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Lactation Characteristic of Etawah Crossed Breed Goats Under Intensive Management

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ABSTRACT

The study aimed to describe lactation characteristic of Etawah Crossed Breed goats raised under intensive management. The study located in *BBPTU HPT* Baturraden, Purwokerto, used 27 female pregnant goats, at 24 to 27 months old. The goats were managed followed standard operating procedure of the research institute. The data consisted of body size and body weight, colostrum and milk yield, lactation period and reproductive performance. The results showed the average of daily milk yield, lactation period, total milk and colostrum production in first lactation were 960±340 mL/day, 157±41 days, 114,720±68,900 mL and 415±240 mL/day. The proportion of monthly milk production from initial lactation to dry off were 21.27, 22.17, 20.18, 17.29, 12.52, 9.13, and 5.65% of total lactation yield, respectively. Peak production ranged from first to second months of lactation, the highest was in the week 4th, averaged of 1080 mL/day. Production persistency was 66.39%. The rate of increase toward peak was 5.60%/week and rate of decline from peak was -3.92% of milk yield in the previous week. Trend equation of lactation curve was Y = 8412.7 –233.65 x. Means period of postpartum mating, service per conception and body condition score were 88.7±39.2 days, 1.2 and 3.45, respectively. There was no correlation between postpartum mating, body condition score and milk production. The study concluded that Etawah Crossed Breed goat under intensive management had short lactation period, early peak production, low persistency. The dry period was estimated 3 months and pregnancy occurred after peak production.

Keywords: Etawah Crossed Breed goats, Intensive management, Lactation curve

Introduction

Milk is the main product of dairy goat keeping. Milk production of goat was affected by several factors, included breed, environment (Lobo *et al.*, 2017), lactation period (Waheed and Khan, 2013), *litter size*, parity, lactation phase, and management (Ciappesoni *et al*., 2004; Park, 2016). To attain maximum milk production, it was necessary to select high producing dairy goat. Capability of goat to produce milk could be known by evaluated daily milk production or total lactation, and the shape of lactation curve (Gipson and Grossman, 1990).

The term lactation curve was defined as graph between milk yield and length of time since kidding up to dry off (Ayasrah *et al*., 2013; Marete *et al*., 2014). Lactation curve provided important information for farmers to decide goat management, breeding and selection (Gipson dan Grossman, 1990). Peak production in lactation could be used to predict total lactation production if within lactation persistence was high (Pala dan Savas, 2005). Interval time to attain maximum milk yield and persistency also served useful information to predict milk production of the next period of lactation and milk production pattern of does (Marete *et al*., 2014).

Associated with utilization of *Etawah Crossed Breed* goat as dairy animal, it was important to know and to analyze its lactation characteristic, which expected useful as guidance for management and selection as well as to predict total milk yield based on a particular days milk production. To understand the characteristic of lactation, there was need some data associated with lactation process, especially the length of lactation and milk production. Lactation length of pure dairy goats and several crossbred were longer than 7 months. The average of lactation period on Nubian, Saanen, Toggenburg and Alpine goats were 215, 228, 235 and 215 days, respectively (Fernandez, 2013; Ribas and Gutierrez, 2001), whereas Alpine crossed and Balkan goat reached 256 days (Kume *et al*., 2012; Bogdanović *et al*., 2010). Length of lactation of tropical goat on average was 156.9 days (Bhatnagar and Chawla, 1984). The length of

lactation period was significantly affected total milk production (Waheed and Khan, 2013) and the shape of lactation curve (Pala and Savas, 2005). The shape of lactation curve was affected by litter size (Marete *et al.,* 2014) and disease infection (Lopez *et al*., 2016). In tropical goat the effect of litter size on lactation shape was not significant (Waheed and Khan, 2013).

