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Sensory profile analysis of Sumbawa ruminants milk using quantitative descriptive analysis and check-all-that-apply methods

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Abstract

West Nusa Tenggara, particularly Sumbawa had suitable condition for livestock production, including cow, buffalo, equine, and goat. Those ruminants produce milk that contains notable nutrients for human body. This research aimed to use Quantitative Descriptive Analysis (QDA) and Check All That Apply (CATA) method by using trained and consumer panelist, consecutively. Ten trained panelists were obtained after prior selection process and training. Based on QDA result, bovine milk had yellowish color, salty and bitter taste. Sumbawa buffalo milk associated with thickness and creaminess. Meanwhile, equine milk appearance was white with rancid aroma and taste. Goat milk dominated with barny taste and aroma. Symmetrical plot in CATA result showed the different sensory profile among different Sumbawa ruminants milk.

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Milk, Ruminants, Sumbawa, QDA, CATA, Sensory

1. Introduction

Sumbawa located in West Nusa Tenggara Province which majority of the society lived from livestock production. Based on the West Nusa Tenggara Province Government data the ruminants in Sumbawa is dominated with cow, goat, buffalo, and equine. Milk is one of the most useful products of the ruminants which is utilized in human nutrition intakes. The production of fresh milk in Sumbawa per day was about 1-2 tons based on local data (1). Milk consumption in Indonesia was 16.25 kg per capita per year that categorized as low based on Food and Agricultural Organization (FAO) (2). Beyond the nutritional content such as protein and fat, ruminants' milk is also rich in bioactive compounds which benefited in human health (3).

Different ruminants had diverse characteristics in the sensory properties due to the genetic, forage, and habitat of the ruminants (4). In our knowledge, there is no prior research focus on sensory properties of Sumbawa ruminant's milk, event Sumbawa well known as the producers of buffalo and horse in Indonesia. Currently, the food product of Sumbawa local milk was limited in milk candy which major composition was sugar. Advanced sensory profiling is required to obtain the most possible product development of Sumbawa ruminants' milk that suiting ideal end-product sensory attributes.

Local dairy product is currently under-utilized since the low concern on post-harvest technology in the local farmer. The low consumption of fresh milk also due to the response of the doughy flavors that comes from milk fat and serum protein (5). In consequences, the

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milk production and absorption are low, while the dairy industry is looking for possible option to cover the raw materials. Meanwhile, dairy product is continued to be developed in food industry. Sensory profile characteristics are required in turning the right end-product taste and fulfilling consumer perception. Sensory analysis can be conducted by using either trained or consumers panelists. One of popular method for sensory profiling is descriptive analysis including flavor profile method, quantitative descriptive analysis, spectrum descriptive analysis, time intensity analysis, and optimized descriptive analysis(6). Those analyses were using 8-20 trained panelist through three steps of selection including description generation, assessor training, and evaluation of the samples (7). Quantitative Descriptive Analysis (QDA) is a sensory analytical method which food attributes are identified, descripted, and quantified using trained panelist (8).

Sensory evaluation also could be conducted by using consumer as panelist such as free choice profiling, flash profiling, check-all-that-apply, rate-all-that-apply, and ideal profile method (6). Check-all-that-apply (CATA) method is the simple and fast method for collecting product information based on consumer perception. The data analysis is fast and could be applied in the big number of consumers (9). Commonly, the research in the milk used both ranking and rating test for giving consumer perception of dairy product. The disadvantages of the common sensory analysis such as rating and ranking are that they could not provide more detailed information related to the milk product (10). Hence, this research, by using QDA and CATA, aimed to analyze the detail sensory profile of Sumbawa local milk from 4 ruminants including cow, milk, buffalo, and equine milk as the data pioneer for further development prospective of dairy product.

2. Materials and Methods

2.1. Materials

Materials used in this research including fresh cow milk from Seketeng market Sumbawa, buffalo and equine milk from local farmers in Penyaring District, and goat milk from local farmer in Lantung District, set of basic sensory test (sucrose, citric acid, NaCl, caffein, monosodium glutamate) obtained from online marketplace, QDA and CATA questionnaires, thermometer, and pasteurized tank. Milk samples were expressed at the evening and then chilled at 4°C then pasteurized on 30 minutes before the sensory testing.

