PENGARUH PERIODE LAKTASI TERHADAP KUALITAS SUSU KAMBING PERANAKAN ETAWAH PADA PETERNAKAN SKALA RAKYAT

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Abstrak

Penelitian ini bertujuan untuk mengetahui pengaruh masa laktasi terhadap kualitas susu Kambing Peranakan Etawah ditinjau dari nilai ph, kadar air, dan total mikroba pada salah satu peternakan skala kecil di Lombok tengah. Materi penelitian yang digunakan dalam percobaan ini adalah susu Kambing Peranakan Etawah yang diambil berdasarkan masa awal laktasi, masa pertengahan laktasi, dan masa akhir laktasi. Metode penelitian yang digunakan adalah percobaan eksperimen dengan Rancangan Acak Lengkap terhadap uji nilai pH, uji kadar air, dan uji total mikroba dengan 3 perlakuan dan 15 ulangan. Data yang diperoleh dianalisis dengan analisis ragam (ANOVA), bila terdapat perbedaan yang nyata maka dilanjutkan dengan Uji Jarak Berganda Duncan. Hasil penelitian menunjukkan bahwa masa laktasi memberikan pengaruh yang nyata terhadap nilai pH susu kambing PE. kadar air memberikan pengaruh yang nyata terhadap masa laktasi Kambing PE. Total mikroba susu Kambing Peranakan Etawah dengan masa awal laktasi, pertengahan laktasi, dan akhir laktasi berkisar antara 4,87 – 6,72 CFU/ml. Kesimpulan yang didapat bahwa terdapat pengaruh yang nyata antara masa laktasi awal, pertengahan laktasi, dan akhir laktasi dengan nilai pH dan kadar air namun tidak memberikan pengaruh pada total mikroba susu.

Kata Kunci : Laktasi, Kualitas, Susu Kambing

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INFLUENCE LACTATION STAGE ON MILK QUALITY OF SMALL HOLDERS ETAWAH CROSSBREED GOATS

Abstract

This study aims to determine the effect of the lactation stage on the milk quality of Etawah Peranakan Goats based on pH value, water content, and total microbes in Muda Bakti Barokah Farm. Material used in this research was PE goat fresh milk from 3 different lactation stage i.e. early, mid, and late lactation stages. Completely Randomized Design (CRD) method used in this research, single factor (3 levels of lactation stage) in 15 replication. The research method used a Completely Randomized Design with three treatments and three replications. The data obtained (pH, moisture content, and total microbes) were analyzed by analysis of variance (ANOVA). If there is a significant difference, it is continued with Duncan's Multiple Range Test. The results showed that the lactation stage significantly affected the pH value and moisture content of Etawah crossbreed goat's milk. The total milk microbes of Etawah Peranakan goats during early lactation, mid-lactation, and late lactation ranged from 4.87 – 6.72 CFU/ml. This research concludes that there is a significant effect between early, mid-lactation, and late lactation according to pH values and moisture content. However, it does not affect the total milk microbes of Etawah crossbreed goats.

Key words: Lactation stage, Quality, Goat Milk

INTRODUCTION

Goat milk production contributes 35% to world milk production. In Indonesia, the production of Etawah crossbreed goats has not been carried out continuously, so the quantity and quality are not good enough. Etawah crossbreed goats are purposed for producing milk, meat, and breeds, which is very suitable for Indonesian farmers because they can survive in a tropical climate and high temperatures. According to (Febriana et al., 2018), the productivity of Etawah crossbreed goats is influenced by genetic factors such as type, heredity, age, hormones, pregnancy, and body size. Furthermore, environmental factors, including feed, season, length of lactation, disease, and drugs, also affect goat performance. Etawah crossbreed goats grow faster than other ruminants.

