

PRODUCTIVE AND REPRODUCTIVE PERFORMANCES OF FEMALE ETAWAH CROSSBRED GOATS IN INDONESIA

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ABSTRACT

Although Etawah Crossbred (PE) goat is considered to be dual purpose (meat and milk) goat, it is mainly raised for meat production. Since early 1990, there has been a growing interest of the farmer in some places to raise PE goat for milk production without sacrificing its role to produce kids for meat. The average birth weight of PE kids varied widely (2.8 – 5 kg), resulted in a high variation in weaning weight (9 – 14 kg). A high pre-weaning mortality of 10 – 50% was a major source of lost in goat production in Indonesia, partly due to low birth weight and/or miss mothering ability. Young female PE goat reached puberty at 8 – 12 months of age and at body weight of about 18 – 22 kg or about 53 – 60% of mature body weight. Gestation length varied between 142 – 156 days, and first post partum estrous occurred at 3 – 5 months after parturition took place, resulted in 8 – 10 months of kidding intervals. Lactation period lasted for 5 – 8 months with total milk yield of 177 – 203 kg/lactation (average 0.85 kg/day). Although milk yield of PE goat was not as high as milk yield of some other dairy goats, the ability of PE goat to cope with harsh local environment, particularly climate and feed conditions, was an advantage. Therefore, raising PE goat would still be an important part of farmer activities in the rural areas in Indonesia.

Key words: PE goat, reproduction, milk production

ABSTRAK

KINERJA PRODUKSI DAN REPRODUKSI KAMBING BETINA PERANAKAN ETAWAH DI INDONESIA

Walaupun kambing Peranakan Etawah (PE) termasuk kambing tipe dwi guna (penghasil daging dan susu), pemeliharaan kambing PE di Indonesia masih diutamakan untuk produksi daging. Sejak tahun 1990-an, di beberapa tempat sudah mulai ada petani yang memerah ternaknya tanpa mengorbankan perannya sebagai penghasil anak untuk daging. Rataan bobot lahir kambing PE bervariasi 2,8 – 5 kg, sehingga bobot sapih juga bervariasi cukup besar (9 – 14 kg). Kematian prapapah yang tinggi (10 – 50%) merupakan sumber kerugian yang cukup besar dalam usaha peternakan kambing di Indonesia, sebagian karena bobot lahir yang rendah dan/atau sifat keindukan dari induk yang kurang baik. Kambing PE betina mencapai pubertas pada umur 8 – 12 bulan dan bobot badan 18 – 22 kg atau sekitar 53 – 60% bobot badan dewasa. Lama kebuntingan bervariasi 142 – 156 hari, dan *post-partum* estrus terjadi 3 – 5 bulan setelah beranak sehingga jarak beranak menjadi sekitar 8 – 10 bulan. Laktasi berlangsung selama 5 – 8 bulan, dengan total produksi susu 177 – 203 kg/laktasi (rata-rata 0,85 kg/hari). Walaupun produksi susu kambing PE tidak sebanyak produksi susu kambing dari daerah subtropis, kemampuan kambing PE untuk beradaptasi dengan kondisi lingkungan tropis di Indonesia, terutama dengan iklim dan pakan, merupakan keunggulan dari kambing PE. Oleh karena itu, pemeliharaan kambing PE akan tetap menjadi bagian penting dari aktivitas usahatani petani di pedesaan.

Kata kunci: Kambing PE, reproduksi, produksi susu

INTRODUCTION

The total population of goat in Indonesia was about 14.9 millions and 52% of them were found in Java island (DIREKTORAT JENDERAL PETERNAKAN, 2007). Almost all goats in Indonesia are kept by smallholder farmers with goat ownership of 2 – 5 heads/farmer. However, the contribution of goat farming activity into the total income of the farmer was reported as high as 15 – 48% (PAAT *et al.*, 1992; SARWONO *et al.*, 1993) indicating that goat farming has a significant role in the economic activity of the farmer in the rural area.

There are two major breeds of goat in Indonesia namely Kacang (meat type) and Etawah Crossbreed (PE) (meat and milk type) goats. Originally, PE goat was developed through upgrading program of local Kacang goat using Jamnapari bucks imported from India during the Dutch colonization period. Raising PE goat was still mainly for meat, however, in the last 10 – 15 years, there has been increasing demand for goat milk in Indonesia. This is in line with dairy goat development program promoted by the government in order to accelerate the improvement of income and nutritional status of the people in the rural areas. Some reports

showed that milk yield of PE goat varied widely, 0.45 – 2.2 kg/day, (OBST and NAPITUPULU, 1984; SUTAMA *et al.*, 1995, SUBHAGIANA, 1998; BUDIARSANA and SUTAMA, 2001a; ADRIANI *et al.*, 2003), and this was partly due to uncontrolled breeding program done by the farmer. The present paper is focussed on production performances of PE goat, particularly of those under confinement condition since this is the main practice of PE goat production in Indonesia.

