ISSN 1994-5434

Current Research in Dairy Sciences

http://knowledgiascientific.com

Knowledgia SCIENTIFIC
A Place to Publish Outstanding Research

Current Research in Dairy Sciences 7 (1): 26-31, 2015
ISSN 1994-5434 / DOI: 10.3923/crds.2015.26.31

Increase of Milk Production and Calcium Content by Feeding Biscuit of *Carica papaya*

Yuli Retnani, Idat Galih Permana, Nur R. Komalasari and Taryati
Department of Nutrition and Feed Technology, Faculty of Animal Science, Bogor Agricultural University, Jl. Agatis, Campus Darmaga, Bogor, 16680, Indonesia

Corresponding Author: Yuli Retnani, Department of Nutrition and Feed Technology, Faculty of Animal Science, Bogor Agricultural University, Jl. Agatis, Campus Darmaga, Bogor, 16680, Indonesia

ABSTRACT

In Indonesia, Ettawa crossbreed goat is one of common milk goat that categorized low production goat. Bio-supplement biscuit is one of feed industry to increase milk production. This study aims to evaluated milk production and calcium content. The used 10 Ettawa crossbreed in Bangun Karso Farm. Research design used t-test with treatments: T0 = Mix forage+concentrate and T1 = Mix forage+concentrate+biscuit 15%. Parameters were milk production and calcium content. The research resulted that biscuit bio-supplement affected milk production and calcium content significantly ($p<0.05$). Biscuit bio-supplement contained papaya leaves increased calcium content until 174.832 mg/100 g. Active compounds in papaya leave was proved increases milk production and calcium content. Biscuit bio-supplement increased 43.35% milk production and 48.27% calcium content.

Key words: Ettawa goat, biscuit bio-supplement, milk production, calcium content

INTRODUCTION

Goat milk is one of in famous farm commodity in Indonesia although it has a prospect to develop. Commercially goat milked in Indonesia is Ettawa crossbreed from Ettawa goat (origin from India) and Kacang goat (origin from Indonesia) (Attabany, 2001). These breed produce only about 1.12 L of milk per head per day (Marwah *et al*., 2010) that categorized low producer, unfortunately.

The increasing of milk production should be balanced with calcium content, due to it is important mineral for human body (Mahan and Escott-Stump, 2000). Sodiq and Abidin (2002) reported that calcium content in goat milk is 134 mg/100 g. Calcium content in goat milk derived from feed quality.

Calcium needed for each person is different depend on age and health condition (Tagliaferri *et al*., 2007). Dietary Reference Intakes (1997) suggested 2500 mg calcium per day for children (1-8 years), 3000 mg per day for adult (9-30 years) and 2000 mg per day for old people (>50 years), although Indonesian only consume calcium about 254 mg per hari. Calcium is important mineral to help bond development and prevent from osteoporosis (Lopez-Huertas *et al*., 2006).

The major constraints of ruminant feed are as follows: Low quality of forage; the level of palatability and digestibility is lower (Retnani *et al*., 2014a). Goat nutrition and feeding is extremely important to the success or failure of milk production. Feed supplement contained high energy, protein and mineral is one of solution to increase rumen fermentation product that provide nutrient for milk production. Milk production and composition affected by ewe age, feed, season,

animal health, geographic position and management pattern (Mardalena *et al.*, 2011). In tropic, low soluble carbohydrate in forage (Tillman *et al.*, 1986; Morand-Fehr and Sauvant, 1980) reduces the quality and consumed forage could not fulfill animal needed (Devendra and McLeroy, 1982).

Biscuit bio-supplement is one of supplement feed to increase milk production (Retnani *et al.*, 2014b). Biscuit form is innovated product in feed industry to increase feed quality based on durability, easy to store, distribute and consume by animal (Whiteley, 1971). This feed type is important for animal in fluctuated quality and quantity ransom. Biscuit bio-supplement were processed by pressing and heating to form compact feed. It has a purpose to easier transportation, storage and animal supply that increases consumption.

This study aimed to evaluate milk production and calcium content in Bangun Karso farm after biscuit bio-supplement consumed.

MATERIALS AND METHODS

Equipments: This research used digital scales, chopper machine, hammer mill and biscuit machine to prepare biscuit; milko tester Milk Analyzing Device Model Master Pro to analyzed milk quality.

