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Non-Genetic Factors Influence on Doe Productivity Performance of Local Kejobong Goat under Village Production System

(Pengaruh Faktor Bukan Genetik terhadap Penampilan Produktivitas Induk Kambing Lokal Kejobong pada Sistim Produksi Pedesaan)

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ABSTRAK: Penelitian bertujuan untuk mengetahui penampilan produktivitas induk kambing lokal Kejobong dan mengidentifikasi faktor-faktor lingkungan (bukan genetik) yang berpengaruh terhadap produktivitasnya. Penelitian lapang pada sistim produksi ternak ruminansia kecil melibatkan 212 ekor induk kambing. Koleksi data meliputi jumlah kepemilikan, identifikasi induk, jumlah cempe saat lahir dan sapih, jarak beranak, bobot sapih cempe, dan produktivitas induk. Prosedur *General Linear Model* (GLM) melalui bentuk *fixed model* diterapkan untuk menguji faktor tipe kelahiran dan paritas terhadap penampilan produktivitas induk. Hasil penelitian menunjukkan bahwa rataan jumlah cempe saat disapih 1,6 ekor, jarak beranak 268 hari, dan produktivitas induk 26,65 kg/induk/tahun. Faktor non genetik (tipe kelahiran dan paritas) nyata berpengaruh terhadap penampilan produktivitas induk kambing. Jumlah cempe saat disapih beserta produktivitas induk nyata meningkat hingga paritas keempat kemudian berangsur menurun kembali, dan juga meningkat pada tipe kelahiran kembar dua dan tiga. Jarak beranak nyata lebih pendek pada tipe kelahiran tunggal dibanding pada kelahiran kembar dua maupun tiga, demikian pula peningkatan paritas nyata memperpendek jarak beranak. Peningkatan produktivitas induk kambing direkomendasikan melalui usaha perbaikan pengelolaan, utamanya adalah memperpendek jarak beranak dan meningkatkan jumlah cempe hidup hingga disapih.

Kata Kunci: Produktivitas induk kambing, jarak beranak, jumlah cempe saat disapih, tipe kelahiran, paritas

Introduction

The majority of goats in Indonesia are concentrated on the Island of Java, and 23% of total population located in Central Java (DGLS, 2006). The major breeds being the Kacang and Peranakan Etawah goat (Djajanegara and Setiadi, 1991). Kacang is an indigenous breed of goat found in Indonesia. Peranakan Etawah goats are descended originally from crossing between the Kacang and Etawah goats. Local Kejobong goats are widely distributed over the whole areas of 13 villages at Kejobong Subdistric with the total population 15.317 heads. They have a relatively medium body frame and hanging ears, a convex face and horns in both sexes. Most animals are black, white and brown, although the pattern of colour is not necessarily uniform. Goats are kept primarily for meat production, so production traits of interest are the number of young weaned and the total weaning weight per doe per year.

Increasing the productivity of goats will enhance national development planning for increasing rural income, reducing poverty and also increasing the level of protein consumption (Sodiq, 2005; Sodiq and Tawfik, 2003; Bradford, 1993). Key production traits considered for improving productivity in meat goats are adaptability and productivity conditions, reproductive rate, growth rate and carcass value (Luginbuhl, 2002). The level of productive performance is dependent on the interaction of genetic and environmental factors (Ahmadu and Lovelace, 2002; Günes *et al.*, 2002; Greyling, 2000), and also affected by feeding (Akingbade *et al.*, 2004; Muir, 2006; Lassoued *et al.*, 2006) and management system (Dickson-Urdaneta *et al.*, 2000; Song *et al.*, 2006). Meat production in animals is affected by such variables as growth, weight at different ages, mortality, parturition interval, milk yield and mothering ability (Awemu *et al.*, 2002). 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 low (Ndlovu and Simela, 1996).

High mortality of young stock and poor reproductive efficiency of dams are major causes of

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low productivity in many livestock production system. Low productivity of small ruminants in the tropics to poor management which predisposed the animals to diseases. Productivity rates are therefore generally low, with low kidding percentages and high mortality. The interval between kiddings is an important predictor of lifetime productivity. Wilson *et al.* (1985) have shown that prolonged kidding interval were responsibility for a decrease in overall productivity of goats. Kidding interval itself has been reported to be affected by a number of environmental factors (Wilson and Light, 1986, Mtenga *et al.*, 1994). The objectives of this study are to find out the level of does productivity, and to assess the influence of environmental (non-genetic) factors on doe productivity of local Kejobong goats under village production system.

Research Methods

Animal and Management

The study was conducted at small-ruminants smallholders over all 13 villages of Kejobong subdistric, Purbalingga regency, Central Java. All locations relatively have similar environmental conditions. Forage availability follows the distribution of rainfall with abundant and good quality forages in the rainy season. In the wet season, forages is generally scarce and of low quality.