2.2. Methods

2.2.1. Trained panelist selection

Trained panelists were selected through pre-screening including time, age, milk consumption, health status, food pattern, and medication history. The questionnaire was published online, then 65 respondents were enrolled. Only 30 panelists were qualified based on the criteria, including the frequency of milk consumption and free from the milk allergies. The suitable panelist were proceed into panelist selection test (Table 1). The training of panelist referred to the previous method (11) the detail of test was explained below:

- Basic sensory tests

This test aimed to explore the ability of candidates in knowing sensory basic taste including sweet, sour, salty, bitter, and savory. The candidates asked to choose the taste of solution in different concentration: sweet (1 and 2 g/L sucrose), salty (0.2 and 0.8 g/L NaCl), sour (0.03

and 0.05 g/L citric acid) bitter (0.03 and 0.05 g/L caffeine) and savory (0.18 g/L monosodium glutamate) (12).

- Triangle test

Triangle test used 2 cups of bovine milk and a cup of equine milk that had been pasteurized. The panelist who passed the test should find out the different milk among three cups of samples (2 bovine, 1 equine).

- Threshold test

The last test was threshold in sweet, salty, sour, and bitter with different concentration. Below the set of concentration of each taste.

Table 1. Total recruited panelist that enrolled to training were 10 people that passed the screening process and sensory basic tests.

Materials	Series of the concentration (g/L)				
Sucrose	5	10	20	40	80
NaCl	0.4	0.8	1.6	3.2	6.4
Citric acid	0.12	0.24	0.48	0.92	0.96
Caffeine	0.16	0.32	0.64	1.28	2.56

2.2.2. QDA and CATA test

QDA was conducted by trained panelists, using unstructured scale (15 cm) in each sensory attribute. The explanation of each attribute had been introduced in the training session. Each sample was given in 20 ml to the panelists. The test was triplicate to minimalize bias. Warm mineral water was provided to neutralize the taste in different sample. Focus group discussion (FGD) was conducted for finalizing the result and close the trained panelist session. Then, the result was analyzed and plotted in spiderweb using XLSTAT sensory.

CATA test used 30 consumer panelists. The consumer panelists asked to check all attributes that related to the milk. The criteria of the panelist including consumers and not having allergy in pasteurized milk. The data were tabulated in XLSTAT sensory and analyzed by using Cochran's test and plotted in symmetrical plot based on principal coordinate analysis.

3. Results and Discussions

3.1. QDA result

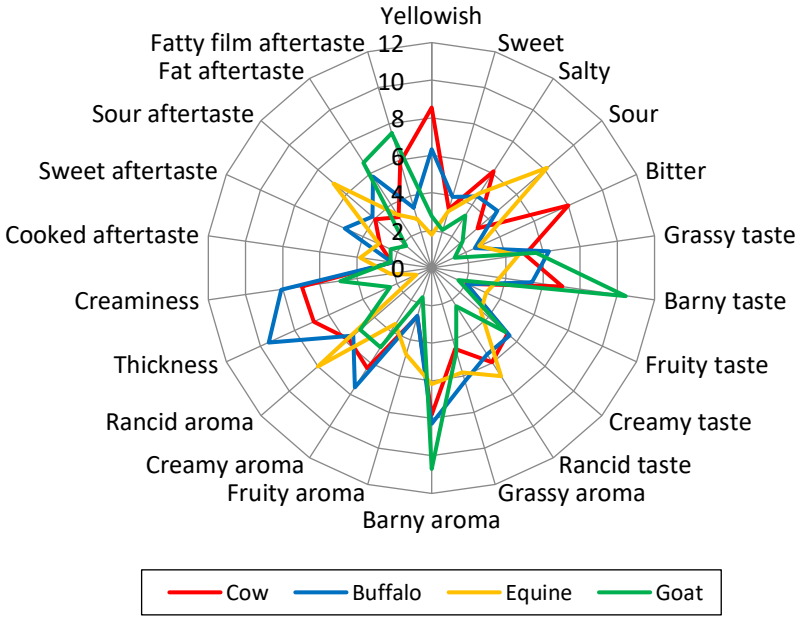

Figure 1. QDA result plotted in radar chart based on 10 trained panelist and focus group discussion.