PRODUCTION PERFORMANCES

Litter size, birth weight and pre-weaning performances

PE goats are less prolific compared to Kacang goat. Litter size of PE was low (1 – 1.04) in the first parity (SUTAMA *et al.*, 1995; ARTININGSIH *et al.*, 1996) and increased to 1 – 3 (average 1.65) in the following parities (YULISTIANI *et al.*, 1999; ADIATI *et al.*, 2001). Increasing ovulation rate in superovulation program was also followed by an increase in litter size, and incidence of embryonic mortality as high as 31 – 47% (ARTININGSIH *et al.*, 1996; ADRIANI *et al.*, 2003).

Some studies showed that birth weight of PE kids was low (2.5 – 3 kg) in the first parity (SUTAMA *et al.*, 1995; ARTININGSIH *et al.*, 1996) and then increased to 3.5 – 5.4 kg in the following parities (SETIADI *et al.*, 1987; SIANTURI *et al.*, 1998; ADRIANI *et al.*, 2004a; KOSTAMAN and SUTAMA, 2006), depending on sex and litter size. Body weight of doe had a positive correlation with the birth weight of kid (KOSTAMAN and SUTAMA, 2006). However, improving body condition of doe during pregnancy by supplementation feeding using concentrate with crude protein (CP) content of 18% did not result in higher birth weight and weaning weight compared to control (CP 15%), as a consequence of lower milk yield of the treatment group (0.48 vs 0.60 kg/day) (ADIATI *et al.*, 2001). This result confirmed the previous study of YULISTIANI *et al.* (1999) who reported that overfeeding in PE doe did not show higher performances as expected. One may speculate that PE goat was less responsive to improved nutrition.

Grouping doe into low, medium and high milk yield, SUBHAGIANA (1998) found that birth weight of kids increased from 3.39 kg in low milking doe, to 3.93 kg in medium milking doe and 4.10 kg in high milking doe. Pre-weaning growth rate and weaning weight also increased as milk yield increased (Table 1).

Pre-weaning mortality

A high pre-weaning mortality of kids (10 – 50%) (SUTAMA *et al.*, 1993; ADRIANI *et al.*, 2003) was a major source of loss of goat production in Indonesia. Mortality of triplet and quartet kids (26-43%) was higher than single or twins (17 – 18%) (SUTAMA *et al.*, 1993). Low birth weight and lack of mothering ability are the major cause of kid's mortality, and therefore most of kid's mortality (30%) occurred within the first week of age. Super-ovulation and/or improved quality of feed increased birth weight and reduced pre-weaning kid's mortality (ADRIANI *et al.*, 2003). Moreover, creep feeding also reduced kids mortality and increased growth rate (MARTAWIDJAJA *et al.*, 1999).

Milk production and composition

As mention above, PE goat was developed by crossing between Jamnapari bucks from India with local Kacang goat of Indonesia. Uncontrolled breeding program might result in wide variation in phenotypic appearance and could be on genotype of PE goats as well. Milk yield of PE goat was higher compared to Kacang, and in some extent this was due to the presence of genotype of Jamnapari breed. At present, PE goat is considered to be dual purpose goats with lactation performances varied as shown in Table 2. Doe with twins produced milk (0.87 – 1.01 vs 0.76 – 0.82 kg/day) and showed longer lactation period (246 vs 214 days) than single kidding does (SUBHAGIANA, 1998; BUDIARSANA and SUTAMA, 2001a). These results were confirmed by ADRIANI *et al.*, (2004b) that super-ovulation treatment using PMSG increased milk yield up to 32% compared with control (Figure 1). This could be related to mammogenic hormone level during

