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Dairy Goat Milk Production of Community in Besut, Terengganu, Malaysia

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Keywords:
Age of dairy goats
Community dairy goat's farm
Individual dairy goats
Late lactation periods
Milk production

ABSTRACT

The objectives of this study were to determine goat milk production from two community farms (Farm A and Farm B) in Besut, Terengganu as well as to compare the dairy performance between origin of goats (UniSZA Saanen Dairy Goat and Community Goat). The does were hand-milked once a day in the morning and recorded. The results showed that milk production was insignificant ($p > 0.05$) between the two community farms. However, it was significantly different ($p < 0.05$) for individual does as well as different age groups of goats for both farms. The milk production between UniSZA Saanen Dairy Goat and Community Goat were insignificantly different ($p > 0.05$). In conclusion, milk production of the two community farms in Besut was influenced by the individual age of the goats, regardless of the origin of the goats within the district.

Keywords: Milk production, Individual dairy goats, Age of dairy goats, Community dairy goats farm, Lactation period

ABSTRAK

Objektif kajian ini adalah untuk menentukan produksi susu kambing daripada dua ladang komuniti (Ladang A dan Ladang B) di Besut, Terengganu dan untuk membanding prestasi tenusu antara asal kambing (Kambing Tenusu Saanen UniSZA dan Kambing Komuniti). Kambing betina diperah susunya secara tangan sekali sehari pada waktu pagi dan direkod. Keputusan menunjukkan produksi susu tidak signifikan ($p < 0.05$) antara dua ladang komuniti. Walaubagaimanapun ianya signifikan ($p < 0.05$) antara individu dan kumpulan usia kambing yang berbeza bagi kedua-dua ladang. Produksi antara Kambing Saanen UniSZA dan Kambing Komuniti adalah tidak signifikan ($p > 0.05$). Kesimpulannya produksi susu bagi kedua-dua ladang komuniti di Besut adalah dipengaruhi oleh usia individu kambing, tanpa mengira asal kambing dalam daerah itu.

Kata kunci: Produksi susu, Kambing tenusu individu, Usia kambing susu, Ladang kambing tenusu komuniti, Tempoh laktasi.

INTRODUCTION

Goat milk production and consumption are gaining popularity in Malaysia due to the belief that it has health, therapeutic and Islamic religious values. However, goat milk yield is still low and poorly managed by small community farmers with lack of technologies and innovations. There are several factors that influence the production of milk such as breed, species, feed and feeding, stages of lactation, and milking frequencies (Chandan and Shahani, 1995; Yangilar, 2013; Gamal, 1999; Escareño et. al., 2012; Aziz, 2010; Iñiguez and Aw-Hassan 2005).

Objectives of this study were to evaluate the possible factors such as the origin of the goats, age groups and individual capability of goats in producing milk within two community farmers in Besut, Terengganu. Malaysia.

MATERIALS AND METHODS

The Site of Study. Experimental Animals and Farm Management

The study was conducted at two different community farms (Farm A and Farm B) located in Kampung Kubang Depu, Besut, Terengganu, Malaysia from December 2017 until April 2018. In Farm A, a total of 7 lactating goats consisting of 4 late lactating goats originated from UniSZA Farm and 3 lactating goats from other farms (Community Farm or Non- UniSZA). For Farm B, there were 2 late lactating goats originated from UniSZA Farm, and 3 lactating goats from other farms (Community Farm or Non-UniSZA). The age of the goats ranged from 1.5 to 4.5 years old. The goats were housed under intensive system. Both farmers practised relatively similar management system, with feeding of grasses such as *Pennisetum purpureum* or *Brachiaria humidicola* with the combination of the different amounts of concentrates. In Farm A, the farmer gave chopped *Pennisetum purpureum* with 200-350 g pellets/head/day. While, in Farm B, the farmer gave of fresh *Brachiaria humidicola* with 300-450 g

pellets/head/day. Grasses were given approximately 1-2 kg/head/day. The goats were fed twice daily (morning and evening) using a 'cut and carry' system, with free access to fresh water and mineral block. All kids were weaned at 3 months of age and then separated from the lactating females during the experimental period.

