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Milk Transmitting Ability of Saanen Bucks under Intensive Management

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ABSTRACT: Saanen goats have been maintained intensively for their good milk production in some parts of West Java, Indonesia. Genetic evaluation is required for dairy bucks to be used as breeding stocks. Milk transmitting ability of 18 Saanen bucks, whose female offspring for 1-27 hd, were evaluated at Fajar Taurus Dairy Farm, Cicurug, West Java. Data of daily milk yield were evaluated only for lactation lengths ≥120 days at 1st lactation period. Lactation lengths were standardized to complete lactations of 180 days. Heritability of 180-d milk production was estimated by paternal half-sib correlation method. Variant components among bucks were generated from general linear method by considering fix effects of kidding year and kidding month on milk yields of offspring. Contemporary Comparison (CC) method was used to evaluate milk transmitting ability of the bucks. Heritability of milk production was $h^2 = 0.301$. The values of estimated transmitting ability (ETA) of Saanen bucks varied with the highest ETA being 9.3 (CC = 114.3 and EBV = 18.6). Bucks at the 3 highest ranks (ETA = 2.9 to 9.3) could be considered as breeding stocks. However, the accuracy of these best bucks had to be improved as their ETAs were derived from limited female offspring.

Keywords: Saanen Buck, Milk Production, Transmitting Ability.

INTRODUCTION

The commercial business of dairy goat farms recently has grown in some urban areas in Java Island, Indonesia. This dairy goat business has developed due to a growing number of consumers of goat milk, especially in large cities. Consumers believe many functions can be obtained by consuming milk from dairy goat. Goat milk is a source of animal food with a balanced nutrition, containing a high quality of proteins and a great content of minerals and vitamins. Goat milk is also considered as a medical food to address a number of health problems. Moreover, this milk also has better digestibility of lipid fraction and is lower in allergenicity of protein fraction compared to milk of dairy cattle (Brito *et al.*, 2011).

Genetic improvement of dairy goat production of milk, fat, protein and a number of other related lactation traits is considered necessary. Currently milk production is the primary target in dairy goat business in our country as it directly determines income of farmers and farms. A buck had an important role to make genetic improvement of milk production of dairy goat due to its ability to produce a large number of offspring in a relatively short period (Wiggans *et al.*, 1989). However, males do not produce milk, so their ability to pass milk production onto their offspring can only be evaluated by progeny testing. Progeny testing makes possible that the determination of milk transmitting ability of each of bucks.

A number of large dairy goat farms have commercially reared Saanen goats in West Java. One example is Taurus Dairy Farm, Cicurug-Sukabumi, West Java. Saanen goats on this farm were originally imported from Perth and New South Wales in 1996. Twenty young females (eight months old) and 4 young males (one year old) were initially imported. In 1999, 33 Saanen ewes were brought from Central Java. Mating was performed between the existing males and females,

later followed by the mating among their offspring. Animals were reared intensively under a good feeding and management.

The purpose of this study was to evaluate milk transmitting ability of saanen bucks reared under an intensive management at PT Taurus Dairy Farm, Sukabumi, West Java.

MATERIALS AND METHOD

Secondary data were collected from Saanen bucks consisting of identity, date of mating and date of kidding of their offsprings. Milk production of female offsprings were also collected during 2000 - 2011. Twenty Saanen bucks were identified that had a wide ranged number of female offspring (1-31 hd). For the purpose of this study, 18 Saanen bucks with 1-27 female offspring were considered in evaluation. Some bucks (10 bucks) for the evaluation had only one female offspring; while anothers had either 2-5 offspring (4 bucks) or 6-11 offspring (4 bucks). However, 2 bucks had female offspring of 16 hd and 27 hd, respectively.

Milk production of female offspring evaluated in progeny test of their bucks were summarized as monthly cumulative milk productions for lactation lengths of more than 120 days in 1st lactation . Differences in lactation lengths were standardized to complete lactation to 180 days (Anggraeni, 2014). Correction factors of lactation length of milk production at the first lactation of 120d, 150d, 180d, 210d, 240d, 270d, 300d, 330d and 360d were succesively 1.40, 1.16, 1.00, 1.16, 1.30, 1.41, 1.58, 1.64 and 1.79. Heritability of this 180-d milk production was estimated by paternal half-sib correlation method. Variant components among bucks were generated from general linear method by considering fix effects of kidding year and kidding month.

