

Reproductive Performance and Prewaning Mortality of Peranakan Etawah Goat under a Production System of Goat Farming Group in Gumelar Banyumas

(Penampilan Reproduksi dan Kematian Prasapih Kambing Peranakan Etawah pada Sistim Produksi Kelompok Tani Ternak Kambing di Gumelar Banyumas)

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ABSTRAK: Program pengembangan dan perbaikan sistim produksi peternakan dapat diawali dengan penilaian terhadap potensi suatu bangsa ternak melalui serangkaian proses pencatatan, evaluasi *on-farm*, dan monitoring. Tujuan kajian ini adalah (1) mengetahui penampilan reproduksi dan kematian cempe prasapih Kambing Peranakan Etawah pada sistim produksi di kelompok tani ternak kambing Gumelar Banyumas, dan (2) mengetahui faktor-faktor non-genetik yang berpengaruh terhadap penampilan reproduksi dan kematian cempe prasapih. Digunakan kompilasi data penampilan reproduksi dan kematian cempe prasapih hasil penelitian lapang melibatkan 562 cempe dan 344 ekor induk kambing. Uji Chi-Square dan prosedur *General Linear Model* (GLM) diterapkan untuk menguji faktor-faktor non-genetik (jenis kelamin, tipe kelahiran, paritas) yang berpengaruh terhadap jumlah anak sekelahiran, kematian cempe prasapih, dan jarak beranak. Hasil penelitian menunjukkan rata-rata kematian cempe prasapih sebesar 5,9%. Kematian cempe prasapih betina (6,3%) nyata lebih tinggi daripada jantan (5,4%). Kejadian kematian cempe prasapih paling sering dijumpai pada kelahiran kembar tiga (16,7%), sedangkan pada kelahiran kembar dua dan tunggal masing-masing sebesar 5,6% dan 2,9%. Kematian cempe prasapih dipengaruhi oleh paritas induk, dan kecenderungan menurun dengan peningkatan paritas. Rataan jumlah anak sekelahiran sebesar 1,64 ekor, dan dipengaruhi sangat nyata oleh paritas induk. Induk pada paritas 1, 2, 3, 4, 5, 6, dan 7 menghasilkan jumlah anak sekelahiran berturut-turut 1,45; 1,71; 1,73; 1,95; 1,76; 1,83; dan 2,13 ekor. Rataan jarak beranak 285 hari dan nyata dipengaruhi oleh faktor paritas induk dan tipe kelahiran. Jarak beranak nyata lebih pendek dengan peningkatan paritas induk (1-7) berturut-turut adalah 319, 271, 261, 234, 236, 230, dan 228 hari. Jarak beranak nyata dipengaruhi oleh tipe kelahiran, pada kelahiran tunggal rata-rata jarak beranak (308 hari) nyata lebih pendek dibandingkan pada kelahiran kembar dua (272 hari) dan kembar tiga (245 hari).

Kata Kunci: Kambing Peranakan Etawah, jumlah anak sekelahiran, mortalitas cempe prasapih, jarak beranak, sistim produksi peternakan

Introduction

Kidding frequency and litter size are important components of an efficient kid production system. Kids of Peranakan Etawah in the Banyumas regions of Indonesian are traditionally marketed at a live kids ages ranging from 4 - 12 months. Consequently, in the Peranakan Etawah goats production system, the productivity of does is relatively more important than the growth potential of individual kids. Peranakan Etawah goats are descended originally from crossings between the Kacang with Etawah (Jamnapari) goats. They have a larger body frame, long hanging ears, a convex face and larger horns.

The role of goats in the traditional areas has been recognized. Besides producing animal products, they also provide manure to maintain soil fertility. Peranakan Etawah goat production is frequently associated with crop production, mainly because of its buffer function for crop failure and crop surpluses. Peranakan Etawah goats also play an important role in religious festivities, mainly in *Idul Adha* celebration. In the Peranakan Etawah Goat Farming Group of Gumelar Banyumas, goats are kept as a dual purposes for producing meat and milk.