Milk Collection

Milking was carried out by hand milking, once per day, starting 08.00 a.m. to 9.00 a.m. with the whole milking process took about one hour. The milk measurements were taken 1 time/animal/day and were repeated 10 different days for Farm A and 7 days for Farm B. Milk was collected by using a collecting jug (Salama et al., 2005). Before milking was conducted, the animal was restrained properly and the teats were cleaned by using warm water and clean towels for Farm A. While, for Farm B, the teats were cleaned using cold water. The milking was done by grasping technique and the milk was allowed to be ejected slowly from the udder into the collecting jug. The milk was measured by using 100 ml measuring cylinder and recorded.

General Procedure and Parameters Measurement

Age of the goats was determined by counting the number of milk teeth and adult teeth. This measurement was followed as suggested by Vatta et al., (2006) whereby milk teeth indicated the animal age was still below 1 year old. The present of 2,4,6,8 and more than 8 adult teeth indicated the animal age was already 1,2,3,4 and more than 4 years old respectively. Hand milking was collected from individual goats and the volume of milk was recorded. The data was collected from the two community farms based on the origin of goat and individual age.

Statistical Analysis

All the data were analysed by using the Statistical Package for the Social Science (SPSS) – Analysis of Variance, ANOVA, one-way test followed by Duncan Multiple Range Test (DMRT).

Experimental Design

The flow of experimental design is described in Figure 1.

