PRODUCTIVITY COMPARISON BETWEEN BOER AND KACANG GOAT DAM

S. Elieser[1,3], Sumadi[1], G. S. Budisatria[1] and Subandriyo[2]
[1]Faculty of Animal Science and Industry, Gadjah Mada University,
Jl Agro-Karangmalang, Yogyakarta – Indonesia
[2]Research Institute for Animal Production (Balitnak-Ciawi), PO Box 221 Bogor – Indonesia
[3]Permanent Address: Research Institute for Goat Production, Sungei Putih PO Box 1,
Galang, North Sumatera - Indonesia
Corresponding E-mail: simonsinulingga@yahoo.com

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ABSTRAK

Penelitian bertujuan untuk mengetahui produktivitas induk kambing Boer dan Kacang telah dilaksanakan selama 2 tahun di Loka Penelitian Kambing Potong Sungei Putih-Sumatera Utara dengan menggunakan materi kambing yang ada pada institusi tersebut. Parameter yang diamati adalah total bobot lahir dan sapih anak, jumlah anak sekelahiran, mortalitas anak prasapih, interval beranak dan paritas induk. Data dianalisis secara statistik dengan General Linear Model, sedangkan laju reproduksi dan produktivitas induk diestimasi dengan menggunakan perhitungan menurut metoda Amir dan Knipscheer. Hasil penelitian menunjukkan bahwa total bobot lahir dan sapih anak kambing Boer lebih tinggi (P<0,05) daripada kambing Kacang. Jumlah anak sekelahiran pada kambing Boer lebih tinggi (P<0,05) daripada kambing Kacang. Mortalitas prasapih pada kambing Boer (15,1 ± 6,02%) lebih rendah daripada kambing Kacang (22,3 ± 5,05%). Interval beranak pada induk kambing Boer lebih tinggi (P<0,05) daripada kambing Kacang. Paritas induk berpengaruh (P<0,05) pada semua sifat produksi kambing kecuali pada mortalitas prasapih. Laju reproduksi induk kambing Boer (1,88) relatif sama dengan kambing Kacang (1,78). Produktivitas induk kambing Boer (37,12 kg/ekor/thn) lebih tinggi daripada kambing Kacang (18,12 kg/ekor/thn), sehingga dapat disimpulkan bahwa laju reproduksi induk kambing Boer relatif sama dengan kambing Kacang tetapi produktivitas kambing Boer lebih tinggi daripada kambing Kacang.

Kata kunci : produktivitas induk , kambing Boer, kambing Kacang, reproduksi

ABSTRACT

A study to evaluate the productivity of Boer and Kacang goats dam was carried out for 2 years at Research Institute for Goat Production, Sungei Putih-North Sumatera. The materials used were goats owned by the institute. The parameters observed were total birth and weaning weights of kid, litter size, parity of dam, pre-weaning mortality and kidding interval. The rate of reproduction and productivity of the dam were estimated using Amir and Knipscheer methods and were statistically analyzed using General Linear Model. The results showed that the total birth and weaning weight of Boer goats were higher (P<0.05) than that of Kacang goats, while litter size of Boer goats were higher (P<0.05) than that of Kacang goats. The pre-weaning mortality of Boer goat 15.1 ± 6.02% was lower than that of Kacang. The kidding interval of Boer goats was higher (P<0.05) than that of Kacang. Parity of dam had significant effect on all production traits (P<0.05) except for pre-weaning mortality. Dam reproduction rate of Boer (1.81) was higher than that of Kacang (1.78), while productivity of Boer goat (37.12 kg/head/year) was higher than that of Kacang (18.12). It can be concluded that the reproductivity of Boer and Kacang goats were similar, however the productivity of Boer goat had better than Kacang.

Keywords: dam productivity, Boer goat, Kacang goat, productivity, reproduction

INTRODUCTION

In Indonesia goats plays an important role in farming systems as reflected by the high goat population which is reached 16.841 million heads. The predominant breeds kept by farmer is Kacang goat. This goats is characterized with small body size, flat nose, and small erext ears, short fur and

color are varied widely, and known well adapted to the local environment and can show the productivity on limited resources.

Doloksaribu *et al*. (2005) reported that the birth weight of male and female Kacang goats were 1.81 ± 0.23 kg and 1.74 ± 0.21 kg; weaning weights of male and female kids were 6.69 ± 1, 38 and 6.41 ± 1.34 kg, respectively. Average litter size of Kacang goats was 1.23, while pre-weaning survival rate and kidding interval were 83% and 268 ± 34 days, respectively.

Government make the policy to improve the quality of Indonesian local goats by crossed with imported superior goats, such as Boer. Boer goat is meat types goats, with some superior characteristics such as having a rapid growth, excellent meat quality and high reproductive rate (Greyling, 2000; Malan, 2000). Boer goats also have a wide range of tolerance to the natural conditions and disease resistant or tolerant to the parasite (Mirkena *et al*., 2010).

