The effect of feed on feeding combination of the ark with ammonized citronella grass waste to the quality of lactated etawah crossbreed goat milk

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Abstract. This study aims to determine the effect of giving a combination of the ark with ammoniated citronella grass waste on the levels of protein, fat, lactose and density of lactated Etawah crossbreed goat milk. The design used in this study was a randomized block design (RBD) consisting of 5 treatments and 3 groups. The treatment consisted of P1 (0% ark: 8% ammoniated citronella grass waste), P2 (2% ark: 6% ammoniated citronella grass waste), P3 (4% ark: 4% ammoniated citronella grass waste), P4 (6% ark: 2% citronella ammonia grass waste) and P5 (8% ark: 0% ammoniated citronella grass waste). The data obtained were analysed statistically using Microsoft Excel software. Based on the results of the research, giving the combination of the ark with ammoniated citronella grass waste shows no significant effect (P > 0.05) on the quality of milk which includes density, lactose level, protein level and fat level in Etawah crossbreed goat (PE) milk. However, the quality test results showed an increasing trend when compared with the quality of PE goat's milk without treatment. The results of the data for each of the PE goat's milk quality before given the feed treatment were 1.027; 3.34%; 3.42% and 6.40% for the density, lactose level, protein level and fat level. Meanwhile the results of the data for each of the PE goat milk quality after given the feed treatment got the best results, namely 1.030; 3.66%; 3.78% and 6.55% for the density, lactose level, protein level and fat level.

1. Introduction
The problem that often occurs in dairy farming is the quality of milk that does not meet the standards of the milk processing industry. Cooperatives will reject milk with substandard quality, which will harm farmers. The quality of milk is greatly influenced by the nutritional content of the feed for the livestock, poor quality of the feed will influence the nutrients from feed ingredient to be absorbed in the digestive tract for milk production to decrease. This affects the quality of the milk produced. Effort that can be made to produce milk that meets quality standards is by providing feed additives. Feed additives are non-nutritional substances that are given to increase productivity and growth in livestock. Feed additives commonly used by breeders are antibiotics, enzymes, probiotics, prebiotics and plant bioactive.

Ark block is a development of tape-curcuma paste and Sakura block. Tape pasta is a source of easily digest carbohydrates and rich in yeast, especially Saccharomyces Cerevisae which will
maintain the balance of rumen microbes, increase nutrient consumption and nutrient digestibility. Curcuma contains bioactive ingredients, namely curcuminoids and essential oils. This bioactive functions as an anti-inflammatory, anti-worm, stimulant for ration consumption, and substances similar to the hormones Oxytocin and Prolactin. It also can improve the condition of the rumen.

Citronella grass waste has better quality than straw. Citronella grass waste has a high enough lignin content so that it is difficult for livestock to digest. To increase digestibility, chemical processing in the form of ammonia can be carried out. In addition to increase the digestibility of ammonia, it can also increase protein levels in citronella grass waste. Therefore, if PE goats consume fragrant citronella grass waste, it will increase milk protein content because the higher the consumption of crude protein, the higher milk production, protein content and milk lactose produced by PE goats. Based on this background, it is necessary to carry out further research on the effect of giving a combination of the ark with ammoniated citronella grass waste to the quality of lactated etawah crossbreed goat milk.

2. Materials and methods

2.1. Materials and method
The research sample used was 15 lactating PE goats with lactation periods 1, 2 and 3. The data obtained in this study were statistically analysed using a randomized block design (RBD) consisting of five treatments and three groups. The five treatments were P1 = 0% ark + 8% ammoniated citronella grass waste; P2 = 2% ark + 6% ammoniated citronella grass waste; P3 = 4% ark + 4% ammoniated citronella grass waste; P4 = 6% ark + 2% ammoniated citronella grass waste; P5 = 8% ark + 0% ammoniated citronella grass waste.

The curcuma solution is made based on a ratio of 2/1 w/v (weight/volume), where the mass of the solute is curcuma and the volume of the solution is water. All the ingredients are mixed evenly and then weighed based on the level of the ark then printed in a round shape, after printing, the ark will be dried for three days until it hardens.

