Nutrition Evaluation of Etawa Crossbreed Dairy Goat's Milk as Human Food to Increase Immunity During The Covid-19 Pandemic

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ABSTRACT
Increasing the body's immunity by consuming goat's milk is one of the efforts that can be done to prevent the transmission of the covid-19 virus. This study aims to evaluate the nutrition of Etawa crossbreed dairy goat's milk as human food for self-protection from the transmission of the Covid-19 virus. The method used is survey and sampling. Milk samples were taken from three dairy goat farming companies in West Sumatra. Nutritional evaluation is presented descriptively from the results of laboratory tests. Parameters measured were pH, specific gravity, solid non-fat, protein, lactose, and Ca, P, Zn and Fe minerals. The results of the research showed that the nutritional content of the Etawa crossbreed dairy goat's milk was following the Thai Agricultural standard of goat's milk standard.

Keywords: *Covid-19, Etawa crossbreed dairy goat, Milk, Nutrition composition, Human food.*

1. INTRODUCTION

Corona virus deseases-2019 (Covid-19) has claimed and changed many lives. [1] explained that data until October 9, 2021, Covid-19 had claimed the lives of 142,560 people in Indonesia. Covid-19 is a newly discovered disease, therefore knowledge regarding its prevention is still limited. The key to preventing the transmission of this virus is early detection, basic protection and preparing the body immune system.

The human immune system can be increased by consuming nutritious food and drinks. Goat milk is a drink that contains a complete nutritional composition and is able to maintain the body's immunity. Goat milk is believed to have many properties such as high digestibility, low allergenicity, nutritional content that is almost the same as human milk. Goat's milk can be an alternative to cow's milk which is currently commercial milk [2], [3].

Etawa crossbreed dairy goat (ECDG) is a goat whose milk is often consumed by Indonesian people. ECDG has high productivity and good resistance to adverse environments [4], [5]. The nutritional content contained in goat's milk as a quality standard is protein, fat, lactose, specific gravity, pH, solid non fat (SNF) and minerals. A good nutritional composition will have a positive effect on health.

Indonesia already has quality standards for cow's milk, but there is no standard for goat's milk yet. The standard for determining the quality of goat's milk is still using Thai Agricultural Standard (TAS) No.6006-2008[6]. This study is very important as basic information for the quality of ECDG milk circulating in West Sumatra. This study aims to provide information on the nutritional composition of ECDG milk in West Sumatra as a food ingredient to increase immunity during the COVID-19 pandemic.

2. MATERIALS AND METHODS

2.1. Research Sites

Samples of goat's milk were taken from three locations of dairy goat farms in West Sumatra, namely Padang, Agam and Payakumbuh. Analysis of fat, protein, specific gravity, lactose, pH of goat's milk was carried out in the Payakumbuh Polytechniques Laboratory. Analysis of the mineral content of calcium (Ca), phosphorus (P), zinc (Zn) and iron (Fe) was carried out at the Environmental Engineering Laboratory of Andalas University.

2.2. Research Methods

This research is a survey and laboratory research. milk data is taken by sampling at the ECDG farm company. Milk that is used as a test sample is milk that will be sold to the public market. The data are presented descriptively with nine samples for each test parameter.

2.3. Parameters Tested

The parameters tested in this study were protein, fat, lactose, solid non-fat, specific gravity, pH, minerals (Ca, P, Zn and Fe). Protein, fat and lactose were analyzed using the AOAC method [7], SNF was measured using a lactescent MCC50, pH was measured using a digital pH meter, while specific gravity was measured using a Lactodensimeter.

3. RESULTS AND DISCUSSION

West Sumatra ECDG milk quality range data are presented in Table 1. Fat content is a component of milk that affects the selling price of milk. Milk fat content in this study was 6.16-7.28%. [6] reported that the fat content of goat's milk was > 4%. The results of this study indicate that the milk fat from ECDG in West Sumatra belongs to the premium quality of goat's milk. Fat content is usually influenced by the type of feed given. Forage feeding greatly affects milk fat content [8]. Forage eaten by livestock undergoes a fermentative process in the rumen by rumen microbes [9], [10]. The main product of fermentation in the rumen is VFA (Volatile fatty acids) [11], [12]. VFA consists of acetate, propionate and butyrate [13]. Acetate enters the blood and is converted into fatty acids. Fatty acids enter the secretory cells of the udder and become milk fat.