Milk production of Etawah Crossed Breed goats was known to around 430 to 520 mL/day (Rosartio *et al*., 2015) and 920 mL/day (Cyrilla *et al.,* 2015). There was little information pertaining to length of lactation, persistency and other factors related to lactation in Etawah Crossed Breed goats. This study aimed to describe lactation characteristic, including pattern of lactation curve, peak production, persistency, length of lactation, and total milk yield in Etawah Crossed Breed goats which were raised under intensive management. Curve and characteristic of lactation of goat in this study will be useful to predict milk production in a particular days, to provide basic data for other study as well as for guidance of keeping Etawah Crossed Breed goats as dairy animal.

Materials and Methods

The study was done by using 27 primiparous Etawah Crossed Breed goats in *BBPTU* Baturraden, Purwokerto. The does were 24 to 27 months old, characterized by black and white hair colour. Other equipment that were used in the study consisted of lifted goat houses (*kandang panggung*) completed with feed through and water container, scale, thermohigrometer, recording, feed and sampling equipment. Goat ration consisted of grass (*Pennisetum purpureum*), *Calliandra callothyrsus, Gliricidia maculata, Desmodium rensonii*, wheat pollard, rice bran and cassava tuber. Feeding and practical goat keeping were done followed standard operational procedure of the institute. The does were placed in group, 8 to 10 goats/flock. The data consisted of body size and body weight, colostrum and milk yield, lactation period, the period of postpartum mating (PPM) and body condition score (BCS) were collected during the study period. Body size and body weight of goat were measured prior to kidding. Colostrum and milk were measured from morning and evening milking, started from kidding until 4th days of lactation (for colostrum) and up to dry off (for milk). Dry off was done when milk production was less than 100 mL/day.

Lactation period was determined as the interval from parturition up to dry off. Persistency of milk production was calculated followed formula P= (Milks*100)/Milkp, where Milks and Milkp were accumulated milk during early lactation phase (before peak production) and after late phase (after peak), respectively (Pesantez *et al*., 2014) The rate of declining milk production from peak production to dry off was calculated by trend analysis. Postpartum mating and pregnancy of goat were decided based on recording data. Body condition score was measured at 4 weeks after kidding. The data were analyzed descriptively by calculating means and standard deviation. The association between PPM, BCS, and milk production was determined by correlation analysis.

Result and Discussion

The physical characteristic of Etawah Crossed Breed goats in this study was observed to have 68.59 cm of body length and 82.47 cm of heart girth on average (Table 1). The does showed long pendulous ears, averaged of 28.00 cm and whip existed around neck and jaw. In compared with SNI (2008) which required body length of 61 cm and heart girth 80 cm, goat in this study were passed the standard requirement. The shape and size of ears indicated high quality trait of Etawah Crossed Breed goats. Therefore, based on the physical character, the does in this study have potency as breeding goat.

Table 1. Body size of Etawah Crossed Breed goat during the study

Variables	Means ± standard deviation
Body length (cm)	68.59±4.51
Height at withers (cm)	74.00±16.74
Heart girth (cm)	82.47±5.14
Length of ears (cm)	28.00±3.80
Width of ears (cm)	11.79±2.07
Bodyweight (kg)	46.73±7.08

The term of intensive management in this study was shown by comfortable housing, sufficient nutrition for goat, routinely and hygienic milking. The site of study located on 725 m above sea level, temperature around 25.7ºC and humidity 70.2%. The condition was similar with previous study by Rosartio *et al*. (2015) reported in the temperature of 26.8ºC and 69.5% humidity, Etawah Crossed Breed goats showed longer lactation period.

The average dry matter intake of goat in this study was 3.10 g/kg body weight, equivalent with 3.1% of body weight. The level of dry matter intake counted to be low for dairy goat, because pure dairy goat reached maximum dry matter intake of 4.1 to 5.3 g/kg body (Tarr, 2018). Referred to Amrudin *et al*. (2014) dry matter intake could reach 3.5 to 4.2% of body weight in goat fed ration containing 40% concentrate. On the other hand, goat ration in this study contained high protein, i.e. 16.60%, which was in the range of recommended nutrient for lactating goat, as 14 to 19% crude protein, 74% total digestible nutrient and 17.4% crude fiber (Lunn, 2018). From the aspect of energy and crude fiber, the ration contained less than recommended level, with value of 69% and 15.74%, respectively. The study results indicated that goat ration in this intensive management need to be improved.

