

Milk Quality of Anglo Nubian X Etawah Grade Goats and Saanen X Etawah Grade Goats at First Kidding Period

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ABSTRACT: Goat milk has been well-known as useful human consumption due to its nutrition content and medical for many diseases. To improve productivity of dairy goats is through crossbreeding between local breed and adapted exotic breed. A study was carried out to evaluate milk quality of Anglo Nubian (AN) x Etawah grade (PE) goats and Saanen (SA) x Etawah Grade goats. There were 26 does first kidding that consisted of 15 ANxPE does and 11 SAxPE does used in this study. All does were raised and given same feeding and management system at Dairy Goat Unit of Indonesian Research Institute for Animal production. A weekly single hand milking data was collected for milk quality from 12 weeks evaluated by lacto-scan. Data were analyzed using linear model from SAS program. Results indicated that there were significant difference ($P < 0.01$) in fat and total solid milk content between the two genotypes, with overall means (%) for fat content 5.01 and 4.88, protein 3.02 and 2.98, lactose 4.94 and 4.97 and total solids 13.68 and 13.17 for ANxPE and SAxPE. The weeks of lactation affected fat and protein contents ($P < 0.01$). It can be concluded that ANxPE does produced acceptably fat and protein content. This study might be used as early information used for recommendation in increasing goat milk production and quality.

Keywords: goat crossbreeds, milk composition

INTRODUCTION

Goats are mainly kept for meat production and their milk is rarely consumed. However, nowadays, there is an increasing consumption of goat milk due to its better-quality such as lower cholesterol, higher vitamin and valuable amino acid than cow milk, also can be used as infant food (Abbas *et al.*, 2014; Asresie *et al.*, 2014). Besides, goat milk has been used several medicinal values as therapeutic virtues for dietetic and ulcers problems or people allergic to cow milk and inflammatory diseases which led to an increased interest in goats milk as a functional food, and it now forms a part of the current trend to healthy eating (Abbas *et al.*, 2014). In many countries the prize of goat milk is much higher than cow milk (Kosgey *et al.*, 2013).

Ettawah grade (PE), a local goat breed, is one of the dairy goat breed in Indonesia. They have been well-known for their adaptability in harsh environment thus smallholder farmers like to raise them. However, their milk production is still low ranged 0,2-1,2 liter/head/day (Sutama *et al.*, 2014; Praharani, 2014a). To meet the demand of goat milk, consequently, the milk production of PE has to be increased through improving management and genetic.

Many crossbreeding program in dairy goat has been done to increase goat productivity in producing milk (Assan, 2013; Norberg *et al.*, 2014). There are many dairy goat breed with excellent milk production such as Saanen, Toggenburg, Alpine and Anglo Nubian that has been used for crossbreeding to local goats in many countries. The Saanen goats performed the highest milk production. However, Anglo Nubian has the highest adaptability in the tropic condition with the highest fat content of milk (Goetsch *et al.*, 2011). In Indonesia, Etawah grade has been crossbred to Saanen goats for many years, resulted to increased milk production 0.8-1.2 liter/head/day (Sutama *et al.*, 2014).

Indonesian Research Institute for Animal Production has done a crossbreeding program using Anglo Nubian bucks mated to Etawah Grade does since 2012. First crossbred kids were born

in 2013 and have been observed their productivity. Praharani (2014^a) and Praharani *et al.* (2014^b) reported that growth rate from birth to puberty of F1 ANxPE was higher than Ettawah Grade.

Milk composition and quality are important attributes that determine the nutritive value and consumer acceptability. There are several studies reported goat milk yield and composition are affected by breed/genotype, age/parity of does, lactation stage/month, season and plane of nutrition (Goetsch *et al.*, 2011; Adass *et al.*, 2013; Pesantez and Hernandez, 2014). Evaluation of goat milk composition especially in ANxPE has not been done since they were still doeling. Therefore, this study was to investigate goat milk composition in ANxPE compared to SAxPE at first kidding.

MATERIALS AND METHODS

This study was carried out at the Dairy Goat Unit of Indonesian Institute for Animal Production, in Bogor, located on 250-350 m above sea level. The study had been done for 12 weeks. About 26 does were used in this study consisting of 15 ANxPE and 11 SAxPE does at first kidding aged between 15-18 months. All animals were reared in the same management system. They were fed 0.8 kg/head/day of concentrate 16-17% Crude Protein and 65-70% TDN. Forages containing of King grass were given about 4-5 kg/head and 0.5-0.6 kg/head/day of legumes (Caliandra, Leucaena, Gliricidae). Clean water were available ad libitum.

Does were milked twice a day (morning and afternoon) by hands. Morning-milked sample were evaluated using lacto-scan to obtain milk composition of fat, protein, lactose, solid non fat (SNF), and total solid (SNF + fat). The mean of fat and protein level of milk for 12 weeks were plotted in graph. The data generated were subjected to analysis of variance using the General Linear Model (GLM) of SAS (2003). Genotype and weeks of lactation were included in the model as source of variation. Effects were considered significant at 0.01 level or less using P-DIFF test.