The level of SNF in this study was above the standard set by T [6], which was > 8.25%. the SNF range of this study was 10.17-15.89%. SNF is influenced by the quality of feed given to ECDG. The addition of protein feed sources can increase milk SNF [14]. SNF is also affected by lactose and protein [15]. If the levels of lactose and protein are high, the SNF will increase. SNF in this study was still within the normal range of SNF reported by [16], which was 14.43-15.66% and higher than [17], which was 7.48-8.00%.

Milk protein content in this study had a range of 2-4.3%. the lowest range is still below the standard according to [6], which is > 3.7%. but the highest range is above the standard according to [6]. The milk protein content is influenced by the type of feed given to ECDG. High protein content in feed will increase the protein content secreted into milk. Sources of feed protein usually come from concentrate feed. The concentrate will be synthesized into amino acids by rumen microbes. Amino acids are absorbed in the small intestine, transported into the blood and enter the secretory cells of the udder. Increased availability of amino acids in the feed will increase milk protein synthesis [18].

Protein intake is greater than usual needed to increase the body's immunity. The protein requirement for adult men is 65 grams per day. Adult women need 60 grams of protein per day. During a pandemic, protein consumption can be increased to 75-100 grams per day [19]. This increase in protein intake aims to increase immunity. Protein plays a role in the formation of immunoglobulin (Ig). Immunoglobulins play a role against viruses [20],[21].

Lactose levels in this study were higher than the results of the study [22], which was 2.76%. Lactose is the main milk carbohydrate. The lactose in goat's milk is 0.2-0.5% lower than that of cow's milk [23]. The nutritional content of the feed will affect the level of lactose in milk. Lactose is an energy source for the growth of lactic acid bacteria in fermented milk. The bacteria also act as a producer of acid levels in the fermented milk. The lactose value in this study was still in the normal range as reported by several researchers, namely 4.01-4.16% [24] and 3.72-3.89% [25].

Table 1 shows the specific gravity in this study ranging from 1.029 to 1.032. The specific gravity in this study was higher than the standard [6], which was 1.0280. Specific gravity is influenced by the fat content of milk. [26] stated that the specific gravity of milk depends on the fat content of milk and milk solids. The increase in specific gravity of goat's milk can be caused by the release of gases such as CO_2 and N_2 contained in milk after milking [27]. The specific gravity of goat's milk is higher than that of cow's milk in the range of 1.0231-1.0398 kg/m3, but lower than that of sheep's milkin the range of 1.0347-1.0384 kg/m3 [28].

The pH value in this study was still in the range set by Standard [6], which was 6.5-6.8. PH value is anindicator in determining milk spoilage. Changes in the value of pH are caused by the content of CO_2, phosphate,citrate and protein compounds in fresh milk that has just been milked. These compounds affect the buffering ability of milk. Milk buffers can inhibit the breakdown of milk [29]. Bacteria can lower the pH value to 6.5 [30]. A high pH value (>6.7) indicates the possibility of mastitis [26].

Table 1. West Sumatra ECDG milk quality range data

Parameters	Results Test (n=9)	TAS 6006 (2008)
Fat	6.16-7.28%	>4%
SNF	10.17-15.89%	> 8.25%
Protein	2-4.3%	>3.7%
Lactose	4.45-5.83%	-
Specific gravity	1.029-1.032	>1.0280
pH	6.6-6.8	6.5-6.8
Ca	0.15- 0.19%	-
P	0.18-0.21 %	-
Zn	0.0534-0.0865 ppm	-
Fe	0.0912-0.137 ppm	-

Minerals are one of the most important nutritional elements for the human body. Minerals are needed in small amounts but are indispensable for the regulation of enzyme work, maintenance of acid-base balance, maintenance of muscle and nerve sensitivity to stimuli [31].