Milk production and lactation curve

The average milk production as 960 mL/day similar with Cyrilla *et al*. (2015) reported 920 mL/day and in the range of tropical dairy goat milk production of 770 to 1,090 mL/day (de la Rosa *et al*., 2006). Based on data in Table 2, the length of lactation in primiparous Etawah Crossed Breed goats was 157 days, ranged from 74 to 224 days. The average colostrum production during first day after kidding was 415 mL/day and total milk production in lactation was 114720 mL (Table 2).

The lactation length of goat in this study was shorter than that in pure dairy goat which ranged from 215 to 235 days (Fernandez*,* 2013; Ribas and Gutierrez, 2001). This short lactation period indicated one such traits of dual purpose goats which capable to produce milk and meat. This results in accordance with the trait of non-dairy goat, showed could not continue lactation in long period as dairy goat (Devendra and Burns, 1983). The lactation length of goat in this study also similar with that in tropical dairy goat, such as Beetal of 156.9 days (Bhatnagar and Chawla, 1984) and Jamnapari 135.4 to 143.9 days (Hassan *et al*., 2010). The proportion of milk production towards total production in lactation was increased from the first to second months and subsequently decreased gradually up to 7 months in lactation (Table 3).

The values of milk production proportion per months indicated that Etawah Crossed Breed goats reached the peak production in the second month of lactation. This results resembled with lactation curve of Jamnapari, showed increased in production from initial lactation to the end of second month (Hassan *et al*., 2010), also similar with Alpine goat which reached peak production at week 8th of lactation (Marete *et al.,* 2014).

Lactation curve consisted of peak phase, which occurred in short time and persistency phase which was longer and produced more milk than peak phase (Ribas and Gutierrez, 2001). In this study, milk production during peak phase made up 39.90% and persistency phase was 60.09% of total production in lactation. Lactation length of goat in this study was short and peak production was attained in early period, i.e at two weeks after parturition, therefore formed a sharp lactation curve. In this case, hand milking which was done after colostrum period (3 to 4 days post parturition) caused stimulation on mammary gland reduced which subsequently decreased capability of does to maintain milk production.

Milk production persistency

The value of persistency, which presented ratio between milk production before and after peak lactation, the in this study was 66.39%. The rate of increasing production toward peak was 5.60%/week and rate of decline from peak was -3.92% of milk yield in the previous week. The lactation curve showed trend equation as Y = 8412.7 – 233.65 x (Figure 1). The rate of production decline in this study was in line with that in low producing dairy goat, of -4.2 g milk/day (Gipson and Grossman, 1990) whereas equation and lactation curve (Figure 1) showed gradual decreased of milk production. The value of persistency indicated that proportion of milk after peak production was greater than in early phase of lactation.

Etawah Crossed Breed goats which were intensively managed to produce milk in this study have specific characteristic, such as short period of lactation, low persistency and early peak production. Production persistency in this study differed to non-dairy persistency which characterised by low peak yield (El-Wakil dan Fooda, 2013; Waheed dan Khan, 2013). In dairy cows higher rate of increase to peak production had a quicker decline after peak. Persistency was also affected by calving season (Guler and Yanar, 2009). Low persistency of goat in this study also indicated the effect of environment (kidding season), since most of goats lactation occurred during the rainy season, when forage dry matter was low. That condition affected appetite and nutrient consumption of the dam.