RESULTS AND DISCUSSION

Effects of Genotype

Table 1 shows the composition of goats' milk analyzed during 12 weeks of lactation. Overall averages of milk composition contents (%) were: fat 4.91, protein 3.00, lactose 4.95 and total solid 13.47 for both genotype. Table 1 showed fat 5.01 and 4.88, protein 3.02 and 2.98, lactose 4.94 and 4.97, and total solids 13.68 and 13.17 for ANxPE and SAxPE, respectively. These findings were ranged of some reviews in milk composition from several breeds (Mayer and Fiechter, 2012; Abbas *et al.*, 2014).

Effect of genotype on milk content were only significant in fat and total solid ($P < 0,01$) in agreement with Goetsch *et al.* (2011) that goat milk composition affected by breed/genotype. The ANxPE had higher fat and total solid compared to SAxPE. Adass *et al.* (2013) found breed effects on fat and total solid content in Sahel goat milk, Sokoto Red and Dwarf. The present study indicated that Anglo Nubian milk had higher fat content than Saanen, in agreement with Fernandez (2013) that found higher fat and protein in Anglo Nubian. The protein and lactose content in both genotype were not different ($P > 0,05$) that were similar to Zarkawi *et al.* (2013) studied in Syrian Mountain goats, Damascuss x Syrian Mountain goats in Syria and found that protein and lactose were not affected by breed. Sumarmono *et al.* (2012) found fat content 5,17% in PE goats close to ANxPE in the present study.

Comparing the results of fat, protein, lactose and total solid milk compositions obtained in the present study with those of other goat breeds. Average fat content (%) in the milk of both genotype was higher than those reported in Ettawah grade goats of 3,74-5,4% (Sumarmono *et al.*, 2012; Wibowo *et al.*, 2013); 4,65% reported in Anglo Nubian goats in USA and 4,57% in Cuba (Fernandez, 2013). Some literature found fat content 4% in Saanen goats in Sudan and Swiss

(Sabil *et al.*, 2011), 3.59% in USA and 3.56% in Cuba (Fernandez, 2013). However Anglo Nubian x Saanen crossbreds produced 4.17% of fat content (Gadir *et al.*, 2005) and 3.45% SaanenxKilis in Turkey (Guzeler *et al.*, 2012). This present study had lower fat content in SAxPE than those reported by Prasetyo (2012) found 6.34%.

Table 1. Means, LSMeans and standard error of milk composition of ANxPE and SAxPE and effect of genotype and week of lactation

Parameters	N	Means	P-Value		LSMeans±std.error	
			Genotype	Weeks of lactation	ANxPE	SAxPE
Fat	312	4.91	<0.0001	<0.0001	5.01 ^a ±0.04	4.88 ^b ±0.04
Protein	312	3.00	0.7547	0.0043	3.02±0.01	2.98±0.01
Lactose	312	4.95	0.2250	0.7009	4.94±0.01	4.97±0.02
Total Solid	312	13.47	<0.0001	0.4640	13.68 ^a ±0.07	13.17 ^b ±0.09

^{a,b}superscripts of different column in the same row were significantly different (P<0,01)

In the present study, the mean of protein content of Saanen were lower than 3.62-3.86% in Turkish Saanen (Guzeler *et al.*, 2012) and 3.48% in USA or in Sudan and Swiss (Sabil *et al.*, 2011). Also the protein content of Anglo Nubain in this study were lower 4.38% in Nubian goats and 2.84% in Anglo Nubian in USA. When Anglo Nubian were crossed to Saanen, they produced 3.66 % of protein content (Gadir *et al.*, 2005) and 3.81% SaanenxKilis in Turkey (Guzeler *et al.*, 2012). The present study obtain lower than those reptred by Sumarmono *et al.* (2012) found that lactose in PE goat milk was 3.55-4.27 %. Prasetyo (2012) found protein content 4.97% in SAxPE.

The mean of lactose in this study were lower than those reported by Sabil *et al.*, (2011) that found 4.50 % of lactose in Saanen goats in Sudan and Swiss. However it was lower compared to who found 4.53% in Anglo Nubian and 4.54% in Saanen raised in the same management in USA. The ANxSA crossbreds produced 4.91% of lactose content (El Gadir *et al.*, 2005) and 4.12% SaanenxKilis in Turkey (Guzeler *et al.*, 2012). Sumarmono *et al.* (2012) found that lactose in PE goat milk was 3.55 % lower compared to present study. While Prasetyo (2012) found lactose content 3.19% in SAxPE.