Feed material: Composition for biscuit bio-supplement were papaya leaves, *Indigofera* sp. leaves, molasses and concentrate. Conventional feed of Bangun Karso farm were grasses and concentrate. The nutrient content of conventional feed in Bangun Karso farm has been seen in Table 1.

Animal and cage: This study used 10 female Ettawa crossbreed in woody cage completed with feed and water container.

Time and location: This study conducted in Bangun Karso farm, Bogor in 3 month (June-August) 2014. Calcium content analyzed in Laboratory of Dairy Cattle, Faculty of Animal Science, Bogor Agricultural University Indonesia.

Process of biscuit production: Process of biscuit bio-supplement production from raw material i.e., *Carica papaya* L. leaf and *Indigofera* sp. leaf and processed by grinding, mixing, pressing and heating to temperature 100°C for 5 min to form biscuit feed bio-supplement and then cooled at room temperature. Diagram process of biscuit bio-supplement production was presented in Fig. 1 (Retnani *et al.*, 2014c).

Procedure of milk calcium analysis: Milk calcium analyzed by Atomic Absorption Spectrophotometer (AAS). Sample preparation involved wet destruction used HNO_3, H_2SO_4 and $HClO_4$, warming sample by hotplate and filtration.

Statistical analysis: A statistical analysis was carried out on two data set used t-test in order to compare control (T0) and treatment (T1). The treatments were:

Table 1: Nutrient content of conventional feed in Bangun Karso farm

Feeds	Ash	CP	CF	C-Fat	Beta-N
	(%)				
Grasses	11.70	15.72	29.10	3.18	40.30
Concentrate	6.31	19.84	15.50	6.34	52.01

Analyzed in Laboratory Feed Technology and Science, Faculty of Animal Science, Bogor Agricultural University, CP: Crude protein, CF: Crude fiber, C-Fat: Crude fat

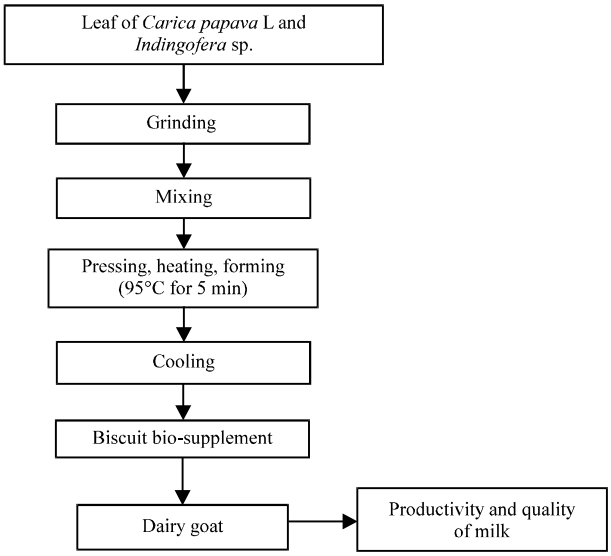

Fig. 1: Process of biscuit bio-supplement production (Retnani *et al.*, 2014c)

T0: Mix forage+Concentrate
T1: Mix forage+Concentrate+Biscuit 15%

Parameters in this study were milk production and calcium content.

RESULTS AND DISCUSSION

Milk production: Nutrient content of bio-supplement biscuit are 7.43% ash, 33.56% crude protein, 13.85% crude fiber, 2.61% crude fat and 42.55% Beta-N (Retnani *et al.*, 2014a).

Biscuit bio-supplement increased milk production almost along this study (Fig. 2). Fluctuation of milk production in each day depends on stage of lactation (Kuchtik *et al.*, 2008) and season (Pollott and Gootwine, 2004). Seasonality effects commonly found in other sheep production systems include the effect of variation in nutrition from feed material. Milk production was associated with number of secretory cells in mammary, activity cell and subtract availability for milk synthesis. Milk synthase in secretory cells mammary used nutrient from consumed feed (Manalu *et al.*, 2000).

Data analyses resulted that bio-supplement biscuit increased milk goat production, significantly ($p<0.05$). Effect of biscuit bio-supplement on milk production at Ciapus and Leuwiliang Farm (mL/head/day) has been shown in Table 2. Biscuit bio-supplement increased milk production until 137 mL per head per day (43.35%). Milk production average for each ewe was lower than Mardalena *et al.* (2011) and Ramadhan *et al.* (2013) that reported their ewe produced 440 mL per head per day or and 320.60-340.16 mL per head per day. Milk production in each day has been shown in Fig. 2.