Based on Figure 1, bovine milk had dominant yellow color and salty taste compared to other ruminants. Yellow color possibly manifested from consumed feed (13). In Sumbawa, commonly cows were fed by wild grasses in the field. Grasses contains high amount of β-carotene that effect the yellowish color in the bovine milk (4). Trained panelist also observed bitter taste in the cow milk that perhaps due to the bacteria contamination that produce taste distortion in milk (14). The bacteria contamination possibly came from the groups of heat-resistant lactic bacteria which not destroyed after pasteurization process (15).

Buffalo milk dominant in creamy aroma, thick and creamy texture, grassy taste, and sweet aftertaste. Creaminess usually related to the size of milk fat globule that previously found bigger compared to other ruminants (16). The increasing of creaminess was priorly observe into the sensory properties of the bigger size of fat globule droplet size (17,18). Meanwhile, the thick texture was manifested from equal distribution of the milk fat in the milk serum (17). Grassy taste was an undesired taste available in milk that was caused by nonanal or p-cresol accumulation in the nasal of milk (19–22). This odor come from the pasture-feeding which usually feed to the buffalo in the local farmer, including Sumbawa. Further pasteurization and homogenization could slightly reduce the off flavors (23).

Sumbawa is well known as horse producer in Indonesia. The milk produces by the mare was described to have sour taste and aftertaste also having rancid taste and aroma. Sour taste and aftertaste possibly due to the starting point of acidification or natural fermentation. The lactose content of equine milk was the highest among others that supported to the ease of fermentation process (24). The 17.6% Polish respondent also described sour taste in the equine milk (25). The rancidity commonly affected by the free fatty acid, such as butyric acid, formation in milk which accumulated from the activity of either endogenous or exogenous

lipases. The deterioration of milk by free fatty acid could be caused of endogenous lipases activity such as lipoprotein lipase that available in equine milk (26–28).

Goat milk is the minor milk product in Sumbawa, since local community rarely harvest the goat milk. As described through Figure 1, goat milk had strong barny taste and odor, also fat and fatty film aftertaste. Barny taste and odor commonly called as animal flavor was derivatives from p-cresol from grazing consumed by goat (29,30). Dominant fat and fatty aftertaste were commonly observed in goat product since the availability of minor component 4-alkyl-branched-fatty acid, particularly 4-ethyloctanoic and 4-ethyloctanoic acid, that associated in goat flavor (31).

3.2. CATA result

Table 2. Cochran's Q test from each attribute.

Attributes	p-values
white	<0.0001*
yellowish	<0.0001*
cloudy	0.038*
clear	0.172
thick	<0.0001*
watery	<0.0001*
2 separated -phase	<0.0001*
grassy aroma	0.174
barny aroma	0.349
fruity aroma	0.000*
savoury aroma	0.000*
bland aroma	0.572
strong aroma	<0.0001*
rancid aroma	0.979
salty	0.045*
sweet	0.004*
sour	<0.0001*
bitter	0.002*
creamy	<0.0001*
fatty	0.154
grassy	0.615
barny	<0.0001*
fruity	0.007*
rancid flavour	0.004*
watery	<0.0001*
silky	0.001*
thick	<0.0001*
cooked aftertaste	0.343
sweet aftertaste	<0.0001*
sour aftertaste	<0.0001*
fatty aftertaste	<0.0001*
fatty film aftertaste	0.154

** = Significant at 5% level of significance*

CATA data used consumer perception usually to draw consumer acceptation for the ideal product in food industry. Cochran's Q test (Table 2) continued with Sheskin test (Table 3) were conducted to obtain the significantly different attributes among the CATA questionnaire attributes. As much as 9 attributes were not significant including clear appearance, grassy, barny, bland and rancid aroma, fatty and grassy taste, as well cooked and fatty film aftertaste. Those data then plotted in symmetrical plot (Figure 2).