Table 1. Birth weight and pre-weaning growth of PE doe at different milk yield

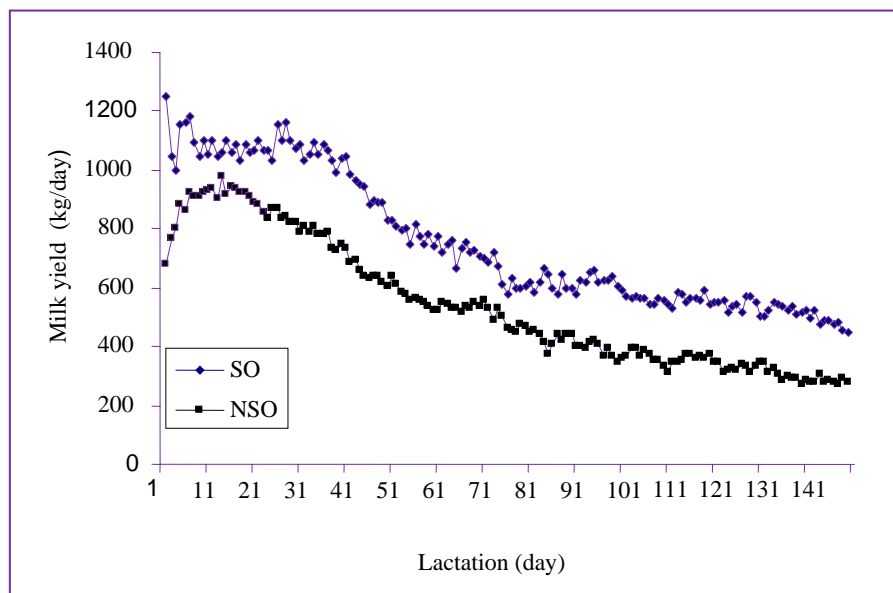
Parameters	Milk yield of PE doe					
	Low		Medium		High	
	LS1	LS2	LS1	LS2	LS1	LS2
Birth weight (kg)	4.20	3.07	3.50	3.90	5.00	3.74
Weaning weight at 3 months of age (kg)	9.00	9.66	12.20	9.50	12.30	10.24
Pre-weaning growth rate (g/day)	52.7	72.4	90.1	61.5	80.0	71.4

LS1 = litter size 1; LS2 = litter size 2

Source: SUBHAGIANA (1998)

Table 2. Lactation performances of PE goat

Parameters	SUBHAGIANA (1998)	SUTAMA <i>et al.</i> (1999)	BUDIARSANA and SUTAMA (2001a)
Length of lactation period (day)	175 – 287	160 ± 27	214 – 245
Milk yield (kg/lactation)	140.1 – 257.5	-	177.4 – 203.2
Daily milk yield (kg)	0.76 – 1.03	1.16	0.83 – 0.87

**Figure 1.** Milk yield of PE goat following super-ovulation (SO) and without super-ovulation (NSO) treatments (ADRIANI *et al.*, 2004b)

pregnancy which had positive effect on udder development and subsequently on milk yield in both ewe (MANALU *et al.*, 1999) and goat (SUBHAGIANA, 1998; SUTAMA *et al.*, 1999).

Supplementation feeding using concentrate feed with protein content (CP) of 22 and 26% did not significantly increase milk yield of PE goat compared to those given concentrate with protein content of 16% (YULISTIANI *et al.*, 1999), indicating less response of PE goat on nutritional regimes. PE goat adapted well to harsh environmental conditions including climate, temperature, and feed quality.

Milk composition of PE goat is shown in Table 3. There are number of factors influencing milk composition such as breed of goat, age, nutrition, time of milking. Both fat (4.39 – 6.54%) and protein (3.78 – 4.52%) contents of PE goat milk were relatively high. Goat milk is also known as a good source of Ca (0.11 – 0.16%) and P (0.08 – 0.12%). Although milk yield of PE goat is lower than that of some European breeds (Saanen, British Alpine), milk processing plant gave higher price to PE goat milk due to high total solid

(13.5 – 16.3%) (PERDANA, personal communication). The price of PE goat milk in Indonesia at consumer level ranges from USD 1.65 – 2.20/liter, and this will encourage the farmer to raise PE goats.

ASHARI *et al.* (2000) reported that goat milk consumption in Indonesia is generally for medication purposes of some illness particularly respiratory diseases (pneumonia, asthma, tuberculosis, bronchitis, etc.) rather than for nutritional purposes. JENSEN (1994) reported that in order to get more beneficial effect of what is termed as life energy of goat milk, goat milk should be consumed as soon as possible after milking, since it is immediately digested at body temperature. Moreover, he clearly stated “*that pasteurization of milk not only kills germ life but destroys enzymes and changes the chemical balance of the milk, so it is not the same as nature made it*”. Therefore, soon after milking, goat milk should be stored in refrigerator or frozen before delivery. Good quality milk can be stored for several days in refrigerator, or 1 – 2 weeks in freezer without affecting its quality.