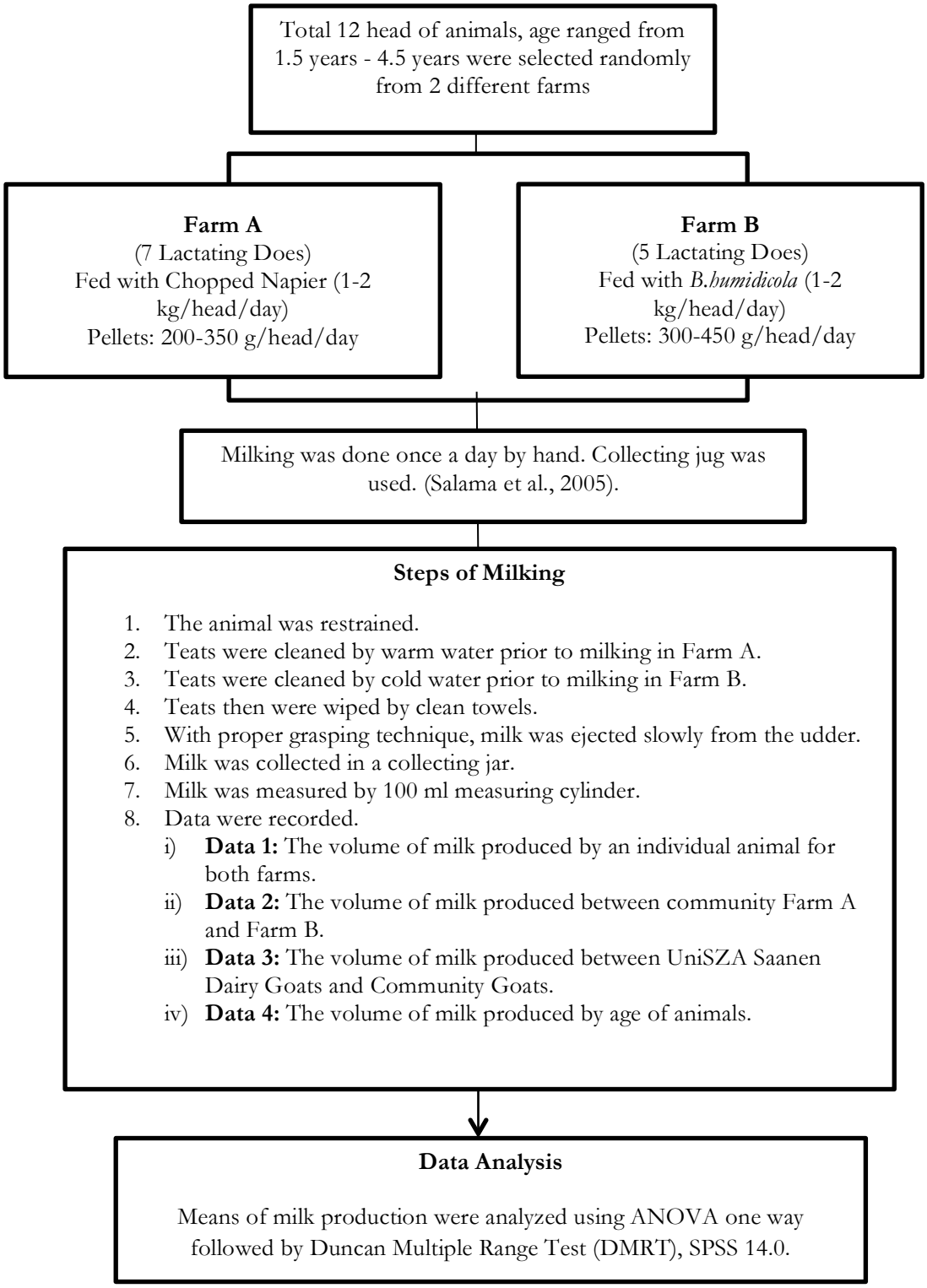

Figure 1: flow of experimental design.

RESULTS AND DISCUSSION

Table 1 Average Daily Goat Milk Production (Mean ± SEM) at Farm A and Farm B.

FARM	n	MILK PRODUCTION (ml) (Mean ± SEM)
FARM A	70	491.87 ± 26.64
FARM B	35	459.89 ± 32.91

Table 1 shows that similar daily goat milk production for Farm A (491.87 ± 26.64) and Farm B (459.89 ± 32.91), although the goats in these two farms were given the different type of grasses, which were *Pennisetum purpureum* grass for Farm A, and *Brachiaria humidicola* grass for Farm B.

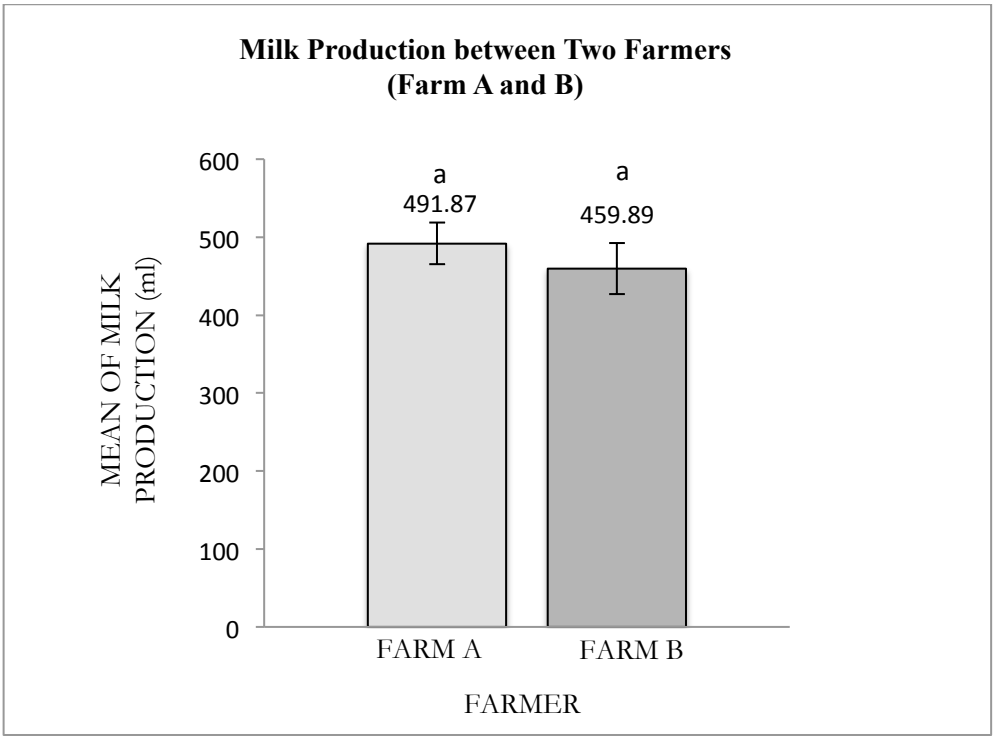

Figure 2 Milk Production by Dairy Goats for Farm A and Farm B.

