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Effect of Steaming up by *Gliricidia sepium* to Dairy Goats in Late Gestation on Milk Yield and Composition during the Early Lactation

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***Abstract*—** *Effects of steaming up by Gliricidia sepium to dairy goats in late gestation on performance during the early lactation were investigated in three experiments. Etawah crossbreds were paired towards in late gestation, first experiment was as a control, second and third experiment was steamed up by 0.4% and 0.8% DM/BW/day of Gliricidia sepium. All experiment restricted to the same basal concentrate diet 0.9% DM/BW/day and ad-libitum of Pennisetum purpureum. Data were analyzed using analysis of variance with block random design. The differences in group were analyzed followed by a Duncan Multiple Range Test. Average milk yield that steamed up by 0.8% of BW in the second and third lactation period were significantly differences than control treatment and 0.4% of BW (P<0.05). Milk fat content that steamed up by 0.8% of BW showed significant differences results compared to control treatment and 0.4% of BW (P<0.05). Milk protein and lactose content that steamed by 0.4% of BW showed the highest value, but not significantly different (P>0.05). The results showed that steaming up by Gliricidia sepium as much as 0.8% of BW in late gestation showed a low decrease in BCS values, increased initial milk production at various periods, and showed the highest fat content. No different in milk protein and lactose content.*

***Keywords*—** *Dairy goats, late gestation, milk production, milk composition.*

I. INTRODUCTION

Etawah crossbred (Peranakan Etawah) is one of indigenous dairy goat in Indonesia (Susilorini, *et al*. 2014) and generally owned by smallholder farmers (Suranindyah, *et al*. 2009). Etawah crossbred were purpose goats, meat and milk production. Etawah crossbred goat does produces 1.0-1.5 l/days (Batubara, *et al*. 2016) and had long lactation period 214-246 days (Sutama, 2009) to 287 days lactation (Marwah, *et al*. 2010) both indicating that Etawah crossbred goat had high potency to be selected and developed as milk goat type. According Marwah, *et al*. (2010) that efforts to increase milk production are done by providing nutrition in late gestation.

Steaming up for dairy goat is generally defined as the time period from three weeks prior to parturition to feed energy-rich nutrition (Sirohi, *et al*. 2014). It is now recognized that defining and meeting the nutritional requirements of the transition dairy goat can greatly impact on production in the ensuing lactation, and animal wellbeing (NRC, 2001). Nutrition of the dairy goat has a large influence on the yield and composition of milk goats production (Moorby, *et al*. 2010) and decrease risk of negative energy balance on early lactation. During early lactation, goat produces high milk yield an they use body fat to support milk production. Body fat content is perceived to be relatively easy to measure in the dairy goat by the use of body condition score. Late gestation goats require nutrients for maintenance, production, and growth of the foetus. Dietary protein requirement is then increased due to the increased catabolic disposal of amino acids (Bell, 1995). Dietary protein also us to regenerate udder tissue. Most of proxies for milk shynthesis were in the blood dependent on feed quality. Increased milk production can be done by steaming up by *Gliricidia sepium*.

Gliricidia sepium had a high N-protein content more than 2.5% and is classified as high quality protein (Harun, 2009). *Gliricidia sepium* also has low tannin content which is less than 3% and also had in vitro dry matter digestion around 37.99%-54.61% (Daning and Foekh, 2018) to 48-77% (Chakra, and, Trisnadewi, 2016) and organic matter digestibility 45.16%-59.49% (Daning and Foekh, 2018). This study was initiated to compare the effect of steaming up by *Gliricidia sepium* to dairy goats during late gestation on milk production and composition of fat, protein, and lactose during early lactation.

II. MATERIAL AND METHODS

A. Location Research

This study was conducted in dairy goat farm Singosari located Malang, Indonesia. This study was started from October 14th until December 14th 2018.

B. Animal and Management

The material were twelve late gestation of Etawah crossbred goats. It was devide into three groups, and each group consists of goat at second lactation period and third lactation period. Animal were being dreid according predicted kidding date. Goats were placed in individual house with ad-libitum water. They were milked during 4 weeks once a day at 08.00 to 8.30 from postpartum by hand milking.