Table 3. Composition of goat milk

Parameters	SUTAMA <i>et al.</i> (1995)		BUDIARSANA and SUTAMA (2001a)	ADRIANI <i>et al.</i> (2004)	EDDLEMAN (2007)
	PE		PE	PE	
	Morning	Afternoon			
Total solid (%)	13.62	15.72	13.92	16.33	12.90
Fat (%)	4.42	6.54	4.39	4.75	4.10
Protein (%)	4.27	4.13	3.78	4.52	3.40
Lactose (%)	-	-	5.08	5.52	4.70
Energy (cal/g)	856.31	914.23			
Ca (%)	0.15	0.16	0.10	0.11	0.19
P (%)	0.12	0.12	0.08	0.10	0.27

- = not available

REPRODUCTIVE PERFORMANCES

Puberty and estrous cycles

Puberty in PE goat, as defined as the first onset of estrous of female, was attained at 321 – 362 days of age and at body weight of 18 – 22 kg which was about 57 – 70% (average 63.2%) of mature body weight (SUTAMA *et al.*, 1994; 1995; 1999). Improved growth rate during pre-pubertal could accelerate the incident of puberty. PE goats which were given feed supplement of urea-molasses block reached puberty 20 days earlier than control (WODZICKA-TOMASZEWSKA and MASTIKA, 1993). Once the young goats attained puberty, they will show regular estrous cycle every 18 – 22 days (average 20 days), with duration of estrous of 28 – 84 hours. Mating in the first estrous usually resulted in low pregnancy rate (60 – 73%), through laparoscopy study showed that all young females PE ovulated at their first estrous (puberty) (SUTAMA *et al.*, 1999). Therefore, it was recommended to delay first mating to second or third estrous after puberty. THOMAS (1990) reported that body weight at first mating affected subsequent productive performances, and recommended that the young goat should have 60% of mature body weight before first mating.

Mating and kidding interval

At present, natural mating is still the main practice for goat breeding in Indonesia with pregnancy rate could reach up to 84 – 100% (ADIATI *et al.*, 1998; BUDIARSANA and SUTAMA, 2001b). While some studies on artificial insemination (AI) in PE goat showed pregnancy rate of 26.7 – 55.6% depending on the time of insemination, number of insemination and place of semen deposition (Table 4). Double inseminations at 10 hours interval gave higher pregnancy rate than single insemination (38.9 vs 55.6%) (SUTAMA *et al.*, 2002). AI on 20 – 25 hours after the onset of estrous gave lower (37.5%) pregnancy rate than that of 35-40 hours after onset of estrous (40.9%) (BUDIARSANA and SUTAMA, 2001b). These results were in contrast with results reported by NGANGI (2002) who found that AI on 14 – 23 hours post estrous resulted in higher pregnancy rate compared to those inseminated 27 hours after the onset of estrous (46.7 vs 26.7%). Most of the above studies showed results in comparison with 33 – 73% reported by BARIL *et al.* (1993) and ROCA *et al.* (1997). Pregnancy rate of 67 – 75% was found when insemination was done 12 hours after the onset of estrous (LEBOEOUF *et al.*, 2000).

Table 4. Pregnancy rate of PE goats following AI using frozen semen

Treatments	Pregnancy rate (%)	Reference
Time of AI: 20 – 25 vs 35 – 40 hours after onset of estrous	37.5 vs 40.9	BUDIARSANA <i>et al.</i> (2001)
Time of AI: 14 – 23 vs 27 – 34 hours after onset of estrous	46.7 vs 26.7	NGANGI (2002)
No. of insemination: 1 vs 2 times (24 hours vs 24 and 36 hours after onset of estrous)	38.9 vs 55.6	SUTAMA <i>et al.</i> (2002)
Type of mating: Natural vs AI	84.2 vs 40.9	BUDIARSANA <i>et al.</i> (2001)
Place of semen deposition: cervix vs uterus	34.2 vs 44.9	RITAR <i>et al.</i> (1990)

AI = artificial insemination

Gestation length of PE goat was reported 144 – 156 days (ARTININGSIH *et al.*, 1996; SUTAMA, 1996; ADIATI *et al.*, 1999; BUDIARSANA and SUTAMA, 2001b, KOSTAMAN and SUTAMA, 2006). Post partum estrous occurred 3 – 5 months after kidding resulted in kidding interval of 8 – 10 months. Reducing kidding interval is possible, but since this PE goat is also milked, post partum mating is delayed until 4 – 5 months after parturition. The average litter size of PE goat increased from 1 in the first parity (ARTININGSIH *et al.*, 1996; SUTAMA *et al.*, 1994; 1995) to 1.3 – 1.6 in the following parity (SUBANDRIYO *et al.*, 1986; BUDIARSANA and SUTAMA, 2001b). Like other breed in the tropics, PE showed sexual activity throughout the year.

CONCLUSION

As a local breed, PE goat can be developed as a dairy breed through a good breeding program. A high variation in milk yield will give a high chance of success for the improvement of milk production of this breed. PE goats are well adapted to local environment conditions and show good productive and reproductive performances. Therefore, PE goats are well accepted by farmer and this will support the existence of this breed in Indonesia.

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