Figure 2 shows the graphical presentation of goat milk production for the two community farms studied. It is worth noted that if the relative amount of concentrate given to animal is higher than forage, it will lead to the better production of milk in dairy goats (Goetsch, 2001; Zambom et al., 2005).

In this study, although animals in Farm B were given higher concentrate level (300-450 g/head/day) compared to the animals in Farm A (200-350 g/head/day), no difference was detected in the milk production between the two community farms. In farm B, the owner did not follow appropriate milking practice, for an example using cold water to clean the teats prior to the milking process which is proven to lead to the occurrence of mastitis in dairy goats due to bacterial infection. According to Bergonier et al. (2003), mastitis could cause chronic and contagious infection, especially for small ruminants (Megersa et al., 2010). One of the

sources of the mastitis infection is during the milking process (Bergonier et al., 2003). Therefore, it is suggested that the small community farmers should follow good animal husbandry practices (GAHP) as recommended by the Department of Veterinary Services Malaysia (DVS). This not only will ensure maximum milk production but also provide save and quality milk for human consumption. Due to this reason, it has been suggested the importance of management, sanitation, control, and milking technique should be given full attention by farmers to ensure optimum productivity as well as viability and sustainability of dairy goat production by farmers (Neave et al., 1969; Delgado-Pertiñez et al., 2003). It was also observed that, salt-lick block was not provided to the animals in Farm B. According to Bowman and Sowell (1997), the main function of this salt-lick was to maintain the imbalance of body fluids pressure of animal, instead, minerals such as calcium and phosphorus were supplied for growth of bone and teeth. Salt-lick also helps in overcoming the deficiency of minerals in feedstuff (Hendratno et al., 1991).

For Farm B, the farmer was a part-time farm worker while for Farm A, the farmer worked full-time at the farm and the latter paid more attention to the farm management including the hygiene and biosecurity aspects of the farm. However, there was no significant difference in milk production between the two farms.

Table 2 Average Daily Goat Milk Production of Individual Animals (Mean ± SEM) Based on Age in Farm A.

ANIMAL ID	**n (days)**	**MILK PRODUCTION (ml)**	**AGE (years)**
		(Mean ± SEM)	
TG2336	10	300.40 ± 49.99[a]	3.0
AHM18463	10	301.00 ± 41.68[a]	3.0
AHM18459	10	415.70 ± 31.01[ab]	2.5
AHM18452	10	450.70 ± 26.29[b]	3.0
AHM18466	10	519.00 ± 25.09[b]	1.5
TG2338	10	690.90 ± 60.05[c]	3.5
00102	10	765.40 ± 78.74[c]	3.0

[a, b, c] Means with different superscripts within a column were significantly different ($p<0.05$)

Table 2 shows that goats with identification number TG 2336 and AHM 18463 had significantly lower milk production compared to the rest of the animals in Farm A (AHM 18459, AHM 18452, AHM 18466, TG 2338 and 00102). At the same time, TG2338 and 00102 had significantly the highest milk production which was (690.90 ± 60.05) ml and (765.40 ± 78.74) ml respectively compared to the rest of the animals in this farm (AHM 18459, AHM 18452, AHM 18466, AHM18463 and TG2336).