Reproductive performance of doe

The average value of period postpartum mating (PPM) and service per conception (S/C of goat in this study were 88 days and 1.2,

Table 2. Milk production and length of lactation of Etawah Crossed Breed goat during the study

Variables	Means ± standard deviation	Range
Length of lactation (day)	157±41	74 – 268
Colostrum production (mL)	415±240	100 – 1,150
Total milk production in lactation (mL)	114,720±68,900	28,390 – 263,640
Milk production/day (mL)	960±340	260 – 1,470

Tabel 3. Proportion of milk production per month in total lactation of Etawah Crossed Breed goat in the study

Month of lactation	Proportion/month (% of total production in lactation)
1th	21.27±7.95
2nd	22.17±9.72
3rd	20.18±9.94
4th	17.29±8.24
5th	12.52±5.38
6th	9.13±5.58
7th	5.65±4.30

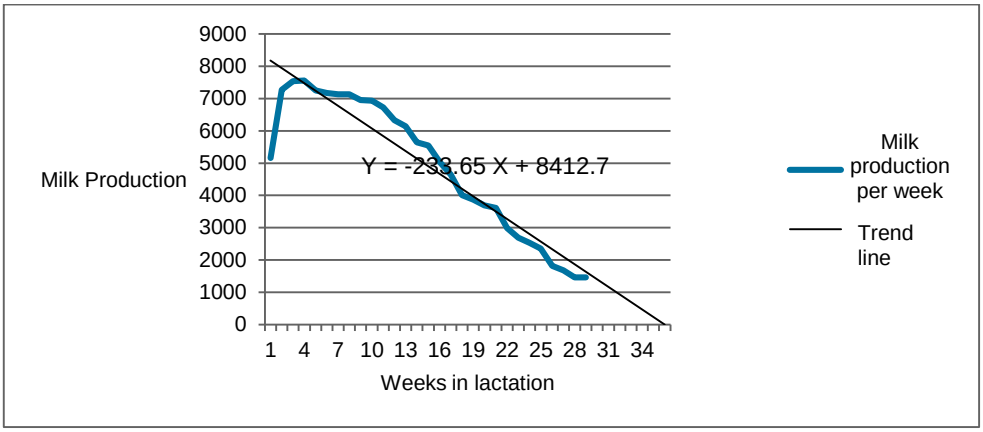

Figure 1. Lactation curve of Etawah Crossed Breed goat.

respectively (Table 4). Based on the data in Table 4, goat pregnancy could be estimated occurred after peak production. Body condition score of does at 4 week after parturition which valued of 3.45 was in the range of ideal BCS of breeding goat as around 3.0 to 3.5 (Villaquirán *et al.*, 2004).

Table 4. Reproductive performance of Etawah Crossed Breed goat in the study

Variables	Means ± standard deviation
Postpartum mating (days)	88.7±39.2
Body condition score	3.45±0.56
Service per conception	1.2±0.6

Statistical analysis did not show correlation between PPM and BSC with milk production during early or late lactation. The result was contrary with Glória *et al*. (2012) which reported there was an association between high persistency and long service period, due to prevention of negative effect of fetus on milk production. Referred to Capuco *et al*. (2003) the negative effect of pregnancy on milk production was caused by estrogen that was secreted from *fetus-placental unit*. According to Ribas dan Gutierrez (2001) milk production ceased due to physiological effect. Based on the reproductive data, Etawah Crossed Breed goat in this study could be estimated to have interval dry period of around 3 months. This period similar to dry period of non-dairy breed goat, that was longer than 2 months (Assan, 2014).

The favorable trait of Etawah Crossed Breed goat in this study was indicated by short period of postpartum mating. The doe also capable to continue lactation during pregnancy although the production period was restricted in short interval, i.e around 2 months. This result demonstrated the typical traits of Etawah Crossed Breed goat as dual purpose goat.

Conclusions

The average milk production of Etawah Crossed Breed goat which was managed intensively was 0,96 L/head/day. Lactation period was 157 days and peak production was attained at 1 to 2 months after kidding. The doe showed low persistency of production, with average value of 66.39% and rate of milk production decline of -3.92% of previous week production. Postpartum mating occurred after peak production. There was no correlation between PPM and BCS and milk yield.

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