Production traits among individuals and flocks of Peranakan Etawah goats are affected not only by genetic factors, but also by non-genetic factors such as sex, age, production year, age of does, type of birth, herd management, physiological status and nutrition. A number of report on the genetic and environmental factors for goat productivity (Zhang *et al.*, 2008; Oishi

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et al., 2008; Bagnicka *et al.*, 2007; Shrestha and Fahmy, 2007; Muir, 2006; Hailu *et al.*, 2006; Lassoued *et al.*, 2006; Song *et al.*, 2006; Akingbade *et al.*, 2004; Günes *et al.*, 2002; Ahmadu and Lovelace, 2002; Urdaneta *et al.*, 2000; Greyling, 2000; Awemu *et al.*, 1999).

The assessment of production potential of a breeds is the first phase of an improvement research and development program (Steinbach, 1987). It requires recording and on-farm evaluations and monitoring (Holst, 1999). Data on individual reproductive and productive performances of Peranakan Etawah goats have been merged in a data base and provided the basis for estimating flock performance. This article reports on litter size, kid mortality and kidding interval of Peranakan Etawah goat under management of Goat Farming Group in Gumelar Banyumas. The data also provided results on the effects of parity and type of birth on reproductive performance, and the effects of sex, birth type, and parity on pre-weaning mortality.

Research Methods

General

The study was conducted at the Peranakan Etawah Goat Farming Group in Gumelar, Banyumas, Central Java, Indonesia. The altitude of Gumelar region is 420 m above sea level with the annual rainfall average 2867 mm. The temperature, as it is a tropical country, stays within a constant range, differing only a few degrees between the hot and cool months: 23-31°C. Forage availability follows the distribution of rainfall with abundant in rainy season. By-products of agriculture and agro-industry are also available in surrounding areas.

Animals and Production System

Peranakan Etawah in the flocks of Goat Farming Group in Gumelar Banyumas is characterized by larger body frame, long hanging ears, a convex face and larger horns. Averages height at withers and ears length are 86 ± 8.03 cm and 31.7 ± 2.7 cm (buck), and 77 ± 4.60 cm and 29.07 ± 0.3 cm (doe), respectively. The dominant coat-colour are white (88,02%), brown (6,69%), and black (5,29%).

The average flock size was 12 goats, ranges from 6 to 35 goats. The main reason of raising Peranakan Etawah goat is mainly a dual purpose for producing meat and milk. Peranakan Etawah goats play an important socioeconomic role in Gumelar areas and women who are among the most resource farmers. Management of Peranakan Etawah goats was intensive

by cut and carry feeding system. Goats are feed by leguminous such as *Gliricidia maculata* (gliricidia), *Calliandra calothyrsus meissn* (kaliandra), *Leucaena glauca* (lamtoro), and also some shrubs and leaves (banana, cassava, jackfruit, and other trees). Goats mostly was fed a supplementary concentrate and bio-complete feed. Goats were provided with permanent stilted housing. Natural mating system was applied by provided superior bucks in order to improve the flock productivity in term of a high quality of Peranakan Etawah Goat (Grade A).

Data Collection and Analysis

The following data were recorded, flock size and identification of does, reproduction data (litter size at birth and interval between kiddings) and preweaning mortality. Least squares procedure by the General Linear Model (GLM) procedure was used to analyze data on mortality and reproductive performance (SPSS, Inc. 1999^{a,b}). The environmental factors assessed were: sex (male, female); parity (1-7); type of birth (singles, twins, triplets). Where significant differences were observed among three or more means, the Multiple Range test devised by Duncan test was applied. The association between the effects of various factors and preweaning mortality were analyzed using the Chi-squares analysis.

Results and Discussion

Prewaning Mortality

The result of the Chi-square test on preweaning mortality rate is presented in Table 1. This value is much lower than the 8% reported for Peranakan Etawah goats under a production system of village breeding centre in Purworejo (Sodiq, 2004), and 12% for village production system (Anggraeni *et al.*, 1995).