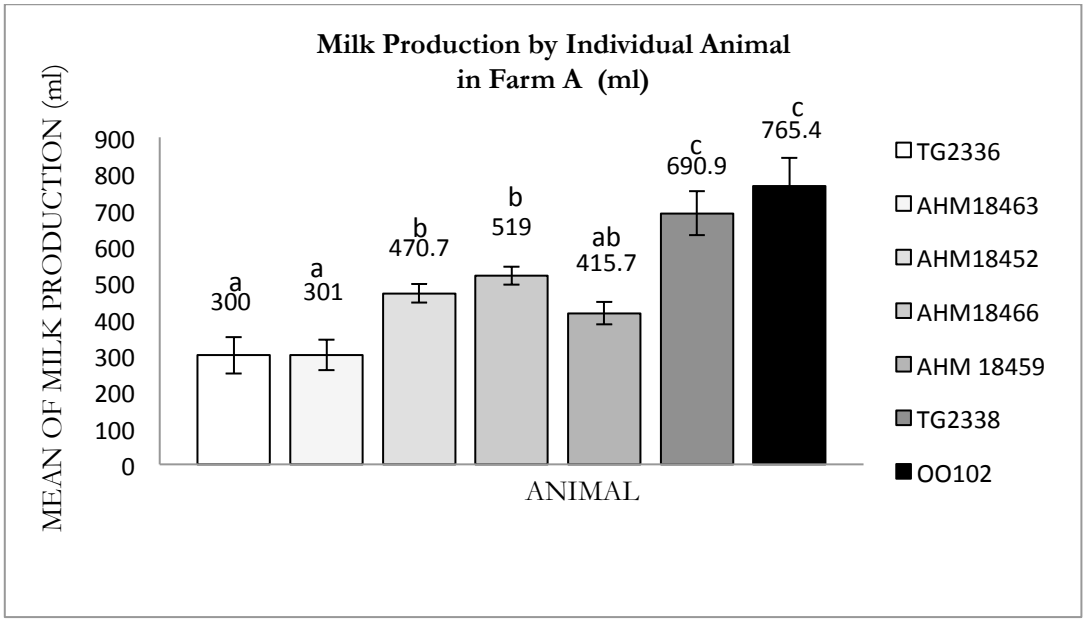

Figure 3 Individual Milk Production for Dairy Goats in farm A.

Figure 3 depits the average goat milk production of individual animals at Farm A. It is important to have a good understanding of milk synthesis and ejection of mammary glands. For an example with improper handling and milking of the teats, it could cause the degeneration of mammary gland secretory cells (Stefanon et al., 2002; Lyimo et al., 2004). In addition, it was also noted that milk production also depends on the rate of apoptosis in the lactating gland (Millier-Cushon, 2013). Pregnancy period also reduced milk production starting from week 10 onwards according to Salama et al. (2005), however, there is no conclusive explanations obtained from the present study with respect to age and lactating period of the goats.

Table 3 Average Daily Goat Milk Production of Individual Animals (Mean ± SEM) Based on Age in Farm B.

ANIMAL ID	**n (days)**	**MILK PRODUCTION (ml) (Mean ± SEM)**	**AGE (years)**
BA	7	232.14 ± 23.06[a]	3.0
NO TAG	7	250.86 ± 11.85[a]	4.5
AHM18467	7	586.00 ± 32.86[b]	2.0
TR15698	7	593.86 ± 32.33[b]	3.0
AHM18475	7	636.57 ± 33.35[b]	3.0

[a, b] Means with different superscripts within a column were significantly different ($p<0.05$)

Table 3 shows the performance of the lactating goats at Farm B whereby there was a significantly higher ($p<0.05$) by animals with identification numbers of BA and NO TAG versus AHM 18467, TR 15698 and AHM 18475. The results were similar to those described for Farm A.