Nurgiartiningsih *et al*. (2006) reported that birth weight and weaning weight of Boer goats were 3.21 and 16.81 kg, respectively, while pre-weaning average daily gain was 140.4 g. They also reported that Boer goats at 5 to 6 months old can reach 35 to 45 kg body weight, while at 2 to 3 years old can reach 120 to 150 kg for males and 80 kg for females. Another researcher, Malan (2000) reported that the kids of the Boer goats was weaned at 120 days with average body weight of 29 kg. The percentage of single births, twins, triplets and quadruplets of the Boer goats were 12.7; 61.4; 23.8 and 1%, respectively. Boer goats was very fertile as shown by 90% pregnancy rate, 189% birth rate and 210% fecundity rate (Campbell, 2003). Bagnicka *et al*. (2007) stated that in breeding program to improve goats productivity should include evaluation of the parent reproductivity such as type of birth single or multiple and weaning, birth and weaning weight and birth interval due to its effect on total production of the parent.

This research was conducted to evaluate the productivity of the Boer and Kacang goat dam.

MATERIALS AND METHODS

Animal and Feeding Management

The research was carried out for 2 years (from early 2008 to late 2009) in experimental pens at Research Institute for Goat Production, Sungei Putih-North Sumatera. The material used were goats owned by the institute. Research was done using 80 heads of Kacang goat dams which were mated to six heads of Kacang stud, fifteen dams of Boer goats mated to three heads of Boer stud, and four vasectomy stud for oestrus detection. Remated of dams was conducted after weaning the kids at 3-month-old and pass the oestrus examination twice a day using vasectomy stud. Females detected in oestrus were then mated to males that have been determined to avoid inbreeding.

Concentrate feed was given daily to all goats in the morning at 8:00 to 9:00 am after the pen was cleaned, at 1.25% of total body weight of goats in dry matter basis in group pen, while water were given *ad libitum*. Dam goats was not grazed or fully confined from a week before kidding to 1 month after kidding. For this dam, the forage was given twice a day in the pen by cut and carry, while for others goats forage was given in the pen in the afternoon only after the goats finished their grazing while was conducted from 10.00 to 16.00 daily.

Kids were administered anthelmintic at 2 months of age prior to be weaned at 3 months of age and were placed on the group pens based on sex and body weight. Provision of anthelmintic was conducted in three monthly from weaned to adult.

Parameters Measured and Data Analysis

The production traits of dam observed were total of birth and weaning weight of the kid, litter size, pre-weaning mortality and kidding interval. The breed of dam and the parity were also observed. Estimated rate of dam reproduction defined as the litter size of kid at weaning per dam per year (Amir and Knipscheer, 1989) was determined as follow :

$$\text{Dam reproduction rate} = \frac{\text{Litter size x Ability of live until weaning (\%)}}{\text{Kidding interval (year)}}$$

Productivity of dam defined as the total of weaning weight of kid per dam per year (Amir and Knipscheer, 1989) was determined as follow :

Productivity of dam = dam reproduction rates x average of weaning weight

The data were grouped and transferred in numeral prior to analysis, namely breed of dam grouped into 2 groups: 11 = dam of

Kacang goat and 22 = dam of Boer goat. Number of litter size were grouped into two groups; 11 = single births; group 22 = twin births (births ≥2 be included in twin births due to very few replicates). Parity of dam were grouped into five main groups: first birth = parity 1; second birth = parity 2; the third birth = parity 3; the fourth birth = parity 4 and the fifth birth and so on = parity 5.

Data were statistically analyzed using General Linear Model of SAS (2002). Mathematical model of dam production analysis was as follows :

$Y_{ijkl} = \mu + B_i + P_j + €_{ijk}$

Where :

Y_{ijk} = production traits of dam
μ = overall man
B_i = effect of dam breed $(i = 11, 22)$
P_j = effect of parity $(k = 1, 2, 3, 4, 5)$
$€_{ijk}$ = random error

RESULTS AND DISCUSSIONS

Least-squares means (LSM) and standard errors (SE) of the production traits of the goat grouped according to breed and parity of dam, are presented in Table 1.

Total Birth and Weaning Weight

Total of birth and weaning weigth of the kids were positively correlated with weight of birth and weaning. Total weight of birth and weaning the kids would increase with the increase of single birth and weaning weight.