Making citronella grass waste begins with drying process for three days, then mashed using a disk mill to become flour. The flour will be ammoniated using urea, where the total ingredients of citronella grass waste flour use urea as much as 4%. The dry matter digestibility of citronella grass waste can be increased to 46.39% by processing ammonia using 4% urea [1]. Then enter the citronella grass waste flour into a 10 kg plastic size. Then ammoniate the citronella waste flour for two weeks.

Milk quality data were obtained from milk sampling which was carried out four times a month at the end of the week. Milk quality test which includes lactose level, protein level and fat level and density were analysed using the Lactoscan Farm Eco tool. Firstly, clean the Lactoscan Farm Eco tool before use, by turning on the Lactosan Farm Eco tool and then cleaning it with aquadest. After that, put 20 ml of milk into the container in Lactoscan followed by inserting the suction tube into the container that already contains milk. Perform analysis and wait for the results to come out of the Lactoscan Farm Eco print tool, then record the results that come out. When finished, sterilize the tool using lactodaily.

The milk quality test which includes density was analysed using a brand Lactodensimeter with a temperature of 27°C [2]. Milk with the amount of 200 ml is poured into the tube, then the Brand Lactodensimeter is immersed. Leave it until the Brand Lactodensimeter appears to the surface then wait for the tool to stand still. The surface of the milk on the Brand Lactodensimeter indicates the density of the milk. Read the numbers on the surface line of the milk showing the 2nd and 3rd digits behind the comma, while the 4th decimal is rounded only [3].

2.2. Data analysis
The data obtained in this study were analysed statistically. Data analysis is intended to answer the research objectives. All data collected for each treatment and group were tabulated according to the
type of data. Microsoft Excel software is used to set the mean value and standard deviation. Data analysed using ANOVA.

3. Results and discussion

3.1. Quality of PE goat milk before the study

One of the factors that affect the quality of milk is feed. Feed that contains good nutrition and high digestibility will produce better milk quality because the nutrient content of the feed metabolism in the blood will be used as a precursor to synthesize milk. The average quality of PE goat's milk before the study can be seen in Table 1 as follows.

| Parameter | Treatment | Average |
|-----------|-----------|---------|
| Density   | P1        | 1,027   |
|           | P2        | 1,026   |
|           | P3        | 1,027   |
|           | P4        | 1,029   |
|           | P5        | 1,027   |
| Lactose (%) | P1      | 3,37    |
|           | P2        | 3,18    |
|           | P3        | 3,36    |
|           | P4        | 3,48    |
|           | P5        | 3,30    |
| Protein (%) | P1     | 3,46    |
|           | P2        | 3,29    |
|           | P3        | 3,42    |
|           | P4        | 3,54    |
|           | P5        | 3,37    |
| Fat (%)   | P1        | 5,89    |
|           | P2        | 5,99    |
|           | P3        | 7,09    |
|           | P4        | 5,97    |
|           | P5        | 7,04    |

Based on the results of the analysis in Table 1, it shows that the density obtained is good, as in the opinion of Adriani [4], which states that the density of goat milk ranges from 1.027 - 1.035. However, the lactose level in PE goat's milk before being given the treatment feed was lower than the research of which was 5.5%. According to Thai Agricultural Standard [5] No. 60062008, the results of the analysis of protein and fat level in the table above, respectively, are included in the good and premium criteria.

3.2. Classification using discriminant analysis

Density is one of the indicators that affects the quality of milk. The average density of milk given to the combination of the ark with ammoniated citronella grass waste can be seen in Table 2.

| Treatment | Group | Average | Standard Deviation |
|-----------|-------|---------|--------------------|
| P1        | 1     | 1,029   | 0,001              |
| P2        | 1     | 1,030   | 0,001              |
| P3        | 1     | 1,031   | 0,002              |
| P4        | 1     | 1,029   | 0,002              |
| P5        | 1     | 1,030   | 0,002              |

The results of the analysis of variance on the density of milk showed no significant effect (P>0.05). The average density of milk in each treatment ranged from 1.028 to 1.030. Treatments P3, P4 and P5 produced density levels that tended to increase compared to other treatments, but based on statistical analysis, they were not significantly different. This is because the dosage of using the ark and citronella grass waste in treatment P3, P4 and P5 is higher than treatment P1 and P2, so that it contains complete nutrients such as carbohydrates, proteins, fats and minerals which will affect the
density of milk. According to Sulistyowati [6] the ark provides essential nutrients such as amino acids, glucose, lactose, VFA, sulfur, phosphorus, potassium and other micro minerals which will then be metabolized, synthesized and secreted into lactated livestock milk. Density is influenced by the dissolved content in milk where the more compounds contained in milk, the density of milk will increase.