Table 3. Multiple pairwise comparisons using the Critical difference (Sheskin).

Attributes	Buffalo	Cow	Equine	Goat
white	0.200 (a)	0.100 (a)	0.333 (a)	0.833 (b)
yellowish	0.200 (a)	0.733 (b)	0.033 (a)	0 (a)
cloudy	0.200 (ab)	0.133 (ab)	0.233 (b)	0 (a)
clear	0.067 (a)	0.033 (a)	0.133 (a)	0 (a)
thick	0.400 (b)	0.533 (b)	0 (a)	0 (a)
watery	0.100 (a)	0.067 (a)	0.700 (b)	0.533 (b)
2 separated-phase	0.367 (b)	0.033 (a)	0.067 (a)	0 (a)
grassy aroma	0.133 (a)	0.333 (a)	0.133 (a)	0.200 (a)
barny aroma	0.367 (a)	0.200 (a)	0.200 (a)	0.233 (a)
fruity aroma	0.100 (a)	0.033 (a)	0.367 (b)	0 (a)
savory aroma	0.333 (b)	0.367 (b)	0.033 (a)	0 (a)
bland aroma	0.033 (a)	0 (a)	0 (a)	0.033 (a)
strong aroma	0.200 (a)	0.200 (a)	0.367 (a)	0.833 (b)
rancid aroma	0.167 (a)	0.133 (a)	0.167 (a)	0.167 (a)
salty	0.167 (a)	0.200 (a)	0.033 (a)	0.033 (a)
sweet	0.133 (a)	0.467 (b)	0.133 (a)	0.200 (ab)
sour	0.433 (b)	0.100 (a)	0.500 (b)	0 (a)
bitter	0.067 (a)	0.033 (a)	0.267 (b)	0 (a)
creamy	0.133 (a)	0.600 (b)	0.067 (a)	0.267 (a)
fatty	0.167 (a)	0.200 (a)	0.033 (a)	0.133 (a)
grassy	0.167 (a)	0.067 (a)	0.133 (a)	0.167 (a)
barny	0.333 (ab)	0.067 (a)	0.133 (a)	0.633 (b)
fruity	0 (a)	0 (a)	0.133 (b)	0 (a)
rancid flavor	0.167 (a)	0.100 (a)	0.200 (ab)	0.467 (b)
watery	0.200 (a)	0.033 (a)	0.667 (b)	0.833 (b)
silky	0.167 (ab)	0.300 (b)	0 (a)	0.033 (a)
thick	0.300 (b)	0.433 (b)	0 (a)	0 (a)
cooked aftertaste	0.067 (a)	0.033 (a)	0.100 (a)	0 (a)
sweet aftertaste	0.033 (a)	0.500 (b)	0.033 (a)	0.100 (a)
sour aftertaste	0.633 (b)	0.133 (a)	0.567 (b)	0 (a)
fatty aftertaste	0.233 (a)	0.167 (a)	0 (a)	0.600 (b)
fatty film aftertaste	0.200 (a)	0.100 (a)	0.033 (a)	0.067 (a)

The alphabetics showed the level of significance based on statistical analysis (alpha 5%)