Estimated breeding value (EBV) for an individual buck was analyzed by Contemporary Comparision (CC) method (Dalton, 1985), following this formula:

CCi: Σi wij dij / Σi wij
EBV: 2b CCi
b: wi / (wi + k); k: (4 – h2) / h2.
nD : number of female offspring of a certain buck as participant in progeny test.
nM: number of herdmates (M) in a same herd.
dij: production difference between female offspring of a tested buck against contemporary.
w: (nD x nM) / (nD + nM).
wi = Σ wij was as a weighting factor of female offspring of ith buck in jth herd.

RESULTS AND DISCUSSION

The Use of Bucks in Natural Mating

Distribution of Saanen bucks in natural mating services on female Saanen population in this study were identified based on kidding year of their offspring as shown in Table 1. However, Saanen bucks having only one offspring in the evaluation (8 hd) were not presented.

Saanen bucks were used for natural mating services over a long period. This was especially true for those having female offspring in relatively large numbers (TDF13, Thunder, TDF 14, TDF 17 and Maralinda P). They were used as natural service sires for 4-7 years. TDF 13 had the largest number of offspring (27 hds); distributed between 2005 - 2010.

Table 1. Number of female offspring of Saanen bucks used in natural mating services from 2000 -2010

Buck Identity	Kidding year of sire's offspring											
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Komuta TP	5	1										6
Drazell				2	1		3					6
TDF 13						15		4	6		2	27
Thunder				2	2	4	2	2				12
TDF 14		1				3	2		1	1	1	9
Maralinda P		6	1	1	3	3	1	1				16
TDF 48						5						5
Keynote		1		2								3
TDF 17		1				3	1		1	1	1	8
Komuta B	2											2

Milk Production

Standardized milk production for a 180-day lactation of female offspring for Saanen bucks in the study are shown in Table 2.

Table 2. Description of standardized 180-d milk production of female offspring of Saanen bucks.

Buck ID	∑ Offspring (hd.)	Mean±SD (lt.)	Buck ID	∑ Offspring (hd.)	Mean±SD (lt.)
Pamona J	1	421	Maralinda P	16	223 ± 71
Komuta T	1	353	TDF 48	5	203 ± 14
TDF 46	1	271	Keynote	3	176 ± 21
Komuta TP	6	332 ± 71	TDF 17	9	262 ± 82
Drazell	6	185 ± 75	TDF 5	1	185
TDF 28	1	236	SP	1	129
TDF 13	27	214 ± 100	Jaloe	1	117
Thunder	11	212 ± 94	Komuta B	2	282 ± 19
TDF 14	9	232 ± 62	TP	1	105

Milk production showed a wide variation, either among the offspring within buck or between bucks. Milk production ranged from 421 lt (Pamona J), to 105 lt (TP). However, both productions were from one offspring.

The average milk production for a standardized 180-d lactationfor first lactation was 227±88 lt. Average milk production of complete lactations for 1-5 lactation of Saanen goats in tropical regions of Sudan were between 206-369 kg (Ishaq *et al.*, 2012). Higher milk production of a previous study was due to longer lactation lengths (vs standardized 180-d), namely 194 - 212 days.

Heritability

Heritability of milk production that was estimated based on a standardized 180-d milk production in 1st lactation was h2 = 0.301. Heritability showed additive genetic variation passed from parent to offspring. Estimated value of heritability in a population depends on population condition such as number of sires evaluated and method used (Warwick *et al.*, 1995). Heritability of milk production in this study was estimated from Saanen bucks having an average number of female offspring of 5.7 hd per buck. Nevertheless, some bucks had only one offspring.

Heritability values can be estimated fairly accurate if a males had a minimal number of female offspring of 10 hd (Dalton 1985). Higher values of heritability were obtained from a study of five exotic dairy goat breeds, namely Saanen, Alpine, LaMancha, Nubian and Toggenburg (h2 = 0.44, 0.42, 0.38, 0.45, and 0.41, respectively) (Grossman *et al.*, 1986). A high value of heritability showed genetic improvement can be made effectively through genetic selection .

Milk Transmitting Ability

To determine genetic potential of Saanen bucks to transmit milking production to their female offspring, it is necessary to estimate breeding value for milk production. This can be calculated by using the Contemporary Comparison (CC) method. The CC method is based on calculation of breeding value and milk transmitting ability by comparing the average of the first lactation milk production of female offspring of a certain sire to those of other males that produce milk in the same herd, season, and year.