Goat's milk contains higher protein than cow's milk and has rich in calcium, phosphorus, and vitamins that are needed for growth and prevents osteoporosis in older people. The complete nutritional content of goat's milk has the potential as a cow's milk substitute. According to the Department of Animal Husbandry and Health NTB, the goat population in 2021 reached

114.324. The huge goat population will affect milk production. Nowadays, Etawah crossbreed goat Milk is starting to be in good demand in Central Lombok. Etawah crossbreed goat milk production averages 1 – 1.5 liters per day (Ministry of Agriculture, Agricultural Research and Development Agency, 2020). Milk production during lactation can be influenced by the type of goat, calving interval, milking methods, feed, and goat's lactation stage. Based on Thai Agricultural Standard (TAS 6006 – 2008), during the 3rd to 4th months of lactation, goat milk production is around 1.5 liters - 1.7 liters per day.

Muda Bakti Barokah Farm is a small-scale Etawah crossbreed goats farm located in Tompek, Kelebuh, Praya, Central Lombok. Tompek Village has a tropical climate with a rainy season from November to April and a dry season from May to October. The farm, founded by Edi Sanjaya in 2017, prioritizes dairy products and goat fattening as its business. According to (Memon et al., 2016), goats can adapt well to a tropical climate with high temperatures and uncertain ecological conditions. Edi Sanjaya founded MBB Farm as a goat milk farm in Central Lombok to promote Etawah crossbreed goat milk, which has a higher nutritional value than cow's milk. The milk production of Etawah crossbreed goats in each month of lactation has a different nutritional quality. According to the research results of (Chen et al., 2018), there is an influence between the components in milk, such as the content of protein, fat, dry matter, lactose, calcium, and the pH value of goats with goat milk production during early lactation, mid lactation, and late lactation. Differences in the nutritional content of milk in each phase can provide up-to-date information about the dietary characteristics of milk that can assist in the areas of milk production, food technology, and adding nutrition to milk. Based on (Lopes et al., 2016a), Many microbes reduce milk production during lactation and affect milk quality, such as fat, non-fat dry matter, and protein.

Identifying the quality of goat's milk can be done by analyzing specific gravity, fat content, moisture content, total solid non-fat, protein content, acidity level (pH), adulteration test, and total microbes. Some identification methods have specific criteria or standards that determine which milk can be categorized as good quality. Quality tests are conducted to assess the quality of goat milk according to standards and safe for consumption. Typically, the pH value of goat milk is 6.5 – 6.8, the water content is 88.5% and microbial contamination in fresh milk is not more than 1 x 106 CFU/ml (Rasheed et al., 2016), Milk production during early lactation, mid-lactation, and late lactation indicate differences in nutritional content such as water content, pH value, and total microbial, so it is necessary to improve the quality of Etawah crossbreed goats milk owned by Muda Bakti Barokah Farm. However, as small-scale farmers, Muda Bakti Barokah Farm still needs help to improve

the production and quality of the goat milk they produce.

MATERIAL AND METHODS

1.1. Material

The study was carried out from October to December of 2022. The goat milk used in the study was collected at Muda Bakti Barokah Farm, Central Lombok. In total, 45 raw milk samples representing Etawah crossbreed goats breeds were tested. The total of 45 goats were divided according to the lactation stage into three groups: 1 – first and second lactation (n=15), 2 – third and fourth lactation (n=15), and 3 – animals of fifth to seventh lactation (n=15). Animals were kept in the same condition and fed by a feeding scheme with grassland, River Tamarind (Leucaena leucocephala), and concentrate. The goats were manually milked twice a day, and milk yield was recorded. Samples from morning milking were used for analyses. Samples were cooled, stored at four °C, and analyzed on the same day of milking.

1.2. Method

Individual goat milk samples were analyzed for pH, Moisture Content, and microbiological quality. Goat Milk pH was determined using method by (Umam et al., 2018) as follows : an Aventru pH Meter AS218. Before using the pH meter, the sample was calibrated with pH four and pH seven buffer standards and adequately cleaned with distilled water. A 50 mL sample was placed in a beaker glass and then inserted into an auto-mode pH meter, with pH values recorded in triplicate. Moisture content is determined by removing moisture and then by measuring weight loss. Microbiology quality was tested along the way of (Zakaria et al., 2020), Sample was incubated The 3M™ Petrifilm™ Aerobic Count (AC) Plate for 48 h at 37±1ºC. Statistical analysis used IBM SPSS Statistics 27 for Mac OS, then continued with Duncan's multiple ranged tests (DMRT).