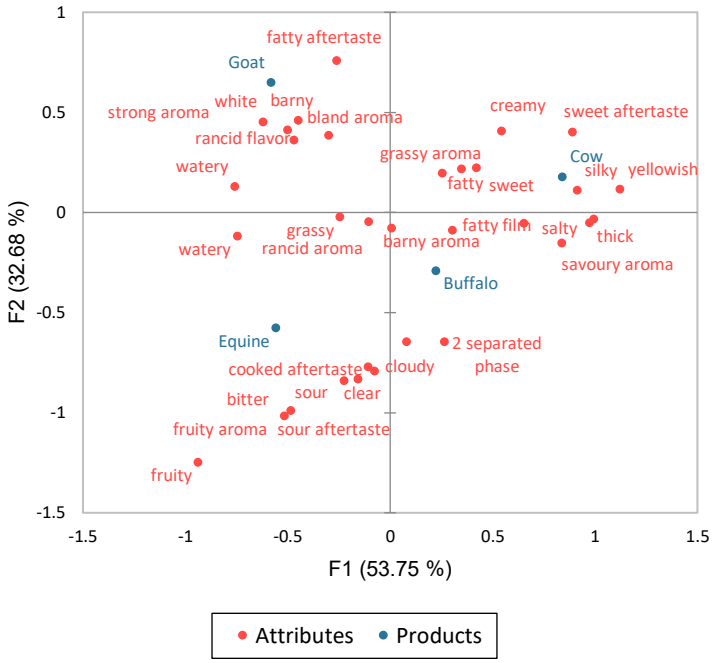

Figure 2. Symmetrical plots F1 F2 CATA method based on CATA analysis in XLSTAT sensory.

In the symmetrical plot represented 86.43% of the principal coordinate data. Based on the consumer perception cow milk was associated with grassy aroma, fatty taste, sweet taste, sweet taste, silky texture, yellowish color, and creamy taste. Those attributes made cow had different quadrant in the symmetrical plot. Those results were different with the perception in the trained panelist through QDA spider web result. Consumers based analysis might neglect small difference, while the trained panelist that used in QDA analysis noticed since they were following the series of training before the testing day (32).

Buffalo milk associated with cloudy appearance, 2 separated-phase, savory aroma, thick texture, and fatty film aftertaste. Those attributes made buffalo milk clearly located in different quadrant, different with others. Meanwhile, the insignificant Cochran's Q test resulted in the plot of barny and rancid aroma in the middle of the plot that explained all of milk product had those attributes without significant different. The buffalo milk contains almost 30% higher fat and higher total solid compared to the cow milk that appears in opaque appearances, bold texture, and leaving fatty film aftertaste (33).

Consumer precepted equine milk in bitter, sour taste and aftertaste, fruity, clear, and watery. The sour and watery attributes were also mentioned in trained panelist through QDA result. Watery and clear was associated with low fat content of mare's milk compared to other ruminants (34). The sour attributes were closed to the fruity flavor of milk.

The "goaty" were also found by consumer panelist by perceiving strong aroma, barny, and rancid flavor. That could be caused of the strong grassing feeding since majorly local people wild rearing the goat even more compared to other livestock. Those also the reason why goat milk less consumed and milked by farmers, since too many undesired sensory properties present through the product. Based on the

previous research the goaty flavors related to the octanoic acid (C8) that available in milk (35).

Conclusions

This research revealed the diverse sensory profile among all the ruminants. The cow milk holds positive attributes such as sweet aftertaste, yellowish color, and creamy texture. In contrast, goat milk strong aroma, barny, fatty aftertaste and rancid flavor. Equine milk showed the watery texture, fruity and sour taste. Meanwhile the buffalo milk had thicker texture, salty and savory aroma.

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Author Contributions

R.N.S: conceptualization, supervising, data analyzing, project leader, original draft preparation; L.H.R supplies and materials, administration, draft editing; A.N method, performed the experiment, supplies and materials, draft editing; S.N contributed to experiment, questionnaire, and data preparation.

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Conflicts of Interest

Authors may declare no conflict of interest.

References

1. Badan Pusat Statistik Provinsi Nusa Tenggara Barat. Jumlah Produksi Telur Unggas dan Susu Sapi Segar Menurut Kabupaten/Kota di Provinsi Nusa Tenggara Barat (kg), 2023. 2025 Feb.
2. Sekretariat Jendral Kementerian Pertanian. Outlook Susu Pusat Data dan Sistem Informasi Pertanian Sekretariat Jenderal-Kementerian Pertanian 2022. 2022.
3. Wang X, Zhao X, Huang D, Pan X, Qi Y, Yang Y, et al. Proteomic analysis and cross species comparison of casein fractions from the milk of dairy animals. Sci Rep. 2017;7(February):1–9.