Milk calcium content: Milk calcium content in the end of the research increased to 174.84 mg/100 g (48.27%) after bio-supplement biscuit treatment. Total calcium milk content is higher than Sodiq and Abidin (2010) who reported milk goat calcium was 129 mg/100 g. Kuchtik *et al.* (2008) reported that stage of lactation had effect on the contents of all milk components, included milk calcium. Milk calcium content was affected by protein content in

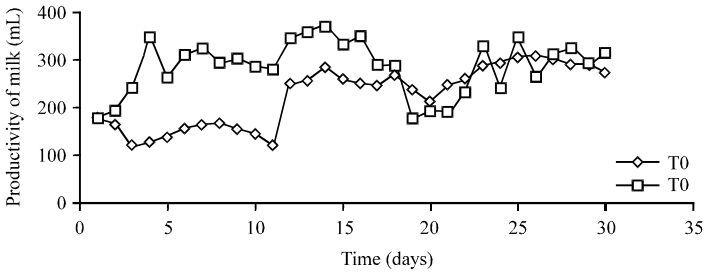

Fig. 2: Milk production in each day

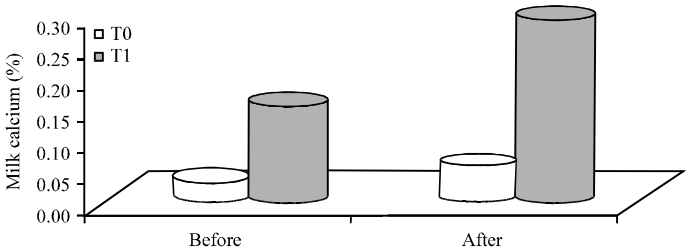

Fig. 3: Milk calcium

Table 2: Effect of biscuit bio-supplements on milk production at Bangun Karso farm

	Average milk production (mL/head/day)		
Treatments	Before treatment	After treatment	Delta
T0	177±76.12	274±83.82	97±45.83
T1	179±61.88	316±78.89	137±42.52

T0: Without biscuit, T1: With biscuit 15%. Results are significant at ($p<0.05$)

Table 3: Effect of biscuit bio-supplement on milk calcium content at Bangun Karso farm

	Before treatment		After treatment		Delta
Treatments	%	mg/100 g	%	mg/100 g	mg/100 g
T0	0.03±0.02	30.51±21.38	0.05±0.07	50.78±53.98	20.27±23.06^{b}
T1	0.15±0.07	105.70±73.38	0.29±0.30	280.54±299.04	174.84±159.57^{a}

T0: Without biscuit, T1: With biscuit 15%. Superscript in the same columns indicated significant differences ($p<0.05$)

bio-supplement biscuit due to protein role as calcium catcher. Protein-calcium form was easier to absorb by mucosa used diffusion mechanism from cytoplasm to basal membrane (Trilaksani *et al.*, 2006). Calcium would be deposit as milk mineral in lactated animal system.

Calcium is one of important mineral for human body that needed in abundant number. Result analyses showed that bio-supplement biscuit had significant effect on milk calcium content ($p<0.05$). Effect of Biscuit Bio-Supplement on Milk Calcium Content at Bangun Karso Farm has been shown in Table 3.

Increase in milk calcium also affects the active compound in papaya leaves as biscuit bio-supplement component. Fiber consume have a role in calcium absorption (Waluyo, 2009) that reduce feed transit time in intestinal tract and accelerate absorption process. Moreover, calcium absorption affected by age, animal requirement and feed sources. Milk calcium has been represented in Fig. 3.

CONCLUSION

Bio-supplement biscuit increased milk production up to 43.35% and milk calcium about 48.27%.

ACKNOWLEDGMENT

Authors are highly thankful to Department of Nutrition and Feed Technology, Faculty of Animal Science, Bogor Agricultural University and Directorate General of Higher Education (DGHE), Ministry of Education Republic of Indonesia for funding this research.

REFERENCES

Attabany, A., 2001. [A study on production of etawah-grade goats in Barokah farm and Saanen goats in PT. taurus dairy farm]. Ph.D. Thesis, Bogor Agriculture University, Pascasarjana, Bogor.