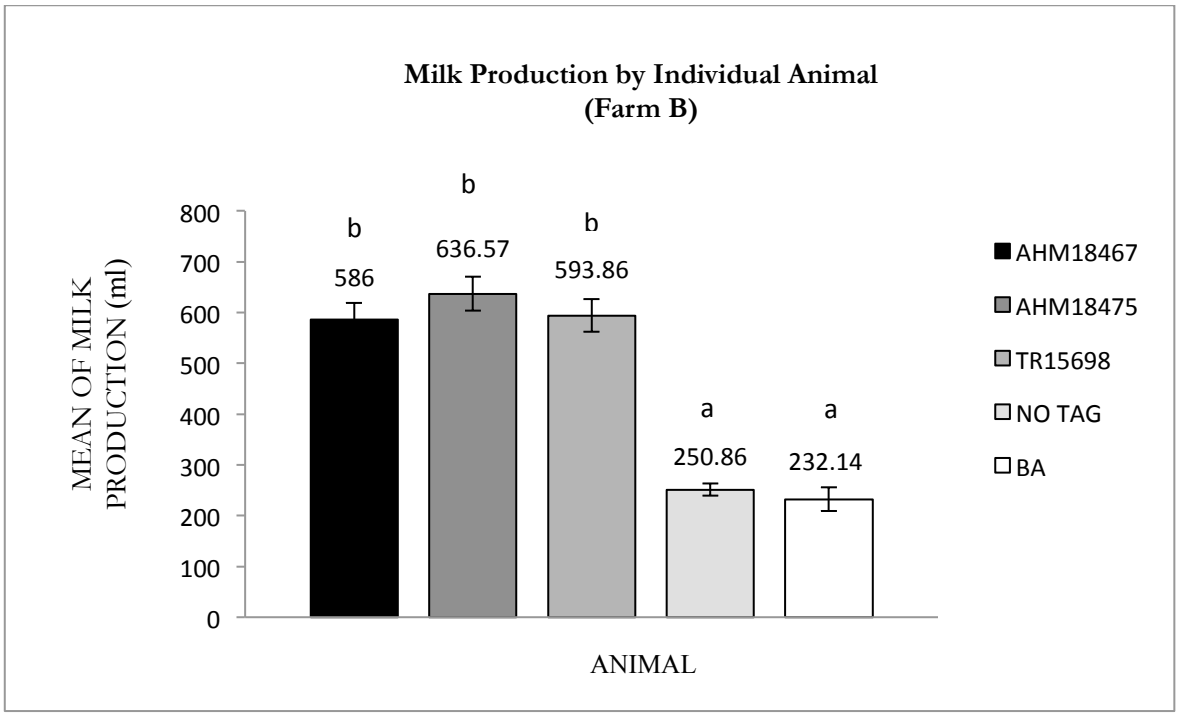

Figure 4 Individual Milk Production for Dairy Goats in Farm B.

The graphical presentation for milk production of individual goats for Farm B is given in Figure 4. There are numerous factors influencing milk production in goats. For an example breeds of goat, whereby Saanen breed was known to have the capability to produce high milk quantity as stated by Escareño et al., (2012), Haenlein and Caccese, (1984), Shrestha (2012) and Rojo-Rubio et al., 2016.

Table 4 Milk Production by Goats Originated From UniSZA Farm and Community Farm (Mean ± SEM).

ORIGIN	n	MILK PRODUCTION (ml) (Mean ± SEM)
UNISZA FARM	54	473.06±19.47
COMMUNITY FARM	51	492.26±37.79

[a, b] Means with different superscripts within a column were significantly different ($p<0.05$)

Table 4 shows that no significant difference in milk production was observed between goats obtained from UniSZA Farm (Saanen) and Community Farm (Local mixed breeds) for both Farm A and Farm B. It was observed that the average volume of milk produced by goats originated from UniSZA Farm (473.06±19.47ml) was similar to that of Community Farm origin (492.26±37.79 ml). The reasons for this phenomena could not be explained in this study, it could be confounded to the complexity of factors such as adaptability, management systems, feeding regime, breeds and different age groups of the goats studied. These factors cannot be controlled easily in this study because of the constraints involving socio-economic structure and cultural practices of the local community farmers.