4. Faulkner H, O'Callaghan TF, McAuliffe S, Hennessy D, Stanton C, O'Sullivan MG, et al. Effect of different forage types on the volatile and sensory properties of bovine milk. J Dairy Sci. 2018;101(2):1034–47.
5. Cheng N, Barbano DM, Drake MA. Effects of milk fat, casein, and serum protein concentrations on sensory properties of milk-based beverages. J Dairy Sci. 2019 Oct 1;102(10):8670–90.
6. Adawiyah DR, Hunaefi D, Nurtama B. Evaluasi Sensori Produk Pangan. 1st ed. Vol. 1. Jakarta: Bumi Aksara; 2024. 1–224 p.
7. Adawiyah DR, Azis MA, Ramadhani AS, Chueamchaitrakun P. Perbandingan Profil Sensori Teh Hijau Menggunakan Metode Analisis Deskripsi Kuantitatif Dan Cata (Check-All-That-Apply). Jurnal Teknologi dan Industri Pangan. 2019;30(2):161–72.
8. Rahmawati D, Andarwulan. N., Lioe HN. Identifikasi Atribut Rasa dan Aroma Mayonnaise dengan Metode Quantitative Descriptive Analysis (QDA) Development of Taste and Aroma Attributes for Mayonnaise by Quantitative Descriptive Analysis. Jurnal Mutu Pangan. 2015;2(2):80–7.
9. Adawiyah DR, Yasa KI. Evaluasi Profil Sensori Sediaan Pemanis Komersial Menggunakan Metode Check-All-That-Apply (CATA) Profile Sensory Evaluation of Commercial Table-Top Sweeteners Using Check-All-That-Apply (CATA). Jurnal Mutu Pangan. 2017;4(1):23–9.
10. Dianah MS. Uji Hedonik dan Mutu Hedonik Es Krim Susu Sapi dengan Penambahan Pasta Ubi Jalar Ungu (Ipomea batatas L). 2020.
11. Nurjanah S, Sari RN. Persiapan Panelis Terlatih untuk Analisis Profil Sensori Susu RUminansia Sumbawa. In: USC UTS Student Conference. 2023.
12. Maulidiah DM, Fibrianto K. Profil Sensori Produk Msg Pt. X Dengan Variasi Media Air Mineral Dan Kaldu Ayam. Jurnal Pangan dan Agroindustri. 2019;7(2):37–46.
13. Wolf I V., Bergamini C V., Perotti MC, Hynes ER. Sensory and Flavor Characteristics of Milk. Milk and Dairy Products in Human Nutrition: Production, Composition and Health. 2013;310–37.
14. Diastari IGAF, Agustina KK. Uji Organoleptik Dan Tingkat Keasaman Susu Sapi Kemasan Yang Dijual Di Pasar Tradisional Kota Denpasar. Indonesia Medicus Veterinus. 2013;2(4):453–60.
15. Kim H, Hardy J, Novak G, Ramet J, Weber F. Off Taste in Raw and Reconstituted Milk. 21st ed. Vol. 21. Rome: Food and Agriculture Organization; 2004. 1–200 p.
16. Abd El-Salam MH, El-Shibiny S. A comprehensive review on the composition and properties of buffalo milk. Dairy Sci Technol. 2011;91(6):663–99.
17. Truong T, Palmer M, Bansal N, Bhandari B. Effect of Milk Fat Globule Size on Functionalities and Sensory Qualities of Dairy Products. 2016. 47–67 p.
18. Wang W, Wang M, Xu C, Liu Z, Gu L, Ma J, et al. Effects of Soybean Oil Body as a Milk Fat Substitute on Ice Cream: Physicochemical, Sensory and Digestive Properties. Foods. 2022;11(10).
19. Juvinal JG, De Steur H, Schouteten JJ, Muhammad DRA, De Leon AA, Dewettinck K, et al. Physico-Chemical Property, Sensory Profile and Consumer Acceptability of Water Buffalo (Bubalus bubalis L.) Chocolate Milk Using Alkalized and Natural Cocoa Powder. Foods. 2023;12(9):1–20.