The effect of sex of young was found important, consistent with the works of Ebozoje and Ngere (1995) who reported higher death rates in females than males. Birth weight of female kid tend to lower than male kid. Awemu *et al.* (1999) reported that mortality generally increase as the birth weight of kids decreased. This is in agreement with the observations Mtenga *et al.* (1994) that animals with low birth weights have lower energy reserves and are therefore less able to withstand harsh environmental conditions.

Kid mortality was higher ($P < 0.001$) in triplet litters than in twins or single kiddings. In general, this finding agrees with results reported in the literature Awemu *et al.* (1999), Ameh *et al.* (2002), and Mtenga *et al.* (1994). Kid mortality increased in multiple births

of Peranakan Etawah goats by a tendency in a linear relationship. Kids from multiple births are often weak at birth as a result of physiological starvation in the uterus and lower energy reserves (Curtis, 1969). The survival rate of such kids is usually low, especially if their dams are not producing enough milk. Hailu *et al.* (2006) revealed that survival of single (70%) and twin (70%) born kids were high compared to survival rate of triplets (43%).

Table 1. Prewaning mortality rate of kids by sex, type of birth, and parity of doe

Sources	Number of born (%)	Viability to weaning	
		Survival (%)	Died (%)
<i>Overall</i>	562 (100)	529 (94.10)	33 (5.90)
<i>Sex</i>			
Male	260 (46.30)	246 (94.60)	14 (5.40)
Female	302 (53.70)	283 (93.70)	19 (6.30)
$\chi^2 = 5.05, P < 0.001$			
<i>Type of birth</i>			
Single	138 (24.70)	134 (97.10)	4 (2.90)
Double	388 (68.90)	365 (94.10)	23 (5.90)
Triplet	36 (6.40)	30 (83.30)	6 (16.70)
$\chi^2 = 5.07, P < 0.001$			
<i>Parity</i>			
1	215 (38.30)	200 (93.00)	15 (7.00)
2	170 (30.20)	159 (93.50)	11 (6.50)
3	81 (14.40)	76 (93.80)	5 (6.20)
4	42 (7.50)	40 (95.20)	2 (4.80)
5	26 (4.60)	26 (0)	0 (0)
6	11 (2.00)	11 (0)	0 (0)
7	17 (3.00)	17 (0)	0 (0)
$\chi^2 = 5.03, P < 0.001$			

Kid mortality of Peranakan Etawah does in first parity does was higher ($P < 0.001$) than that observed in adult does. These results agree with those of Sodiq *et al.* (2004) working on Kacang and Peranakan Etawah goats revealed that survival rate till weaning increased with the advance in parity up to the 4th parity and then slightly decreased. This may be attributed to the physiological maturity of older Peranakan Etawah does and their ability to provide enough milk for the kids. This finding, also in line Awemu *et al.* (2002) working with Red Sokoto goats found an increasing kid mortality across parities.

Reproductive Traits

Litter Sizes at Birth

Average litter sizes at birth was 1.64 kids (Table 2) lower than values recorded for most other Indonesian goat breeds such as Kacang, Jawarandu and local breed (Sodiq, 2004; Sodiq and Haryanto, 2007;

Amsar *et al.*, 1992), which ranged from 1.92 to 1.95 kids. Values of this finding are close to those obtained by Astuti *et al.* (1984), Adiati *et al.* (1998) and Setiadi *et al.* (1999), which ranged from 1.65 to 1.82.

Litter size of Peranakan Etawah does was affected by does age (parity), multiple birth rate increase with increasing parity (Tabel 2). Litter size of Peranakan Etawah does differed ($P < 0.01$) among does parity. Does born as multiples had a higher litter size than single contemporaries (Devendra and McLeroy, 1982; Sodiq and Haryanto, 2007). Lower prolificacy of primiparous does may be associated with an underdeveloped state of the reproductive features required for successive litter bearing compared with those of multiparous does that have reached physiological maturity. This study (Table 2) revealed that the peak litter size of Peranakan Etawah doe was generally achieved between 3 and 8 years of age (2nd - 7th parities).