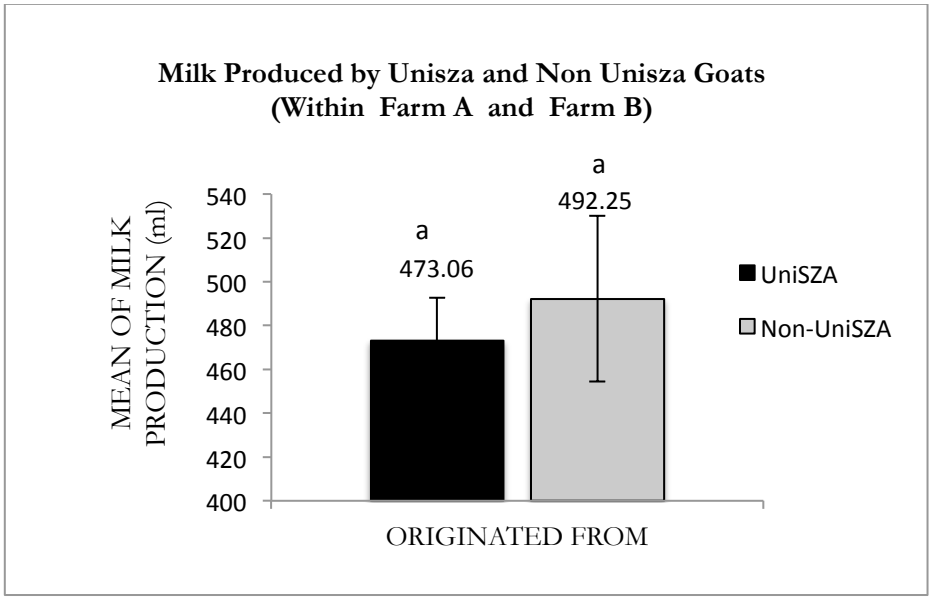

Figure 5 Milk Production by Goats Originated From UniSZA Farm and Community Farm.

Figure 5 shows the graphical description of the average milk production for goats originated from UniSZA Farm (UniSZA) and Community Farm (Non-UniSZA). Goats from UniSZA mostly only gave birth once or twice as compared to the goats from Community Farm (Non-UniSZA), which already gave birth more than two times. Other than that, factors such as feed availability and management also influenced the milk production of dairy goats (Singh et al., 2009). Based on this study, the volume of milk produced by UniSZA goats was similar to Non-UniSZA goats.

Table 5 Milk Production by Dairy Goats According to Age for Combined Farm A and Farm B.

ANIMAL AGE (years)	n	MILK PRODUCTION (ml)
		(Mean ± SEM)
1.5 YEARS	10	519.00 ± 25.09^{bc}
2.0 YEARS	7	586.00 ± 32.86^{bc}
2.5 YEARS	10	415.70 ± 31.00^{ab}
3.0 YEARS	61	465.79 ± 29.85^{b}
3.5 YEARS	10	690.90 ± 60.05^{c}
4.5 YEARS	7	250.86 ± 11.85^{a}

^{a,b,c} Means with different superscripts within a column were significantly different ($p<0.05$)

Table 5 shows that there were significant differences observed between the productions of milk by the goats at different ages. Milk production at age of 4.5 years was significantly lower compared to the other ages. There were no significant differences between the ages of 4.5 years animal with 2.5 years animals. The higher milk production was at 3.5 years of age, followed by age of 3.0 years. However, there were no significant differences observed in milk production between the age of 3.0 years with 2.5 years animals, 2.0 years and 1.5 years animals. There were also no significant differences in milk production were observed between 3.5 years animals with 2.0 years and 1.5 years animals.