Local goats, mostly distributed and found in the Kejobong area of Purbalingga, is characterized by a relatively medium in body frame and hanging ears, a convex face and horns in both sexes. Most of the animals are black (74.50%), white (13%), and brown (12.5%). Management of animals was intensive by cut and carry feeding system and natural mating method. Mostly, a supplementary concentrate was not fed to the animals. Animals were provided with stilted housing in small flock (less than 10 heads). The purpose of raising goat is mostly for meat production.

Data Collection and Analysis

The following data were recorded, flock size, identification of does, litter size at birth and weaning, interval between kiddings, weaning weight, and doe productivity. The General Linear Model (GLM) procedure of the Statistical Package for Service Solution were used (SPSS, Inc. 1999ab). Data on litter size at weaning, kidding interval and doe productivity were analyzed using a mixed model. Independent variables in the model were type of birth and parity. The number of livestock in a flock (converted to the Livestock Unit of small-ruminants) as a source of variance was absorbed in the calculation of statistical analysis. Because in unbalanced models most interactions are meaningless in order to better estimate the effects of the principals factors a model without interactions was finally adopted.

Results and Discussion

Litter Size at Weaning

Average litter size at weaning (Table 1) were higher than values recorded for Peranakan Etawah goat breeds (Sodiq, 2004). Litter size at birth and parity significantly influenced litter size at weaning ($P<0.01$). Litter size at weaning increased with parity, with the largest litters at the fourth parity and then slightly decreased. These results are consistence with those of Wilson and Light (1986) and Sodiq (2004). This may be attributed to physiological maturity of older does and their ability to provide enough milk for the kids. Increasing in litter size at weaning with parity due to an increased rate of twinning as parity increased.

The number of litter at weaning depends on the doe ability in term of the survivability their kids. Previous researchers, Husain *et al.* (1995), Okello (1993), Alexandre *et al.* (1999), Madibela *et al.* (2002), Sodiq (2004), and Hailu *et al.* (2006) reported that survival rate until weaning was significantly affected by type of birth. Awemu *et al.* (2002) working on Red Sokoto goats found that the mortality tended to decrease as parity increased. Survival rate till weaning tended to decrease with larger size litters which also agree with the observations of Awemu *et al.* (1999), Ameh *et al.* (2002), and Mtenga *et al.* (1994). Kids from multiple births are often weak at birth as a result of physiological starvation in the uterus and lower energy reserves. Sodiq (2004) working on Kacang and Peranakan Etawah goats revealed that survival rate till weaning increased with the advance in parity up to the 4^{th} parity and then slightly decreased. This may be attributed to the physiological maturity of older does and their ability to provide enough milk for the kids.

Kidding Interval

The least squares mean for kiddings intervals was 268 days (Table 1) ranging from 210 to 260

days and varying according to type of birth and parity. This value is much larger than the 242 days reported for Kacang goats (Sodiq, 2004). Average kidding intervals of local Kejobong goat (Table 1) were close to values reported by Amsar *et al.* (1992). In this study (Table 1) demonstrated that parity significantly affected the interval between kiddings which generally decreased 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. Sodiq (2004) reported that parity significantly affected the kidding interval of Kacang and Peranakan Etawah goats which generally decreased with parity until the 4th parity. Results of Odubote (1996, 2000) studies on West African Dwarf demonstrated that there was a significant decrease in the kidding interval from the 4th parity. These results are also consistent with the report of Wilson and Light (1986) that females at earlier parities take longer than older ones to return to reproductive status. Das (1993) demonstrated that old does (3-4 year) tended to have lower kidding intervals than the younger (1-2 years) and older does (>5 years). This is probably due to the reproductive physiology function being more active in 3-4 years old does compared to lower activity in younger and older does.

Kidding interval was significantly (P<0.01) affected by the type of birth (Table 1). The same results were also reported by Christopher (2001), Akusu and Ajala (2000), Greyling (2000), and Öztürk and Akta (1996). These results (Table 1) demonstrated that the averages of the kidding intervals shortened progressively with the advance in the type of birth. Results of Christopher (2001) found that the does with multiple births tend to have a shorter gestation length with 1 to 2 days difference between twins and triplets. Amoah *et al.* (1996) reported that the gestation period decreased as the litter size of the doe increased (b = -0.92 d/kid). Akusu and Ajala (2000) investigated on West African Dwarf goats concluded that does with single kids had a longer gestation than those with twins and triplets. Other researchers, Maria and Ascaso (1999) reported that the longer interval could be due to their larger litters. Milk yield of ewes lambing twins ranges from 1.7 to 1.8 kg and increase to 2.4-2.5 kg for those lambing triplets. A high milk production could lead to a negative energy balance. The magnitude of energy deficiency seems to affect these processes of follicular growth and development leading to the first ovulation (Nett, 1987).