Devendra, C. and G.B. McLeroy, 1982. Goat and Sheep Production in the Tropics. 1st Edn., Longman Group Ltd., London, England, ISBN: 9780582609358, Pages: 271.

Dietary Reference Intakes, 1997. Torelable upper intake level, elements. Institute of Medicine, National Academies, USA.

Kuchtik, J., K. Sustova, T. Urban and D. Zapletal, 2008. Effect of the stage of lactation on milk composition, its properties and the quality of rennet curdling in East Friesian ewes. Czech J. Anim. Sci., 53: 55-63.

Lopez-Huertas, E., B. Teucher, J.J. Boza, A. Martinez-Ferez and G. Majsak-Newman *et al*., 2006. Absorption of calcium from milks enriched with fructo-oligosaccharides, caseinophosphopeptides, tricalcium phosphate and milk solids1'2'3. Am. J. Clin. Nutr., 83: 310-316.

Mahan, L.K. and S. Escott-Stump, 2000. Krause's Food, Nutrition and Diet Therapy. 10th Edn., W.B. Saunders, Pennsylvania, USA., ISBN-13: 9780721679044, Pages: 1194.

Manalu, W., M.Y. Sumaryadi, Sudjatmogo and A.S. Satyaningtijas, 2000. Effect of superovulation prior to mating on milk production performance during lactation in ewes. J. Dairy Sci., 83: 477-483.

Mardalena, L.W., E. Nurdin, W.S.N. Rusmana and Farizal, 2011. Milk quality of dairy goat bay giving feed supplement as antioxidant source. J. Indonesian Trop. Anim. Agric., 36: 205-212.

Marwah, M.P., Y.Y. Suranindyah and T.W. Murti, 2010. [Milk production and milk composition of ettawa crossbred goat, fed katu leaves (*Sauropus androgynus* (L.) Merr as). Buletin Peternakan, 34: 94-102, (In Indonesian).

Morand-Fehr, P. and D. Sauvant, 1980. Composition and yield of goat milk as affected by nutritional manipulation. J. Dairy Sci., 63: 1671-1680.

Pollott, G.E. and E. Gootwine, 2004. Reproductive performance and milk production of assaf sheep in an intensive management system. J. Dairy Sci., 87: 3690-3703.

Ramadhan, B.G., T.H. Suprayogi and A. Sustiyah, 2013. The effect of balanced forage and concentrate on feed to milk production and fat content in lactating ettawa grade goats. Anim. Agric. J., 2: 353-361.

Retnani, Y., C. Arman, S. Said, I.G. Permana and A. Saenab, 2014a. Wafer as feed supplement stimulates the productivity of bali calves. APCBEE Procedia, 8: 173-177.

Retnani, Y., I.G. Permana and L.C. Purba, 2014b. Physical characteristic and palatability of biscuit bio-supplement for dairy goat. Pak. J. Biol. Sci., 17: 725-729.

Retnani, Y., I.G. Permana, N.R. Komalasari, R. Roslina and A. Ikhwanti 2014c. Biscuit bio-supplement for increasing milk production and quality in dairy goat farm. Asian J. Anim. Sci., 8: 15-23.

Sodiq, A. and Z. Abidin, 2002. Etawa Crossbreed. Agro Media Pustaka, Jakarta, Indonesia, pp: 17, 57.

Sodiq, A. and Z. Abidin, 2010. Increase Milk Production of Goat Etawa Crossbreed. Agro Media Pustaka, Jakarta, Indonesia.

Tagliaferri, M., C. Isaac and T. Deby, 2007. The New Menopause Book. PT Indeks, Jakarta.

Tillman, A.D., H. Hartadi, S. Reksohadiprodjo, S. Prawirokusumo and S. Lebdosoekojo, 1986. Basic of Animal Feed Science. Animal Science Gadjah Mada University Press, Yogyakarta, Indonesia.

Trilaksani, W., E. Salamah and M. Nabil, 2006. [Utilization waste tuna (*Thunnus* sp.) as a source of calcium with protein hydrolysis method]. Agricultural Technology Newsletter, Vol. 11, No. 2.

Waluyo, S., 2009. 100 Question and Answers: Osteoporosis. 2nd Edn., PT Elex Media Komputindo, Jakarta, Indonesia.

Whiteley, P.R., 1971. Biscuit Manufacture. Applied Science Publisher, London, UK.