The birth weight of a kid depends primarily on the conformation and mature size of the breed (Morand-Fehr, 1981). Thus, as Boer goat was the largest breeds used in this study, the kids had greater total birth weights (5.2 ± 0.23 kg) compared to kids of Kacang goat (3.1 ± 0.19 kg), the small breeds. Results indicated that Boer kids had greater ($P < 0.05$) total birth weights than of Kacang. One of the factors influences total birth weights of goats is the mature size of the sire and dam. Generally, the progeny of large breeds grow faster than the progeny of small breeds. It was also caused by the total weaning weight of the Boer goat that was heavier than Kacang. A significant effect of breed type on birth weight has also been reported by Dhanda *et al*. (2003).

Litter Size

Litter size of Boer goats (1.75 ± 0.077) were higher ($P<0.05$) than of Kacang (1.53 ± 0.066). Higher litter size in the Boer goat indicated that it was able to ovulate more ova and more survival rates of embryo or fetuses than of Kacang goats. High or low litter size were greatly depend on the

Table 1. Least-square Means and Standard Errors of the Production Traits of the Goat Grouped Based on Breed and Parity of Dam

Traits	Total birth weight (kg)	Total weaning weight (kg)	Litter size (head/dam)	Mortality before weaning (%)	Kidding interval (day)
Dam breed					
Kacang	3.1 ± 0.19[a]	10.2 ± 0.79[a]	1.53 ± 0.066[a]	22.3 ± 5.05	247 ± 6.19[a]
Boer	5.2 ± 0.23[b]	20.5 ± 1.18[b]	1.75 ± 0.077[b]	15.1 ± 6.02	301 ± 9.93[b]
Parity					
I	2.8 ± 0.31[a]	11.1 ± 1.39[a]	1.52 ± 0.117[a]	19.2 ± 7.98	299 ± 17.7[a]
II	3.3 ± 0.34[a]	14.6 ± 1.40[ab]	1.59 ± 0.130[ab]	18.8 ± 8.93	284 ± 17.2[ab]
III	4.9 ± 0.38[b]	16.4 ± 1.53[bc]	1.67 ± 0.104[ab]	14.6 ± 8.99	256 ± 22.3[ab]
IV	4.6 ± 0.29[b]	16.8 ± 1.21[c]	1.77 ± 0.099[b]	17.7 ± 7.78	254 ± 17.1[b]
V	3.7 ± 0.79[a]	14.7 ± 1.81[ab]	1.66 ± 0.106[ab]	28.4 ± 8.14	274 ± 16.5[ab]

Differrent superscript in the same column indicates significantly different ($P<0.05$)

number of ovum ovulated, the ovum fertilized, and its survival rates. The number of ova ovulated depend on the genetic and nutrient adequacy of the dam during the period of preceding ovulation (Nalbandov, 1990).

The mean of litter size observed in this study for Boer goats (1.75 ± 0.077) was similar to Boer goats in China (1.76 ± 0.67) (Zhang *et al*., 2009) and to some other goat breeds in the similar rearing condition such as the Dwarf goat (1.8 ± 0.8, Khanum *et al*., 2007) and the Korean native goat (1.78 ± 0.16, Song *et al*., 2006), but lower than the Matou native goat (2.14 ± 0.9, Moaeen-ud-Din *et al*., 2008) reared in the same region, and the West African Dwarf goat (1.93 ± 0.03; Baiden, 2007). The mean of litter size of Kacang goats (1.53 ± 0.066) was higher than (1.23) the result reported by Doloksaribu *et al*. (2005).

Pre-weaning Kid Mortality

The results of pre-weaning kid mortality showed that there were no significant differences on the mortality percentage of kids before weaning between breed of goat dam, however, numerically obtained that percentage of mortality on the Kacang goat (22.3 ± 5.05%) was higher than the Boer goat (15.1 ± 6.02%). Milk production of dam in the period bof pre-weaning was significantly influenced growth and mortality rates of kids, especially the dam with twins. In the Boer goat, it was found that total milk production increased with the increasing of kids number per birth. Raats *et al*. (1983) reported milk production of 2 years old Boer goats with single kid, twins and triplets were 1.47, 1.89 and 2.26 litres / head / day, respectively, while for at 4 years old of Boer goats with single and twin birth were 1.84 and 1.91 litres / head / day, respectively.
Kidding Interval

The results showed that kididing interval of Boer goats (301 ± 9.93 days) was higher (P<0.05) than that of Kacang goats (247 ± 6.19 days). This differences could be due to the breeding season factor. Goats in the tropics such as Kacang goat was not affected by breeding season. In Boer goat does, the sexual activity for all the months of the year were significantly (P<0.01) lower than that observed in April and May, while these two months were similar. Although periods of complete anoestrus within the Boer goat herd was never observed, it would be appear that Boer goat doe is seasonally poli-oestrus, with an extended breeding season. The peak of sexual activity occurred during April and May (autumn) and the period of lowest sexual activity occurred from October through to January (late spring to mid-summer) (Greyling, 2000).