Kidding Interval

The least squares mean for kidding interval of Peranakan Etawah doe was 285 days (Table 2). This value is much shorter than the 303 days reported for the Peranakan Etawah goat under a production system of village breeding centre in Purworejo (Sodiq, 2004). This condition attribute that the main purposes of keeping goat in the Goat Farmer Group of Gumelar Banyumas are producing milk and kids. Generally, the shortest interval generally occurs in traditional systems where uncontrolled breeding is the norm.

Parity of Peranakan Etawah does significantly ($P < 0.01$) affected the interval between kiddings which generally decreased with parity in consonance with the report of Wilson and Light (1986) that females at earlier parities take longer than older ones to return to reproductive status. A number of studies have reported that old does tended to have lower kidding intervals than the younger (Sodiq, 2004; Das, 1993; Odubote, 2000). This is probably due to the reproductive physiology function being more active in old does compared to lower activity in younger does. Awemu *et al.* (1999) reported that parity of does had significant effects on kidding interval, and as parity increased, kidding interval decreased. The interval between first and second kidding was longer (319) than those observed between later parities (ranged between 228 and 271 days, Table 2).

The longer kidding interval of Peranakan Etawah does could be due to their larger litters, as suggested by Christopher (2001), Akusu and Ajala (2000), by

Table 2. Least squares means (LSM) and standard error (SE) for litter size at birth and kidding interval

Variable	Litter size at weaning (head)			Kidding interval (days)		
	n	LSM	SE	n	LSM	SE
Overall	344	1.64	0.03	344	285	2.59
Parity		**			**	
Parity 1	151	1.45 ^a	0.04	151	319 ^a	2.03
Parity 2	93	1.71 ^a	0.05	93	271 ^b	4.09
Parity 3	49	1.73 ^a	0.08	49	261 ^b	5.32
Parity 4	22	1.95 ^b	0.14	22	234 ^c	3.76
Parity 5	15	1.76 ^{ab}	0.15	15	236 ^c	6.46
Parity 6	6	1.83 ^{ab}	0.17	6	230 ^c	9.99
Parity 7	8	2.13 ^b	0.13	8	228 ^c	5.45
Type of birth					**	
Single				138	308 ^a	4.10
Twin				194	272 ^b	3.04
Triplet				12	245 ^c	6.23

^{a,b,c} Means in the same column with different superscripts are significantly different ($P < 0.05$)

* $P < 0.05$, ** $P < 0.01$

Greyling (2000), and Öztürk and Akta (1996). Result of Ricordeau *et al.* (1990) found that milk yield of ewes lambing twins ranges from 1.7 to 1.8 kg and increases to 2.3 ± 2.5 kg for those lambing triplets. A high milk production could lead to a negative energy balance in the ewe. The magnitude of energy deficiency seems to affect these processes of follicular growth and development leading to the first ovulation (Nett, 1987). The gestation length of does with multiple births tend to have a shorter (1 to 2 days) difference between twins and triplets (Christopher, 2001). Gestation length decreased as the litter size of the doe increased (Amoah *et al.* 1996). Ndlovu and Simela (1996) reported that due to the slow growth rates and long kidding intervals the flock productivity in terms of weaned live kid weight (kg) per doe per year was

Conclusions

In animal production systems such as in the Peranakan Etawah goat farmer group, the value of goat breed increases in relation to its adaptation, capacity to make socioeconomic contributions, and potential for increasing productivity. Average litter size at birth, preweaning mortality, and kidding interval were 1.64 ± 0.03 kids; 5.9%; and 285 ± 2.59 days, respectively. The study has revealed that the non-genetic factors exerted significant influences on reproductive performance and preweaning mortality of Peranakan Etawah goat. There is a considerable potential for increased Peranakan Etawah goat

production, provided that proper management is employed. Research and development efforts can significantly improve production from goats can simultaneously enhance the livelihood of the goat farmer group.

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