C. Diets

Basal diet of concentrate is 0.9% DM/BW/day and ad-libitum of *Pennisetum purpureum*, and treatment diet using *Gliricidia sepium*. T0 experiment was as a control, T1 and T2 experiment was steamed up by 0.4% and 0.8% DM/BW/day of *Gliricidia sepium*. Nutrient content of basal and treatment diet shown in Table I.

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TABLE I. Nutrient content of basal diet and treatment diet

Feed	Nutrition content (%)				
	Dry matter	Ash content	Crude protein	Crude fat	Crude fiber
Concentrate[A]	89.18	05.17	16.35	06.09	06.03
Pennisetum purpureum[A]	79.55	15.18	14.66	01.83	24.21
Gliricidia sepium[B]	93.41	08.72	20.01	03.05	16.09

Source: [A] East Java Animal Science Department Laboratorium (2018)
[B] Animal Science Laboratorium, University of Brawijaya Malang (2018)

D. Data Collection and Analysis

Feed Intake. Feed consumtion and remaining feed were calculate for a week before predicted kidding using digital scale. Remaining feed in each group were collected to analyzed nutrition content by proximate analysis.

Lactation Data. Milking goats was done every day at 08:30 am and milk yield was recorded daily during 30 days. Milk samples were taken each week from postpartum during 4 weeks as much as 100 mL of each goat and were subjected to determination of fat, protein, and lactose by milk analyzer Lactoscan.

Statistical Analysis. The obtained data were statistically analyzed used Block Random Design. The differences data were analyzed by a Duncan Multiple Range Test.

III. RESULT

A. Feed and Nutrient Consumption

The effect of steaming up on consumption of dry matter (DM), organic matter (OM) and crude protein (CP) is shown in Table II.

TABLE II. Feed and nutrient consumption

Parameters	Unit	Treatment		
		T0	T1	T2
Average prepartum BW	Kg	54.38±1.11	54.00±2.83	52.75±2.99
Average postpartum BW	Kg	42.25±1.71	44.00±3.94	44.25±0.65
Average pre-natal BCS	-	3.38±0.48	3.63±0.25	3.50±0.41
Average Postpartum BCS	-	2.88±0.25	3.25±0.29	3.25±0.29
Litter size	-	1.75	1.50	1.50
Average DM needed	g/head/day	1963.12	1952.24	1903.30
Average DM Intake	g/head/day	1639.30±06.3[a]	1775.02±14.7[b]	1858.96±28.6[c]
DM Intake: prepartum BW	%	3.02	3.29	3.53
Average OM intake	g/head/day	1426.02±05.5[a]	1504.12±13.1[b]	1562.28±25.9[c]
Average CP needed	g/head/day	168.56±3.4	167.40±8.8	163.53±9.3
Average CP Intake	g/head/day	123.13±0.4[a]	131.34±0.6[b]	138.09±1.0[c]

[a - b] different superscript on the same row shows significantly differences (P<0.05).

Table II showed that there was an increase in DM consumption in the treatment group. Increased consumption of DM will also increase consumption of OM and CP. Level of consumption of DM is influenced by various factors, namely body weight, age, environmental stress, which is caused by physical properties and composition of feed and the capacity of the rumen. Average consumption of DM in T0 is not enough to meet the standard needs of late gestation goats 3.32% based on body weight (NRC, 1981) while T1 and T2 have met the DM consumption standards. Low consumption of DM is caused by goats being selective for feed, goats to prefer to eat *Gliricidia sepium* than grass. The group with steaming up treatment has a high DM consumption value because the consumption of *Glicidia sepium* does not directly meet the rumen capacity of the goat compared to the consumption of *Pennisetum purpureum*. DM consumption in the study was 1426.02-1562.28 g/head/day, higher than Ikhwanti (2014) that OM consumption of 1210g/head/day. The significance of the research CP was higher than that of Nuraini, *et al.* (2014) that CP consumption of late gestation goats is 80g/head/day. According to NRC (1981) the needed for CP goat ration body weight (50 kg) ranged from 157g/head/day. This shows that the quality of rations is low. According to Morand-Fehr and Sauvant (1980) that effect of energy and protein diet increased dry matter, milk yield and content of goat milk.

B. Milk Yield

Etawah crossbred goats milk yield during the first 4 weeks of lactation is shown on Table III.