Concerning the last studied component (total solids), average values were higher Syrian Mountain and crossbred goats, respectively (Addass *et al.*, 2013), which were higher than 9.53% in Turkish Saanen goats (Guzeler *et al.*, 2012), and 13.45, % reported in Nubian goats in the USA (Soryal *et al.*, 2005). While ANxSA crossbreds produced 13.48% of total solid (Gadir *et al.*, 2005). The total solid of PE goats was 13,05-14,01% close to present study (Sumarmono *et al.*, 2012; Wibowo *et al.*, 2013). The crossbred of Saanen and PE (Sapera) goats produced total solid of milk 11.65-12.45% (Susilowati *et al.*, 2013) lower than this present study due to different environment and kidding period.

Effect of Weeks of Lactation

According to Table 1, weeks of lactation affected fat and protein content (P<0.01), but lactose and total solid were not different (P>0.05) along 12 weeks. These findings were in agreement with some literature stated that stage of lactation affected milk composition (Guzeler *et al.*, 2012; Mayer and Fiechter, 2012; Addass *et al.*, 2013).

The changes fat and protein showed in Figure 1 and 2 by genotype, respectively. The fat content was lowest between week 4 and 5 and the highest was at week 1 and 12 (P<0.01). The curve pattern of milk fat for both genotypes was similar. There was a trend of decreasing in fat contents during first month of lactation, however, increasing trend after week 5. Addas *et al.* (2013) studied on Sahel and Sokoto goat in Nigeria found that fat content reached the highest at early lactation. However, the pattern of fat content were different from those found by Gadir *et al.*

(2005) studied on Saanen x Anglo Nubian in Sudan due to the difference on kidding period. While Mayer and Fiechter (2012) plotted fat content decreased from week 10 to 12, similar to this present study, however, there was no data on fat content before week 10 and data were pooled from some different breeds in their study.

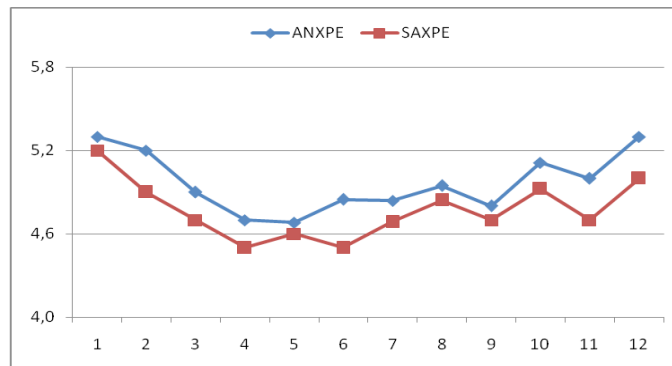


Figure 1. Fat (%) in ANxPE and SAxPE goats' milk during 12 weeks of lactation

The curve pattern of milk protein for both genotypes was different. As seen from Figure 2, average of protein was decreasing during the early weeks of lactation and it started to increase after the 6th week. The lowest of protein contents was at week 3 and 6 ($P < 0.01$) for ANxPE and SAxPE, respectively. While the highest of protein content was at 12 for both genotypes ($P < 0.01$). This pattern was similar to Guzeler *et al.* (2012) studied on SaanenxKillis in Turkey. However, it was different from Addas *et al.* (2013) studied on Sahel and Sokoto goat in Nigeria found that protein content reached the highest at early lactation. Also, the pattern of protein content were different from those found by Gadir *et al.* (2005) studied on Saanen x Anglo Nubian in Sudan due to the difference on kidding period. While Mayer and Fiechter (2012) plotted protein content increased from week 10 to 12, similar to this present study, however, there was no data on fat content before week 10 and data were pooled from some different breeds in their study.

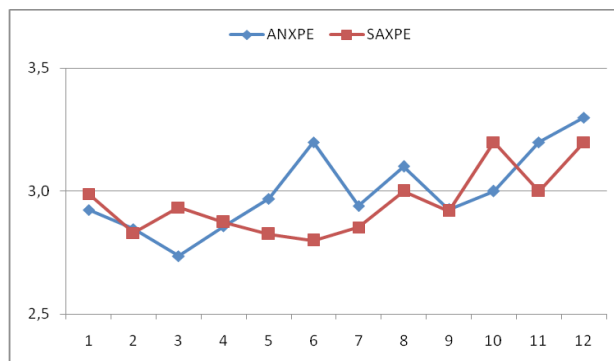


Figure 2. Protein (%) in ANxPE and SAxPE goats' milk during 12 weeks of lactation

CONCLUSIONS

Fat and total solid of ANxPE were higher than SAxPE, but protein and lactose content were similar. Weeks of lactation affected fat and protein for both genotypes above. Milk contents (fat, protein, lactose and total solid) of ANxPE and SAxPE indicated in good quality. This is the first information report in ANxPE concerning the studied parameters and might be used for recommendation in increasing goat milk production and quality.

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