Goat milk in this study contains 0.15-0.19% Ca minerals and 0.18-0.21% P minerals. The minerals Ca and P are required for bone growth and tooth formation. Mineral Ca helps in regulating the transport of ions into and out of membranes, maintains hormonal balance and is a catalyst in biological reactions. Mineral P is useful in maintaining the integrity of cell membranes, part of high energy molecules (ATP, ADP and others) and helps regulate enzyme work [32]. The World Health Organization recommends the amount of Ca intake for adults around 400-50 mg per day. A higher intake of Ca is required in children, adolescents and pregnant women, which is 1200 mg per day [33].

Zinc (Zn) is one of the micro minerals that have great potential to increase immunity against COVID-19. Zn activates natural immunity, circulating humoral immunity and intracellular immunity [34]. Zn in cells inhibits coronavirus replication [35],[36]. Minerals Fe and Se play a role in inhibiting viral mutations [37], [38]. Fe and Zn minerals are micro minerals needed in this COVID-19 pandemic situation. This mineral will work in harmony with vitamins C, D and E to activate the natural immune system as a front line defensive. This mineral also strengthens the body's defensives in blood circulation and cells to protect the body from Covid-19 infection [34]. The need for Zn in adult men is 15 mg per day, while in women it is 10 mg per day. Fe requirements for adult men are around 9,011 mg per day, while for adult women it is 18 mg per day.

4. CONCLUSION

The quality of Etawa crossbreed dairy goat milk in West Sumatra is included in the premium class of milk quality, according to TAS No. 6006 (2008).

AUTHORS' CONTRIBUTIONS

Novirman Jamarun: Designing Research
Rahmani welan: Data analysis
Arief: Conducting a survey of sampling locations
Gusri Yanti: supervising work in the laboratory
Roni Pazla: Data analysis and script writing

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REFERENCES

[1] Worldometers, Corona viruses in indonesia. Diakses 9 oktober 2021, https://www.worldometers.info/coronavirus/country/indonesia/.,2021.

[2] M. Safri, Alergi susu sapi. Jurnal Kedokteran SyiahKuala 2008; 8 (1): 47-55

[3] Sulmiyati, N, Ali, Marsudi. Kajian kualitas fisik susu kambing peranakan etawah (PE) metode pasteurisasi yang berbeda. JITP 2016; 4(3): 130-4.

[4] R. Pazla, Pemanfaatan pelepah sawit danTitonia (*Tithonia diversifolia*) dalam ransum kambing peranakan etawa untuk menunjang program swasembada susu 2020. Disertasi. Fakultas Peternakan. Unand, Padang, 2018.

[5] Arief, Rusdimansyah, S. Sowmen, R. Pazla, Milk Production, Consumption and digestibility of ration based on the palm kernel cake, Tithonia (*Tithonia diversifolia*) and Corn waste on Etawa Crossbreed Dairy Goat. IOP Conf. Ser: Earth Environ, 2021, Sci. 709 012024. Doi:10.1088/1755-1315/709/1/012024

[6] Thai Agricultural Standard. TAS 6006-2008. Raw Goat Milk. National Bureau of Agricultural Commodity and Food Standards, Ministry of Agriculture and Cooperatives. ICS 67.100.01. Published in the Royal Gaze tte Vol. 125 Section 139 D. Thailand.

[7] AOAC, Official Methods of Analysis. 18th ed. In Association of Official Analytical, Chemists International, Maryland, USA (Issue February), 2005.

[8] N. Jamarun, R. Pazla, M. Zain, and Arief, Milk quality of Etawa crossbred dairy goat fed combination of fermented oil palm fronds, Tithonia (*Tithonia diversifolia*) and Elephant grass (*Pennisetum purpureum*). J.Phys: Conf, 2020, Ser.1469 012004. Doi:10.1088/1742-6596/1469/1/012004

[9] R. Pazla, Adrizal, R. Sriagtula, Intake, nutrient digestibility and production performance of pesisir cattle fed Tithonia diversifolia and Calliandra calothyrsus-based rations with different protein and energy ratios. Adv. Anim. Vet, 2021, Sci. 9(10): 1608-1615. http://dx.doi.org/10.17582/journal.aavs/2021/9.10.1608.1615