RESULT AND DISCUSSION

1.1. pH Value

The pH value indicates the level of acidity or alkalinity of a liquid. The average pH value in fresh milk is different for various species. The pH value of cow's milk ranged from 6.59 – 6.67, and the pH value of goat's milk ranged from 6.48 – 6.64. The results of the average pH value during lactation can be seen in Table 1.

Table 1. Milk production indices and chemical composition in thlate lactation goat

Indicators	Group		
	Early Lactation	Mid Lactation	Late Lactation
pH Value	6,6 ± 0,02[a]	6,72 ± 0,01[b]	6,76 ± 0,01[b]
Moisture Content (%)	91,37 ± 0,75[a]	93,40 ± 0,56[c]	92,90 ± 0,03[b]
Microbiology (CFU/ml)	6,72 ± 0,76	4,87 ± 0,51	5,71 ± 1,48

Note: The different superscripts in the same column show significant effect (P<0.05)

The statistical analysis results showed that the pH value of Etawah crossbreed goats' milk during early lactation, mid-lactation, and late lactation ranged from 6.6 to 6.76. The results showed that the lactation stage had a significant effect (P<0.05) on the pH value of Etawah crossbreed goat's milk. The highest pH value was in the late lactation stage at 6.76 ± 0.01, while the lowest pH value was obtained during the early lactation stage at 6.6 ± 0.02. The pH value depends on the stage of lactation, which is lower during early lactation and shows a steady increase until week 8 (month 2), followed by a gradual decrease. Increases and decreases in pH values can result from the conversion of lactose to lactic acid caused by the enzymatic activity of lactic acid bacteria in milk (Diastari et al., 2013). (Ibnu Sholeh et al., 2021) reported an increase in acidity in milk caused by lactic acid, so the higher the lactic acid content, the lower the pH value detected. (Umam et al., 2019) also explained the same thing: adding lactic acid bacteria can produce acid, then reducing the pH value. At the ideal temperature, LAB and yeast had enhanced growth conditions and maximized metabolic activity (Khoirul Umam et al., 2022).

Milk contains casein divided into four fractions, one of which is K-casein. According to (Qin et al., 2021), the Casein content increased at the beginning and decreased at the end of lactation. This decrease occurs because Casein is divided into several fractions. The content of K- Casein, which is the size of the divided Casein part, results in the number of K- Casein becoming more and increasing the pH value. The increase in casein content at the beginning of lactation and its breakdown into tiny pieces causes a high pH value at the end of lactation. Some factors that can affect the high number of bacteria and low pH values are environmental conditions, sanitation, and diseases caused by bacteria (Sasongko et al., 2012). Lactic acid bacteria (C3H6O3) is one of bacteria thar readily dissociates into H+ and CH3CHOHCOO- ions, when

Lactic acid was increasing H+ ion resulted in the decreasing of pH values. (Khoirul Umam et al., 2018).

1.2. Moisture Content

Moisture content is the amount of water in food. The water content in Etawah crossbreed goats ranges from 84 – 89%. Statistical analysis showed that Etawah crossbreed goat's milk moisture content went from 91.37 to 93.40%. The results showed that the water content had a significant effect ($P<0.05$) on the lactation stage of Etawah crossbreed goats. The highest water content was obtained during mid-lactation, and the lowest was accepted during early lactation, with values of 93.40 and 91.37, respectively. The reduction of moisture content of Etawah crossbreed goat's milk during early lactation was caused by feeding them at the beginning of lactation. According to ((Lopes et al., 2016b)High feeding level at the beginning of lactation results in a negative energy balance where goats expend more energy in this condition. Negative energy balance is related to the high demand for power during lactation, which is a trigger factor for fat transfer and contributes to increasing circulating fatty acids for lactogenesis. The development of a negative energy balance at the start of lactation causes adipose tissue fatty acids to consist of long-chain fatty acids, which inhibit the de novo synthesis of short-chain fatty acids by mammary tissue . additionaly, The moisture content is probably high due to the growth of lactic acid bacteria (LAB) ((Radiati et al., 2020)