The results obtained from the density of PE goat's milk did not have a significant effect. However, the density of milk treated with P3, P4 and P5 was 1.030 higher than the results of research by Adriani [7] namely the provision of high-quality feed with a concentration of 60% forage and 40% concentrate produces the best density of milk which is 1.0289. However, similar to the results of Sukarini's [8] study, feeding with 71.70% forage (gamal + waru leaves) and 28.30% concentrate produced the best PE goat's milk density that is 1.030.

3.3. Lactose levels of PE goat milk given a combination of ark with ammoniated citronella grass waste

Lactose is one of the largest components in milk. The average lactose level of PE goat's milk given the combination of the ark with ammoniated citronella grass waste can be seen in Table 3.

| Treatment | Group | Average | Standard Deviation |
|-----------|-------|---------|--------------------|
| P1        | 1,2,3 | 3.44, 3.27, 3.46 | 3.39 | 0.104 |
| P2        | 1,2,3 | 3.62, 3.34, 3.50 | 3.49 | 0.140 |
| P3        | 1,2,3 | 3.58, 3.35, 3.69 | 3.54 | 0.173 |
| P4        | 1,2,3 | 3.52, 3.79, 3.51 | 3.61 | 0.159 |
| P5        | 1,2,3 | 3.34, 3.91, 3.74 | 3.66 | 0.293 |

The results of the analysis of variance on the lactose level of milk showed no significant effect (P>0.05). The average levels of lactose in each treatment ranged from 3.54 to 3.66%. However, the lactose level of milk given the treated feed tended to increase compared to before being feed which was only 3.34%. Table 3 shows that giving the ark as much as 8% (P5) resulted in a milk lactose level that tended to increase compared to other treatments. This is because the use of the dosage of the ark at P5 is higher than the treatment P1, P2, P3 and P4, so that the function of the ark works more optimally. The presence of curcuminoids and essential oils contained in the ark which can indirectly improve the efficiency of the digestive tract, especially the small intestine in absorbing food substances such as easily digested carbohydrates in tape so that the substrate produced in the form of VFA (Volatile Fatty Acid) will be more widely available, carbohydrates easily digested in the feed will be fermented into flying fatty acids, namely propionic acid in the rumen. The propionic acid will then undergo a gluconeogenesis process in the liver to form glucose which will be carried by the blood to the udder gland secretory cells to be used as raw material for the synthesis of milk lactose [9].

The results obtained from the lactose level of PE goat's milk did not have a significant effect. The lactose level of milk with P5 treatment was 3.66% lower than the results of Masitah's [10] giving 10% of chicken claw flour in goat PE rations resulted in the best milk lactose content, that is 4.31%. This is presumably caused from the effect of using chicken claw flour is higher than the use of ark at P5. The gluconeogenesis process in the liver converts the amino acids that are absorbed in the intestine into glucose, thereby increasing glucose levels in the blood, which in turn will increase the lactose level of milk.
3.4. **Protein levels of PE goat milk given the combination of the ark with ammoniated citronella grass waste**

The average protein level of PE goat's milk given the combination of the ark with ammoniated citronella grass waste can be seen in Table 4.

| Treatment | Group 1 | Group 2 | Group 3 | Average | Standard Deviation |
|-----------|---------|---------|---------|---------|-------------------|
| P1        | 3.56    | 3.37    | 3.56    | 3.50    | 0.110             |
| P2        | 3.72    | 3.42    | 3.64    | 3.59    | 0.115             |
| P3        | 3.71    | 3.41    | 3.82    | 3.65    | 0.212             |
| P4        | 3.62    | 3.91    | 3.60    | 3.71    | 0.173             |
| P5        | 3.44    | 4.05    | 3.86    | 3.78    | 0.312             |

The results of the analysis of variance on milk protein level showed no significant effect (P> 0.05). The average protein level in each treatment ranged between 3.50-3.78%. Table 4 shows that giving the ark as much as 8% (P5) resulted in a milk protein level that tended to increase, that is 3.78% compared to other treatments. This is because the dosage of using the ark at P5 is higher than the P1, P2, P3 and P4 treatments, so that the energy availability is higher for the formation of amino acids from microbial proteins in the rumen, so that the availability of these amino acids can contribute to increase the synthesis of milk protein [6]. The increase in milk protein synthesis is caused by an increase in the availability of amino acids in feed [11].