Table 3. Estimated values of CC, EBV and ETA of Saanen bucks, ranked high to low of ETA

BUCK	Offs.	Wi	Dij	∑ Wi	∑Wi Dij	b	CC	EBV	ETA
Pamona J	1	1.09	114.99	1.09	124.68	0.08	114.29	18.4	9.32
Komuta T	1	1.09	46.09	1.09	50.28	0.08	46.09	7.52	3.76
TDF 46	1	1.03	37.14	1.03	38.4	0.08	37.14	5.76	2.88
Komuta TP	6	0.34	9.77	1.43	118.78	0.03	82.84	4.50	2.25
Drazell	6	1.17	39.81	2.74	43.84	0.09	16.02	2.78	1.39
TDF 28	1	1.03	2.34	1.03	2.41	0.08	2.34	0.36	0.18
TDF 13	27	0.11	-50.25	1.3	11.77	0.01	10.44	0.18	0.09
Thunder	11	0.50	21.47	2.75	2.86	0.04	1.04	0.08	0.04
TDF 14	9	0.37	20.87	2.60	0.3	0.03	0.01	0.00	0.00
Maralinda	16	0.29	-43.00	2.73	-15.06	0.03	-5.52	-0.26	-0.13
TDF 48	5	0.28	-73.45	0.28	-20.64	0.02	-73.14	-3.28	-1.64
Keynote	3	0.59	-123.06	1.62	-70.06	0.05	-43.16	-3.96	-1.98
TDF 17	9	1.09	-130.26	3.40	-141.62	0.08	-41.64	-6.79	-3.40
TDF 5	1	1.03	-48.38	1.03	-49.94	0.08	-48.38	-7.50	-3.75
SP	1	1.11	-74.00	1.11	-82.2	0.08	-74.00	-12.27	-6.14
Jaloe	1	1.11	-85.25	1.11	-94.72	0.08	-85.25	-14.14	-7.07
Komuta B	2	0.64	-24.41	0.64	-141.24	0.05	-219.70	-21.84	-10.92
TP	1	1.13	-13.33	1.13	-150.00	0.08	-133.33	-22.36	-11.18

Description:
CC : Contemporary Comparison; EBV : Estimated Transmitting Ability; ETA : Estimated Transmitting Ability

Results of estimated breeding values (EBV) for Saanen bucks, by CC method, showed both positive and negative EBV (Table 3). This genetic evaluation was calculated for many bucks that had female offspring in limited numbers. The 3 highest ranking bucks had CC values of 114.3, 46.1 and 37.1 and EBV values of 18.6, 7.5 and 5.8. Estimated transmitting ability is calculated as half of the EBV. Those bucks having negative CC values also had negative values of EBV and ETA.

Contemporary Comparison method has some advantages in estimating EBV and ETA by making corrections for possible differences in the number of offspring. This was because only the first lactation of offspring were evaluated. However, this method is only accurate when the number of female offspring of the evaluated bucks were at least 10 animals. Only three bucks from this study had more than 10 offspring. The average number of female offspring for the evaluated bucks were limited and made estimation of heritability and ETA less accurate and probably affected accuracy for identifying the best bucks in the herd.

CONCLUSION

Evaluation on milk transmitting ability of Saanen bucks, based on a standardized 180-d lactation of the 1st lactation of female offspring, identified the top three best Saanen bucks with ETA values of 9.3, 3.8 and 2.9. The accuracy of identification of top Saanen bucks can be improved with more offspring per buck.

REFERENCES

Anggraeni, A. 2014. Correction Factors of Lactation Length and Lactation Period on Milk Yield in Saanen Goat. Proceeding The 2nd Asian Australasian Dairy Goat Conference. April 25-27th 2014. IPB Int. Convention Centre. Bogor, Indonesia. Pp. 357-359.

Brito, L.F., F.G. Silva, A.L.P. Melo, G.C. Caetano, R.A. Torres, M.T. Rodrigues and G.R.O. Menezes. 2011. Genetic and environmental factors that influence production and quality of milk of Alpine and Saanen goats Genetics and Molecular Research 10 (4): 3794-3802.

Dalton DC. 1985. An Introduction to Practical Animal Breeding. 2nd edition. The English Language Book Society and Granada.

Grossman. M., R.L., Fernando, W.A., Mohammad, A.K.A., Ali and R.D., Shanks. 1986. Correlations between parities for lactation traits in United States dairy goats. J. Dairy. Sci. 69:1917-1921.

Ishaq, I.A., S.A. Abdalla, and M. K.A. Ahmed. 2012. Factors affecting milk production traits of saanen goat raised under Sudan, semi arid conditions. Online Journal of Animal and Feed Research, Vol. 1, Issue 5: 435-438

Warwick EJ and Legates JE. 1979. Breeding and Improvement of Farm Animal. 7th Edition. New York (USA): McGraw-Hill Book Co.

Wiggans, G.R. 1989. Animal model evaluation of dairy goats for milk, fat and protein yields with crossbred animals. J. Dairy Sci. 72: 2411-2416.