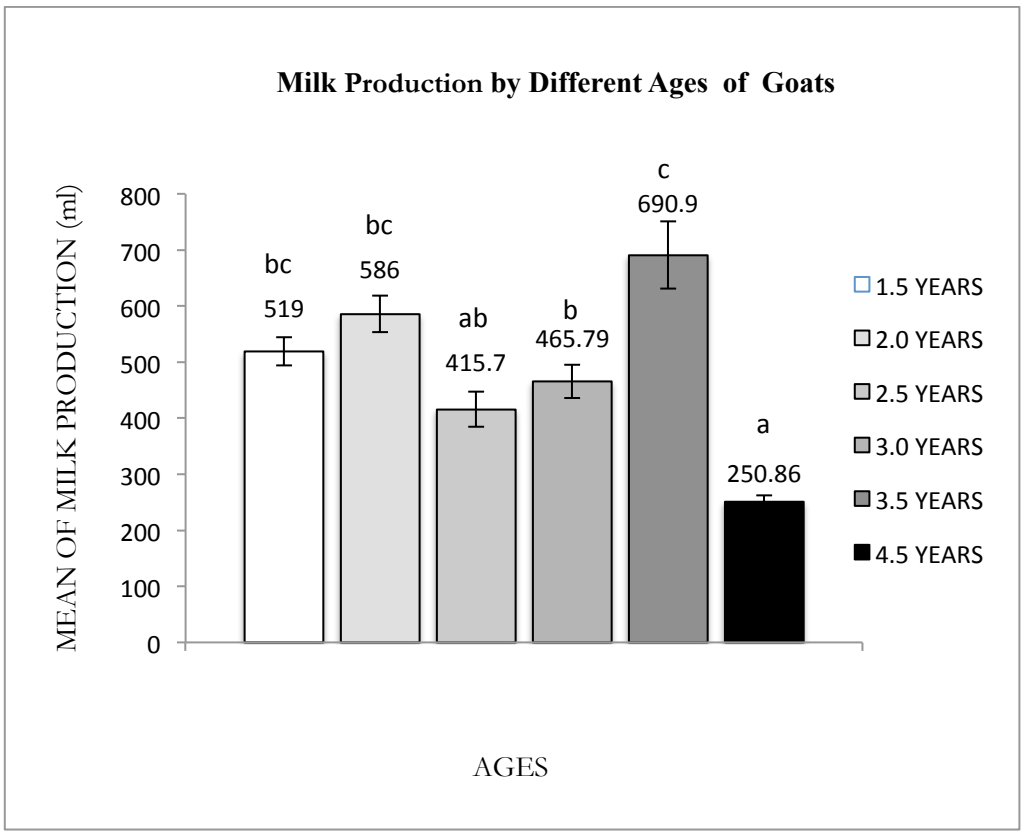

Figure 6 Milk Production for Dairy Goats in Farm A and Farm B based on the Age of the Animals.

During the pregnancy period, milk production will start to reduce from week 10 onwards as stated by Salama et al., (2005). Maximum milk yield commonly was achieved in 4th and 5th lactations whereby the age of the animals was in between of 3 years and 2 months until 4.0 years (Crepaldi et al., 1999). During 4th and 5th lactations, the production of milk was at the higher level compared to the other ages. From this observation, it was proven that the milk production at 3.5 years of age was the highest of all age groups.

Other Factors That Influence the Milk Production

Many factors such as breed, age, stage of lactation were known to influence the milk production by dairy goats (Shelton, 1978). Normally, the phase of lactation could be divided into 3 phases, the early phase, mid-phase and late phase. Commonly, milk production will reach the peak of production after the 4-8 week, and then gradually declined from day to day. Factor such as age also gave great impact on milk production by dairy goats. Lactating does of age 3.5 years showed the highest mean value of milk production compared to the other animal in the same phase of lactation. Animal of age 4.5 years showed the lowest production of milk compared to other animals. In order to ensure the maximum milk production, the milking process should be consistent, whereby the lactating animal should be milking at the same time every day.

Other than that, any action that caused stress should be minimized within the milking place (Bewley and Arnold, 2012). Animal also should be brought into the milking area gently without yelling, kicking or hitting (Bewley and Arnold, 2012). There were other factors that contributed to production of goats milk such as breeds and genetics(Sebei et al., 2004; Otoikhian et al., 2013), body score including body reserve in late pregnancy, lactation period and diet consumed by the lactating animal effects during pregnancy (Pulina and Anna Nuda, 2004) , twin or single births (NRC., 2007) , variation in climate and weather (Di Grigoli et al., 2009; Abecia et al, 2017), feed and fodder availability (Singh et al., 2009), frequency of milking (Capote et al., 2006) and suckling stimulation by kid (Ceballos et al., 2009). The availability of secretory cells number and rate of apoptosis

in lactating gland also could be the factors that affected the production of milk (Capuco et al, 2003; Miller-Cushon, 2013). Moreover, the age of the mother, diseases and other problems such as poor nutrition (Min et al., 2005) parasites, and breeding selection also contributed to the production of milk. Milk production also greatly influenced by the consumption of a good diet (Faye and Konuspayeva, 2012).

CONCLUSION

Goat milk produced by these two farms was insignificant to one another. There were significant differences in milk production of individual animal for Farm A and Farm B. This study also showed that no significant differences between the production of milk by goats originated from Community Farm (Non-UniSZA) and goats originated from UniSZA farm. However, the milk production of the animal during the last phase of lactation showed significant differences among the animal age groups. In summary, the basic information on the farming practices carried out by the community dairy goat farmers obtained from this preliminary research is useful for future intensive and extensive studies in order to improve the productivity of dairy goats for the community farmers in Besut specifically and Malaysia in general.

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