Doe Productivity

The overall doe productivity of local goat at Kejobong Purbalingga was 26.65±0.78 kg/doe/year. The values reported in this study are higher than those reported by Anggraeni *et al.* (1995), and Sutama (1995). Zhou (2003), Bearden and Fuquay (2000), and Ingo (1999, 2002) demonstrated that the environmental factors exerted a significant influence on the productivity. This results (Table 1) revealed that doe productivity of local Kejobong goat was significantly (P<0.01) affected by parity. Greyling (2000) and Marai *et al.* (2002) reported that the productive performance is dependent on the interaction of genetic and environmental factors and the effects of parity were significant. Results of

Table 1. Least squares means (LSM) and standard error (SE) for litter size at weaning, kidding interval and doe productivity

Traits	n	Litter size at weaning (head)		Kidding interval (days)		Doe productivity (kg/doe/year)	
		LSM	SE	LSM	SE	LSM	SE
Overall	212	1.60	0.04	268	2.45	26.65	0.78
Parity		**		*		**	
Parity 1	78	1.46^{a}	0.07	278^{a}	4.68	23.59^{a}	1.31
Parity 2	53	1.62^{a}	0.09	269^{a}	5.01	26.87^{a}	1.57
Parity 3	44	1.75^{bc}	0.08	261^{b}	4.43	29.75^{b}	1.75
Parity 4	13	1.92^{b}	0.14	256^{b}	7.29	32.69^{b}	2.83
Parity 5	11	1.82^{bc}	0.12	256^{b}	8.45	31.31^{b}	2.58
Parity 6	4	1.50^{ac}	0.29	255^{b}	9.36	25.34^{a}	4.43
Parity 7	9	1.33^{ac}	0.17	253^{b}	5.27	22.89^{a}	2.98
Type of birth		**		**		**	
Single	66	0.99^{a}	0.01	296^{a}	4.49	14.63^{a}	0.32
Twin	128	1.86^{bc}	0.03	259^{b}	2.44	31.27^{b}	0.64
Triplet	18	2.06^{c}	0.04	237^{c}	4.78	37.87^{c}	4.41

^{a,b,c} Means in the same column with different superscripts are significantly different (P<0.05)
* P<0.05, ** P<0.01

Ndlovu and Simela (1996) showed 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 low. Awemu *et al.* (2002) reported that the parity significantly influenced doe productivity. Table 1 demonstrated that the average of doe productivity increased with the advance in parity up to the 4th parity and slightly decreased thereafter. Results of Steve and Marco (2001) showed that the goat productivity may be positively correlated with maternal age, but decreased slightly after 9 years of age. It was indicated that the relationship between age and kid production was curvilinear. Awemu *et al.* (2002) investigation on Red Sakoto goats found that the doe productivity (kg/doe/year) in parity 1, 2, 3, 4, 5 and 6 were 20.9, 21.4, 22.5, 23.6, 27.9 and 33.4 kg, respectively.

There was a significant influence ($P<0.01$) of type of birth on doe productivity of local Kejobong goat (Table 1). Similar results also were reported by Awemu *et al.* (2002) that the type of birth of goat significantly influenced the productivity. These results (Table 1) demonstrated that average of doe productivity increased progressively with the advance in type of birth. Awemu *et al.* (1999) reported that increasing litter size at birth and at weaning can improve the productivity of goats. Awemu *et al.* (2002) found that the effect of type of birth was highly substantial in goats, with quadruplets births producing 32.8 kg more meat at weaning than single births. The productivity of goat depends on the number of litter at birth, survival rate till weaning and interval between kiddings (Sutama, 1995). The effect of the type of birth was highly substantial in goats, with multiple births producing more than single births and the prolonged kiddings interval was responsible for a decrease in reproduction and productivity of goats (Awemu *et al.*, 1999). The interval between parturition and the first post partum estrus is an important trait which contributes to the production efficiency (Greyling, 2000).

Conclusion

The study has revealed that the non-genetic (type of birth and parity) exerted significant influences on doe productivity performance. Average litter sizes at weaning, kidding interval and doe productivity were 1.60±0.04 heads, 268±2.45 days, and 26.65±0.78 kg/doe/year, respectively. Litter size at weaning and doe productivity increased with parity, with the largest values at the fourth parity and then slightly decreased thereafter. Litter size at weaning and doe productivity also increased progressively with the advance in the type of birth. Kidding intervals shortened progressively with the advance in the parity and the type of birth. The results call for management effort to reduce intervals between kiddings and improve litter size at weaning, in order to improve the doe productivity of local Kejobong goat under village production system.

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