TABLE III. Early lactation Etawah crossbred goats milk yield

Treatment	Milk yield (ml/head/day)	
	Second lactation period	Third lactation period
T0	560±123.9[a]	600±135.5[a]
T1	600±128.6[ab]	660±142.0[b]
T2	640±109.5[b]	720±133.7[c]

[a-b] different superscripts in the same column show significantly differences (P <0.05).

Average milk yield in T2 group in the second lactation period and third lactation period was higher than in groups T0 and T1. Graff, Javor, and Kukovis (2011) explained that an increase in goat milk production according to the period of lactation with an average in first lactation period (1.8 kg/head/day) increased in second lactation period (2.13 kg/head/day), and reached the peak of milk production in third lactation period (2.18 kg/head/day) and fourth lactation period (2.46 kg/head/day). Milk yield of Etawah crossbred goat

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ranged 500-1.200mL/head/day (Astuti and Sudarman, 2012) to 1.340mL/head/day (Suranindyah, *et al.* 2018).

Based on Table II known that treatment T0 has decrease BCS value by 14.79%; treatment T1 has decreased BCS value by 10.47%; and treatment T2 has decrease BCS by 7.14%. Gross *et al.* (2011) explained that dairy animal at the beginning of lactation had negative energy balance. Lack of tissue reserves will result in animals not being able to produce milk optimally and energy from feed is more widely used to repair their body tissues. The length of the negative energy balance also affects livestock health and reproductive problems.

Steaming up by high protein and energy diet is used by reticulo-rumen microbes to be amino acids. Dead microbes and by-pass proteins will be degraded in the small intestine and converted into amino acids which are then distributed to the mammary gland through blood circulation (Orskov, 1982). Prihatminingsih, *et al.* (2015) protein plays a role in the formation of the enzyme lactose synthetase which functions as a milk lactose synthetase. According Larson (1985) enzyme lactose synthetase is composed by galaktosil transferase and α-lactalbumin which are compounds that affect milk yield. Milk lactose synthesis is positively correlated with milk production (Mmbengwa, *et al.* 2008) this is due to the water-lactose (Santosa, *et al.* 2009).

C. Milk Composition

Milk fat, protein, and lactose of Etawah crossbred goats during 4 weeks of early lactation is shown on Table IV.

TABLE IV. Milk composition of Etawah crossbred goats during early lactation

Composition	Treatment	Average	Lactation period	
			Second	Third
Fat (%)	**T0**	6.79	7.15^{a}	6.43^{x}
	T1	8.18	8.30^{b}	8.06^{y}
	T2	8.71	8.91^{c}	8.51^{y}
Protein (%)	**T0**	3.09	3.24	2.94
	T1	3.58	3.40	3.76
	T2	3.16	3.15	3.17
Lactose(%)	**T0**	3.11	3.28	2.94
	T1	3.41	3.25	3.57
	T2	2.92	2.81	3.03

$^{a\text{-}b;\ x\text{-}y}$ different superscripts in the same column show significant differences ($P<0.05$).

Average of fat content in T2 treatment showed the highest results compared to treatments T0 and T1, and statistically showed significant difference ($P<0.05$). The average fat content of steaming up treatment is higher when compared to Susilorini *et al.* (2014) that the average fat content of PE goats with a value of BCS 3; 3.5; and 4 respectively are 6.72±1.00%; 6.85±1.06%; and 6.09±1.12%. Milk fat content of Etawah crossbred goat was around 4,78-5,17% (Singh, *et al.* 2014) and in other tropical goats reached around 7.5% (Akinsoyinu, *et al.* 2009). Milk protein and milk lactose content treatment T1 showed the highest results, but statistically there was no significant difference on between. There was a tendency of higher milk protein content caused by feeding high energy and protein diet (Never, 2015 and Supriyati, *et al.* 2016). According Marwah, *et al.* (2010) that the average of milk protein is relatively in the range of 2.31-3.87%. Pollott (2004) that milk lactose works as stable component as determinant of milk volume.

IV. Conclusion

Steaming up by *Gliricidia sepium* as much as 0.8% of BW in late gestation showed a low decrease in BCS values, increased initial milk production at various periods, and showed the highest fat content. It had no different in milk protein and lactose content.

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