Ark also has a high crude protein level which results in increased protein levels in milk. The type of feed given is one of the factors that affect milk protein level. The higher the protein level in the feed, the higher the protein level secreted into the milk. Which states that feed that has good quality provides higher blood nutrition and is correlated with the process of milk formation in udder gland secretory cells which in turn will increase the production and quality of milk produced [12].

The results obtained from the protein level of this PE goat's milk did not have a significant effect. However, the protein level of milk with P5 treatment was 3.78% higher than the results of Sukarini [6], that is feeding with 71.70% forage (gamal + waru leaves) and 28.30% concentrate resulted in the best PE goat milk protein level that is 3.64%. The protein level in goat's milk is 3.22% -3.89 [13]. This protein level is also above the standard, as the quality requirements for milk protein level that have been set by the Indonesian National Standard (01-3141-2011) has a minimum of 2.8%.

3.5. **Fat level of PE goat's milk given the combination of the ark with the ammoniated citronella waste**

The average fat level of PE goat’s milk given the combination of the ark with ammoniated citronella grass waste can be seen in Table 5 as follows.

| Treatment | Group 1 | Group 2 | Group 3 | Average | Standard Deviation |
|-----------|---------|---------|---------|---------|-------------------|
| P1        | 7.71    | 8.00    | 8.34    | 8.02    | 0.315             |
| P2        | 8.3     | 8.10    | 6.83    | 7.74    | 0.797             |
| P3        | 7.54    | 6.17    | 7.42    | 7.04    | 0.759             |
| P4        | 5.79    | 7.37    | 7.28    | 6.81    | 0.887             |
| P5        | 5.84    | 7.79    | 6.03    | 6.55    | 1.075             |
The results of the analysis of variance on the fat level of the milk showed no significant effect (P>0.05). The average milk fat level in each treatment ranged from 6.55-8.02%. However, the fat level of the milk which was given the treated feed tended to increase compared to before being given the treated feed which was only 6.44%. In Table 5, it shows that treatment with only the provision of ammoniated citronella grass waste (P1) produces milk fat levels that tend to increase. The milk fat level produced by PE goats which were only given ammoniated citronella grass waste (P1) was higher, that is 8.02% when compared to the milk fat level of PE goats that got the combination with ark, that are 7.74 each; 7.04; 6.81 and 6.55% for P2, P3, P4 and P5.

Ammoniated citronella grass waste has a crude fiber content of 25.73%, so it will affect the formation of fat in milk. In general, milk fat level is a nutritional component that is volatile and highly dependent on fiber level in feed [14]. The main raw materials in synthesizing milk fat are acetic acid and butyrihydroy butyrate which are the results of digestion of crude fiber in the rumen [15]. Acetic acid and butyric acid will enter the bloodstream to the liver to be converted into fatty acids, then it will enter udder secretion cells for the synthesis of milk fat [16, 17].

Milk fat tended to decrease with the addition of ark feed which the lowest results was obtained at P5, that is 6.55%. This is due to the high protein level in the ark which stimulates the production of propionic acid which will increase lactose and milk production. Just like milk protein, milk fat level decreases coincide along the increased milk production. In addition, the high content of ginger in the ark also causes milk fat levels to decrease.

The results obtained from the fat level of PE goat's milk is that it did not have a significant effect. However, milk fat level with P1 treatment was 8.02% higher than the results of Sukarini [6], feeding with 71.70% forage (gamal + waru leaves) and 28.30% concentrate resulted in the best milk fat level, that is 4.86%.

4. Conclusions
Based on the results of the research, it is concluded that the combination of the ark with ammoniated citronella grass waste has not had a significant effect on the quality of milk (density, lactose level, protein level and fat level), but it has shown a tendency to increase milk quality in the form of density, lactose level and protein level.

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