiber content in goat milk kefir was shown by kefir after 3 weeks of aging time, i.e.: 5.98%. In this study, the lowest fiber content was on powder kefir after 4 weeks of aging time, i.e.: 0.89%. So, powder kefir has a lower fiber content than kefir.

The reduction of fiber content is made possible by the use of fiber to support the goat milk kefir fermentation process (*Mumpuni et al., 2020*). The increasing fiber content during 1 week until 3 weeks was caused by the 24-hour fermentation time which caused bacteria to grow optimally, so the decomposition of sucrose into cellulose increased the fiber content (*Wasilu et.al., 2021*).

The best treatment of goat milk kefir dried by vacuum drying method

Selection of the best treatment on kefir and powder goat milk kefir products based on aging time using the Exponential Comparison Method (MPE). The Exponential Comparison Method is a method in a decision support system by ranking decision priorities based on several criteria (*Napian & Meiriza, 2020*).

With this method, the value of the difference between each criterion can be distinguished (*Suranti, 2018*). Based on the results of the calculation for the characterization results of goat milk kefir, the best treatment is 3 week of aging time, both for kefir and powder kefir. Based on the results of statistical analysis, it was found that the characteristics of kefir were very significantly different (P>0.05). The nutritional content of kefir is significantly different after drying using vacuum drying at 65 °C for 4 hours.

Amino acid components of the produced goat milk kefir

Kefir contains vitamins of B1, B2, B5 and C, minerals and essential amino acids which are beneficial in improving fitness, healing processes and homeostasis (*Farag et al., 2020*). The amino acid profile of fermented milk and kefir has higher levels than milk, namely threonine, serine, alanine, lysine and ammonia (*Arslan, 2015*). Goat milk kefir in this study based on Table 2 contains amino acids, such as arginine, histidine, lysine, phenylalanine, isoleucine, leucine, tyrosine, methionine, valine, proline, glutamic acid, aspartic acid, cysteine, threonine, serine and glycine. In this study, the amino acid component with the highest levels was lysine. Lysine is an essential amino acid for humans which is needed for health and can play a role in immune therapy to accelerate wound recovery (*Datta et al., 2001*).

Table 2

Amino acid components of goat milk kefir toward aging time

compound	Powder kefir (%)			Kefir (%)		
	Without aging	2 weeks	4 weeks	Without aging	2 weeks	4 weeks
L-Arginine	0.86	1.02	1.04	0.63	0.48	0.68
L-Histidine	0.56	0.61	0.58	0.31	0.23	0.28
L-Lysine	2.00	2.01	2.12	0.89	0.71	0.81
L-Phenylalanine	0.65	0.65	0.59	0,29	0,24	0,30
L-Isoleucine	0.74	0.73	0.70	0.32	0.26	0.31
L-Leucine	0.98	1.02	0.98	0.47	0.41	0.44
L-Tyrosine	0.11	0.13	0.11	0.12	0.09	0.12
L-Methionine	0.13	0.16	0.15	0.23	0.14	0.17
L-Valine	1.03	1.02	1.01	0.41	0.33	0.38
L-Proline	0.05	0.07	0.05	0.04	0.03	0.03
L-Glutamic Acid	0.98	1.03	0.96	0.48	0.41	0.46
L-Aspartic Acid	1.07	1.04	1.08	0.52	0.42	0.55
L-Threonine	0.60	0.59	0.55	0.30	0.24	0.29
L-Serine	0.83	0.87	0.86	0.42	0.35	0.44
L-Glycine	0.07	0.31	0.22	0.17	0.05	0.11

Powder kefir with different aging times contains different amounts of amino acids. Total amino acids of powder kefir based on aging treatments were 10.67% (without aging), 11.27% (2 weeks of aging time) and 11.00% (4 weeks of aging time). Based on these results, powder kefir was higher after 2 weeks of aging time, especially the components histidine, leucine, tyrosine, methionine, proline, glutamic acid and serine.

Based on Figure 3, kefir has different total amino acid content. Total amino acids of kefir with aging treatments were 5.61% (without aging), 4.39% (2 weeks of aging time) and 5.37% (4 weeks of aging time). Kefir without aging had higher total amino acids, especially in the components of histidine, lysine, leucine, methionine and glycine. The highest amino acid component of kefir in this study was lysine, and the lowest amino acid component was proline. The amino acid component in this study was much higher than other study (*Nurliyani et al., 2014*). The essential amino acids found in kefir play a significant role in regulating protein, glucose and lipid metabolism and have a positive effect on weight management, maintenance of immune response, and energy balance (*Farag et al., 2020*).

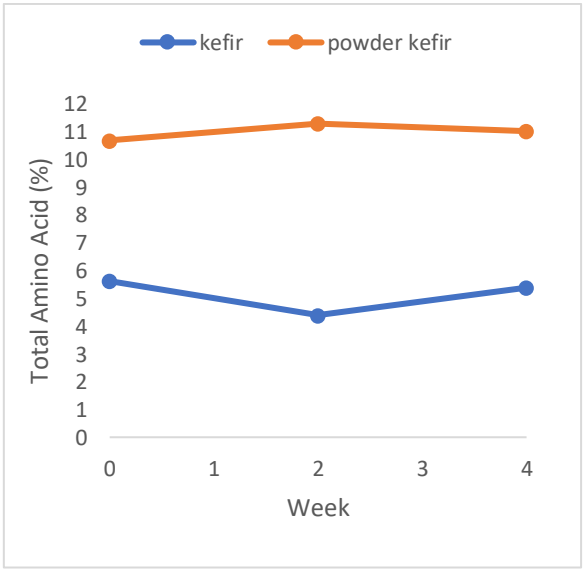

Fig. 3 - Changes in amino acid components after various aging time of kefir and powder goat milk kefir (zero (0) of aging time equals to "without aging")

CONCLUSIONS

This study showed that the total titrated acid and fat content of kefir were significantly different, but powder kefir was not significantly different based on all aging treatments. Yield, and proximate analysis (moisture content, ash content, protein content and fiber content) did not differ significantly with specified aging time. The best treatment based on the exponential comparison method for both powder kefir and kefir is kefir with an aging time of 3 weeks. Based on specified aging time, the amino acid components in powder kefir and kefir underwent changes. The highest total amino acids were in kefir without aging. The highest amino acid component of kefir powder was obtained at 2 weeks of aging time. Based SNI, the both kefir (kefir and powder kefir) have slightly enough quality, but moisture of powder kefir is much lower than the moisture of kefir. The future prospects were sensory and microbiology analysis for evaluating the taste and human health.

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