On the other hand, (El-Tarabany et al., 2018) explained that the total solid content is lower during early lactation compared to mid and late lactation, so more water content is produced at the beginning of lactation. Total solids consist of various macronutrients and micronutrients. Based on (O'Callaghan et al., 2016), milk's total solids and macronutrient components (protein, fat, casein, whey) are deficient at the start of the first lactation. That happens due to the effect of milk concentration reduced milk production along with the development of the goat's lactation stage from mid-lactation to the end of lactation. Milk production at the beginning of lactation is characterized by low milk volume and reaches peak production in the third month.

Several factors can affect the accuracy of the results of the moisture content analysis in the research conducted. The method used in this research is drying the sample at 105ºC. The advantage of this conventional method is that it can be used in large quantities of samples and can easily adjust the temperature to reach the desired temperature more quickly. However, there are drawbacks to this method, such as the loss of other substances contained in milk. The level of accuracy in the drying process using the oven method to determine humidity levels can be influenced by many factors. The oven's condition affects the accuracy of determining humidity, including

temperature, air velocity, pressure, and relative humidity.

1.3. Microbiological quality

Microbes are divided into one cell and multicellular. Microbes can live in various media, such as milk. Microbes in milk can be detected using the TPC (Total Plate Count) and Petri film methods. Based on Indonesian National Standard (2011), the quality requirements for fresh milk are seen from the total plate count, which is not more than 1 x 106 CFU/ml. The analysis showed that the entire milk microbes of Etawah crossbreed goats during early lactation, mid-lactation, and late lactation ranged from 4.87 – 6.72 CFU/ml. The highest total microbes were found in the early lactation stage, and the least number of microbes were found in the mid-lactation stage with a total value of 6.72 ± 0.76 CFU/m and 4.87 ± 0.51 CFU/ml, respectively. The result differs from what (Goetsch et al., 2011) stated: the total microbial increase was directly proportional to the rise in the lactation stage. The increase in total microbes at the beginning of lactation is caused by colostrum residues remaining during lactation stage.

The high number of total microbes contained in the Etawah crossbreed goats milk at the beginning of lactation compared to mid-lactation and late lactation can be caused by high lactoferrin in early lactation. lactoferrin is a glycoprotein that functions as a defense against bacterial infections. Another function of lactoferrin in the early lactation stage is to prevent the formation of post-partum disorders and protect newborn cattle from disease. The concentration of lactoferrin in the mammary gland is related to the health of the udder and the stage of lactation. The udder with high lactoferrin at the beginning of lactation is more easily infected. It is explained that the concentration of lactoferrin can predict the risk of future infections. The total microbes present at the end of lactation are also influenced by lactoferrin, where lactoferrin begins to be produced before the dry stage.

Factors that can affect the high microbial contamination in fresh milk are dirty milking equipment and unhygienic milking process. The length of distribution time also must be considered due to lactic acid bacteria's continuous metabolic activity even in cold supply chain system (Khoirul Umam, Eka Radiati, Hutomo Putra Suwondo, et al., 2022). The results of total microbial analysis of Etawah crossbreed goats milk research on Young Bakti Barokah farm at early, mid, and late lactation stages were 6.72 CFU/ml, 4.87 CFU/ml, and 5.71 CFU/ml, respectively. from the result it can be proven that lactoferrin is produced higher during the dry stage so it can protect the udder efficiently.

CONCLUSION

There was a significant difference between early lactation, mid-lactation, and late lactation according to pH values and water content. However, it did

not affect the total microbes of the Etawah crossbreed goat milk owned by Muda Bakti Barokah Farm (MBB Farm) as a smallholder farmer. The high pH value at the end of lactation is caused by the conversion of lactose into lactic acid generated by the enzymatic activity of lactic acid bacteria in milk. A negative energy balance effect causes low water content at the beginning of lactation with high energy demand during lactation, which triggers fat transfer and increases the circulation of fatty acids. The high total microbes at the start of lactation can be due to the high microbial contamination.

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