[10] Suyitman, L. Warly, J. Hellyward, & R. Pazla, Optimization of Rumen Bioprocess through The Addition of Phosphorus and Sulfur Minerals on Ammoniated Palm Leaves and Fronds (Elaeis Guineensis Jacq.). American Journal of Animal and Veterinary Sciences, 2021, 16(4), 225-232. https://doi.org/10.3844/ajavsp.2021.225.232

[11] R. Pazla, N. Jamarun, L. Warly, G. Yanti, &N. A Nasution, Lignin Content, Ligninase Enzyme Activity and in vitro Digestability of Sugarcane Shoots using Pleurotus ostreatus and Aspergillus oryzae at DifferentFermentation Times. American Journal of Animal and Veterinary Sciences, 2021, 16(3), 192-201. https://doi.org/10.3844/ajavsp.2021.192.201

[12] R. Pazla, N. Jamarun, M. Zain, G. Yanti, R. Chandra, Quality evaluation of tithonia (Tithonia diversifolia) with fermentation using Lactobacillus plantarum and Aspergillus ficuum at different incubation times. Biodiversitas, 2021, 22(9): 3936–3942.https://doi.org/10.13057/biodiv/d220940

[13] R. Pazla, and N. Jamarun, Respon Mikroba Rumen Terhadap Pemberian Kombinasi Hijauan (Pelepah Sawit Fermentasi, Titonia Dan Rumput Gajah). edited by P. Kevin. Padang: LPPM Universitas Andalas, 2021. ISBN:978-623-345-273-1

[14] F.D. Utari, B.W.H.E. Prasetiyono, A. Muktiani, Kualitas susu kambing perah peranakan ettawa yang diberi suplementasi protein terproteksi dalam wafer pakan komplit berbasis limbah agroindustry, 2012, Anim. Agric. J. 1(1): 426 – 447

[15] Y. Zurriyati, R. Noor, R. Maheswari, Analisis molekuler genotipe kappa kasein (κ-kasein) dan komposisi susu kambing Peranakan Etawah, Saanen dan Persilangannya. Jurnal Ilmu Ternak dan Veteriner, 2011, 16(1) : 61-70.

[16] Arief, N. Jamarun, B. Satria, and R. Pazla, (2018). Milk quality of Etawa crossbred Dairy Goat Fed by product of Palm Oil Industry. International Journal of Dairy science, 2018, 13: 15-21.https://dx.doi.org/10.3923/ijds.2018.15.21

[17] Arief, N. Jamarun, B. Satria, R. Pazla, Milk Quality of Etawa Dairy Goat Fed Palm kernelcake,Tithonia (*Tithonia diversifolia*) and sweet Potato Leaves (Ipomea batas L). IOP Cnf. Se: Earth Environ,2021, Sci. 709 012023. Doi:10.1088/1755-1315/709/1/012023

[18] N. Zaidemarmo, A. Husni, Sulastri, Kualitaskimia susu kambing peranakan etawa pada berbagai periode laktasi di desa Sungai Langka Kecamatan Gedong Tataan Kabupaten Pesawaran. Jurnal Ilmiah Peternakan Terpadu, 2016. Vol. 4(4): 307 – 312

[19] Kementerian Kesehatan RI. Permenkes No. 28 Tahun 2019 tentang Angka Kecukupan Gizi yang Dianjurkan untuk Masyarakat Indonesia.

[20] B. Sun, Y. Feng, X. Mo, P. Zheng, Q. Wang, Li P, et al.Kinetics of SARS-CoV-2 specific IgM and IgG responses in COVID-19 patients. Emerging Microbes & Infections. April (2020); DOI:10.1080/22221751.2020.1762515

[21] D. Jacofsky, E.M. Jacofsky, and M. Jacofsky, Understanding Antibody Testing forCOVID-19. The Journal of Arthroplasty (2020), doi: https://doi.org/10.1016/j.arth.2020.04.055.