Kacang is indigenous goat which has been adapted to the tropical climate in Indonesia while the Boer goat from Africa that has been developed in Australia. Indigenous goat breeds have an excellent ability to accommodate and adapt to fluctuated environment particularly fluctuations in temperature (Chemineau, 1983). Fluctuations in temperature especially the differentces between hot and cold temperature lead to prolonged oestrus cycle and it was directly extend the kidding interval (Raharja, 2005). Heat stress in dam can extend the period of anoestrus. Heat stress in goat causing the release of adrenocorticotrophic hormone (ACTH) from the anterior pituitary. This hormone stimulates the release of adrenocorticotrophic hormone and cortisol from the adrenal glucocorticoids cortec. Glucocorticoids inhibit the release of luteotropic hormone (LH) which will lead to longer periods of anoestrus and ultimately prolong kidding intervals (Delgadillo *et al*., 1996).

Parity of Dam

Parity of dam had significant effect on all production traits (P<0.05) except at pre-weaning mortality. Parity of dam significantly affects all the production performances, this phenomenon was also reported in other goat (Bagnicka *et al*., 2007) or sheep (Boujenane, 2002) breeds. It means that the maternal ability will improve with an increase of parity, especially in multiple birth species. Konyal *et al*. (2007) reported that the cotyledon number and placental weight will be increased with the increase of parity of dam in the Turkish Saanen goat, and high relationships exist between litter size weight and cotyledon number (r=0.64) and placental weight (r=0.76). The similar results were also reported in Scottish Blackface and Suffolk sheep (Dwyer *et al*., 2005).

Least-square means of total weigth of birth and weaning, litter size, pre-weaning mortality and kidding interval were the smallest at the first parity, and increased with the increase of parity from 1 to 4, and then decreased in subsequent parities. It is evident that there was a distinct pattern for the solutions of age of dam in all the production traits. The youngest dam had the lowest productive capability. Increased production of the dam from parity 1, 2, 3 and 4 due to the condition of the uterus were the better with increasing parity (Zhang *et al*., 2009), this causes

Table 2. Components of Reproduction and the Reproduction Rate Grouped Based on the Dam Breed

Dam Breed	Reproduction			Reproduction rate of dam (head/dam/year)
	Litter size (head)	Kid survive (%)	Kidding interval (year)	
Kacang	1.53	0.78	0.67	1.78
Boer	1.75	0.85	0.82	1.81

Table 3. Dam Productivity of Goats Grouped Based on Dam Breed

Dam Breed	Reproductive component		Dam productivity (kg/dam/year)
	Total weaning weight (kg)[a]	Reproductive rate of dam (head/dam/year)[b]	
Kacang	10.2	1.78	18.12
Boer	20.5	1.81	37.12

a = data was from Tabel 1; b = data was from Tabel 2

of the hormonal mechanisms at reproductive organs will grow perfectly and skills of dam was higher parenting (Farid and Fahmy 1996). At parity 5 and higher, reproductive performance of the dam was decreased because the parent has been older.

Reproduction Rate of Dam

Reproduction rate of the dam was the ability to produced of kids survive up to weaning per dam per year. Magnitude of the dam reproduction rate is obtained by multiplying the average number of litter size with the ability to live pre-weaning and then divided by the kidding interval. The dam reproduction rate is shown in Table 2.

Table 2 indicated that the dam reproduction rate was not much different among the dam even though the number of litter size and the ability to survive in the Boer goat is higher than those Kacang. This situation was caused by differences in kidding interval between each of breed goats. Kacang goats had kidding interval 0.67, shorter than Boer goats (0.82). Reproductive efficiency in the female is greatly determined by the season (length of the breeding season) (Greyling, 2000).

Productivity of Dam

Productivity calculation of dam aimed to determine the ability of the dam to produced weaning weight of kid per year. Productivity calculations of dam productivity was based of the multiplication between the dam reproduction rate with the average weaning weight of kid. Productivity calculation results are grouped based on the breed of dam are shown in Table 3.

The result of dam productivity in Table 3 showed that the productivity of Boer dam (37.12 kg/head/year), was much higher than of Kacang goat (18.12 kg/head/year). Several factors affect the total production of the dam were the birth weight and weaning of the kids, the long of pregnancy and litter size at birth and weaning (Menendez *et al*., 2003; Bagnicka *et al*., 2007). It markedly reflects that the larger litter size at birth can yield heavier litter weight and higher dam production in suckling period. It is indicated that high birth and survival rate showed especially important for improving dam production and economic efficiency (Zhang *et al*., 2009).

CONCLUSION

It can be concluded that the reproductive performance of Boer and Kacang goats were similar, however the productivity of Boer goat was better than Kacang.

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