20. Chi X, Shao Y, Pan M, Yang Q, Yang Y, Zhang X, et al. Distinction of volatile flavor profiles in various skim milk products via HS-SPME–GC–MS and E-nose. European Food Research and Technology. 2021;247(6):1539–51.
21. Felice VD, Owens RA, Kennedy D, Hogan SA, Lane JA. Comparative structural and compositional analyses of cow, buffalo, goat and sheep cream. Foods. 2021;10(11).
22. Alothman M, Hogan SA, Hennessy D, Dillon P, Kilcawley KN, O'Donovan M, et al. The "grass-fed" milk story: Understanding the impact of pasture feeding on the composition and quality of bovine milk. Foods. 2019;8(8).
23. Kilcawley KN, Faulkner H, Clarke HJ, O'Sullivan MG, Kerry JP. Factors influencing the flavour of bovine milk and cheese from grass based versus non-grass based milk production systems. Vol. 7, Foods. MDPI Multidisciplinary Digital Publishing Institute; 2018.
24. Guo L, Xu WL, Li CD, Ya M, Guo YS, Qian JP, et al. Production technology, nutritional, and microbiological investigation of traditionally fermented mare milk (Chigee) from Xilin Gol in China. Food Sci Nutr. 2020;8(1):257–64.
25. ROMANIUK K, MAJSZYK-ŚWIĄTEK M, KRYSZAK K, DANIELEWICZ A, ANDRASZEK K. Alternative Use of Mare Milk. Folia Pomeranae Universitatis Technologiae Stetinensis Agricultura, Alimentaria, Piscaria et Zootechnica. 2019;348(49):121–30.
26. Scanlan RA, Sather LA, Day EA. Contribution of Free Fatty Acids to the Flavor of Rancid Milk. J Dairy Sci. 1965;48(12):1582–4.
27. France TC, O'Mahony JA, Kelly AL. The Plasmin System in Milk and Dairy Products. Food Engineering Series. 2021. 11–55 p.
28. McSweeney PLH, Fox PF, O'mahony JA. Advanced Dairy Chemistry: Volume 2: Lipids, Fourth Edition. Vol. 2, Advanced Dairy Chemistry: Volume 2: Lipids, Fourth Edition. 2020. 1–489 p.
29. Aday S, Yuceer YK. Physicochemical and sensory properties of mihalic cheese. Int J Food Prop. 2014;17(10):2207–27.
30. Khanal RC, Dhiman TR, Ure AL, Brennand CP, Boman RL, McMahon DJ. Consumer acceptability of conjugated linoleic acid-enriched milk and cheddar cheese from cows grazing on pasture. J Dairy Sci. 2005;88(5):1837–47.
31. Cossignani L, Giua L, Urbani E, Simonetti MS, Blasi F. Fatty acid composition and CLA content in goat milk and cheese samples from Umbrian market. European Food Research and Technology. 2014;239(6):905–11.
32. Ishii R, Kawaguchi H, O'Mahony M, Rousseau B. Relating consumer and trained panels' discriminative sensitivities using vanilla flavored ice cream as a medium. Food Qual Prefer. 2007 Jan;18(1):89–96.
33. Arora S, Sindhu JS, Khetra Y. Buffalo Milk. Encyclopedia of Dairy Sciences: Third edition. 2022 Jan 1;5:784–96.
34. Čagalj M, Brezovečki A, Mikulec N, Antunac N. Composition and properties of mare's milk of Croatian Coldblood horse breed. Mljekarstvo. 2014;64(1):3–11.
35. Yang CJ, Ding W, Ma LJ, Jia R. Discrimination and characterization of different intensities of goaty flavor in goat milk by means of an electronic nose. J Dairy Sci. 2015 Jan 1;98(1):55–67.