[22] N. Ratya, E. Taufik, I.I. Arief, Chemical. Physical and Micobiological of Etawa crosbred GoatMilk in Bogor. Jurnal ilmu produksi dan teknologi hasil peternakan, 2017. vol5 (1): 1-4

[23] J. Setiawan, R.R.A. Maheswari, B.P. Purwanto, Sifat fisik dan kimia, jumlah sel somatik dankualitas mikrobiologis susu kambing peranakan etawa. Acta Veterinaria Indonesiana, 2013. Vol 1(1):32-43.

[24] Arief, Elihasridas, S. Sowmen, E. Roza, R. Pazla, Rizqan, Production and quality of Etawa Raw milk using palm Oil Industry Waste and paitan plants as an Early feed. Pakistan Journal of Nutrition: 2018 17(8):399-404. https://dx.doi.org/10.3923/pjn.2018.399.404

[25] Arief, Rusdimansyah, S. Sowmen, R. Pazla, Rizqan, Milk Production and quality of Etawa crossbreed dairy goat that given Tithonia diversifolia, corn waste and concentrate based palm kernel cake. Biodiversitas, 2020. 21(9): 4004-4009. https://doi.org/10.13057/biodiv/d210910

[26] A.M. Legowo, Kusrahayu, S. Mulyani, Ilmu dan Teknologi Susu. Badan Penerbit Universitas Diponegoro. Semarang, 2009.

[27] R. Rosartio, Y. Suranindyah, S. Bintara, Ismaya. Produksi dan komposisi susu kambing peranakan ettawa di dataran tinggi dan dataran rendah daerah istimewa yogyakarta. Buletin Peternakan, 2015. Vol. 39 (3): 180-188, Oktober 2015

[28] Y.W. Park, M. Ju´arez, M. Ramos, G. F.W. Haenlein Physico-chemical characteristics of goat and sheep milk. Small Ruminant Research, 2007.68: 88- 113.

[29] W.N.H. Zain, Kualitas susu kambing segar di peternakan Umban Sari dan Alam Raya Pekanbaru. Jurnal peternakan, 2013. vol 10 (1):24-30

[30] A. Swadayana, P. Sambodho, C. Budiarti, Total bakteri dan pH susu akibat lama waktu dipingputing kambing peranakan ettawa laktasi. 2012, Animal Agricultural Journal. 1(1) : 12 – 21.

[31] A. Yuniastuti, Gizi dan kesehatan. Yogyakarta: Graha Ilmu, 2008: 61-2.

[32] R. Pazla, N. Jamarun, F. Agustin, M. Zain Cahyani NO. 2020. Effects of supplementation with phosphorus, calcium and manganese during oil palm frond fermentation by *Phanerochaete chrysosporium* on ligninase enzyme activity. Biodiversitas 21: 1833-1838. https://doi.org/10.13057/biodiv/d210509

[33] National Institutes of Health Osteoporosis and Related Bone Diseases National Resource Center. Calcium and vitamin D : importatnt at every age. May 2015.https://www.bones.nih.gov/sites/bones/files/calcium_vit_d_important.pdf

[34] L. Zhang and Y. Liu Potential interventions for novel coronavirus in China: A systematic review. J Med Virol. 92(5):479-490.(2020) doi: 10.1002/jmv.25707.

[35] G. Li, Y. Fan, Y. Lai, T. Han, Z. Li, P. Zhou, et al. Coronavirus infections and immune responses. J Med Virol. 1-9 (2020); doi: 10.1002/jmv.25685.

[36] Li C Ka-fai and Xu X. Host Immune Responses to SARS Coronavirus in Humans. Molecular Biology of the SARS-Coronavirus. 22 : 259–278. (2009). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7123234/

[37] H. Gill, and G. Walker, immune fuction andresistance to viral infection. Nutr Diet. 65(Suppl.3):S41-S47.(2008); doi: 10.1111/j.1747- 0080-00260.x

[38] P.R. Hoffman and M.A. Berry, The influence of selenium on immune responses. Mol Nutr Food Res. 52(11):1273-1280 (2008); doi:10.1002/mnfr.200700330