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A Review Article on Effect of Parity on Litter Traits of Goat

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ABSTRACT

Goat rearing is one of the popular professions of people in the world. Maintenance of productive herds for overall productivity is important from an economic point of view for farmers. Along with the improvement of reproductive and productive performance, improvement of litter traits is also important for generating more profits from goat farming. This is the review paper prepared with the help of many collected scientific papers from journals, research papers, proceedings, annual reports, master, and Postgraduate thesis. This review paper illustrates the effect of parity as a non-genetic/environmental factor on litter traits of goat-like litter size at birth and weaning, litter weight at birth and weaning, and Pre-weaning Kids survivability based upon the finding of the previous papers. The finding of this paper focuses on the improvement of litter traits of goat that is possible with proper breeding programs, selection, and culling of an unproductive doe from the herd.

Keywords- Non-genetic factors, Parity, Litter traits, Litter Size, Litter Weight, Survivability.

I. INTRODUCTION

Goats have been one of the earliest favorite among domesticated animals of humans for 10,000 years (Monteiro et al., n.d.). Their unique characteristics of adoption to various environments and climates make them reared throughout the world (Aziz, 2010) providing meat, milk, fiber, fertilizer, and draft power. Data by(Galal, 2005)states the existence of 570 breeds of goats in the world. (FAOSTAT, 2018) revealed the population of goat as 1 billion with the main concentration in Asia- (China, India, Pakistan, Bangladesh, and Iran) and Africa (Nigeria, Former Sudan, Sudan, Kenya, and Ethiopia).

The goat has been an important domestic animal for Nepalese rural farmers on their economy. It is ranked second for meat production among other meat-producing livestock and also contributes by the second largest to Livestock GDP in the country (Gatenby et al., 1990). Statistics data shows the number of goats reared in the year 2015/16, 2016/17, 2017/18, and 2018/19 as 10986 114, 11165099, 11647319, and 12283752 respectively (MOAD, 2020). The same source states the chevon production in the metric ton as 65583, 67706, 70802, and 73914 in the year 2015/16, 2016/17, 2017/18, and 2018/19 respectively. Data shows the preference of goat is increasing by year in Nepalese livestock rearing communities. The increase in preference of goat is due to the internal and international migration of young men for job and handling of livestock rearing by women who can easily handle children and small ruminant animals like goat together (Maharjan, 2013).Though the preference for goat rearing is increasing, it has been only been limited to subsistence goat farming. National Agriculture Research and Development Fund (NARDF,2004) revealed unplanned breeding, inbreeding, poor sanitation, and poor feeding strategy are some of the problems for goat farming in Nepal.

Litter trait is the suitability attribute that is associated with litter and viability. It comprises litter size at birth and weaning, litter weight at birth and weaning, and Pre-weaning survivability. Parity is the number of times doe had kidded whether live or dead kids were born. (Kolachhapati MR, et al) revealed that non - genetic or environmental factors like parity cause the variation in the litter traits. (N Bhattarai et al., 2007), (Pandey, 2007), (Sapkota, 2007), (Shrestha, 2002) and (Neopane, 1997) also find the effect of parity significantly influencing parameters of litter traits. A similar finding is made by another author (Hoque et al., 2002). With the establishment of the relationship between parity and litter traits, the parity at which peak prolificacy of doe can be known. This can provide information to farmers for the culling and selection program. Thus, the study is advantageous to farmers from an economic point of view. This review paper explains the effect of parity as one of the non-genetic/environmental factors which influence the litter traits of Goat.

II. DISCUSSION

Effect of Parity on Litter size at birth

(Alexandre et al., 1999) defined litter size as the total no. of born lids per kidding per goat. Several authors exposed the relationship between Parity and Litter size at birth. Litter size is significantly influenced by goat age and parity (Amoah et al., 1996) or parity, year and season (Awemu et al., 1999) or parity of dam, location, and litter sex (Sapkota, 2007) or parity and genotype or parity and season of kidding (Neopane,

1997). Table (1) shows that parity significantly (P>0.001) influences the litter size of hill goat i.e., *Capra hircus.* With the progress of the parity, litter size found to be increased such that the maximum litter size (1.69±0.08) has been found beyond the sixth parity. Many other authors also state a similar finding. (Sodiq et al., 2003),studying the reproduction rate of Kacang and Peranakan ethawah breeds of goat conveyed the increment in the litter size with the advancement in parity, up to 4th parity, and reduction after in the other advanced parity. (Das, 1993) revealed that the litter size increases from 1st parity to 5th parity and decreased in successive parity in goat. (Wilson, 1986) and (Awemu et al., 2002) also found the highest litter size at 5th parity on Red Sakota goat. Least litter size during early parity is due to not fully maturity of the reproductive organs at the young age of goat. (McDonald & Pineda, 1988). (FAHMY & DUFOUR, 1988) states that the rise in litter size in advanced parity is due to increase uterine capacity, ovulation rate, and maternal traits related to reproductive efficiency. Reduction in the litter size beyond the peak value might be due to the degeneration of the associated reproductive organs.

Table 1: Least squares mean and standard errors kidding rate (kids per parity per doe).

Parity	Number of Observation	LS Mean± SE of Litter size
1st Parity-3rd Parity	43	1.30±0.05
4th parity- 5th Parity	30	1.5± 0.07
>6th Parity	17	1.69±0.08

LS= Least Square; SE= Standard error; KR= Kidding rate ***Source:*** *(Sharma et al., 2017)*

Effect of Parity on Litter Size at Weaning

From Table 2, regarding the effect of parity on Litter size at Weaning (Mia et al., 2013) & (Mabrouk et al., 2009) found the highest litter weight at weaning for third parity and least for first parity for Black Bengal does and Zaraibi does respectively. (Neopane, 1997) (Sapkota, 2007) and (Pandey, 2007) found litter size at weaning been significantly affected by the dam's parity along with other factors. (Neopane, 2000) estimated the heritability for litter size at weaning for hill goat of Nepal *(Capra hircus)* by two different analyses where the first (Harvey) and second analysis (REML) gave the result of 0.05±0.097 and (0.03±0.083) respectively.

Table 2: Least-squares means (LSM) with standard errors Mean (SEM) of litter size at weaning (LSW) of Black Bengal and Zaraibi does respectively according to the parity of dam

Source: (Mia et al., 2013)		Source: (Mabrouk et al., 2009)	
Parity of Dam (P<0.05)	LSW	Parity of Dam (P<0.0001)	LSW
1	1.04^{b}±0.09 b	1	1.39^{c}±0.03
2	1.12^{a} ±0.12	2	1.64^{b}±0.03
3	1.21^{a}±0.17	3	1.75^{a}±0.03
		4	1.71^{ab}±0.04
		>=5	1.71^{ab}±0.04

Effect of Parity on litter Weight at birth

Litter weight at birth is highly co-related with later body size, rate of growth, and viability (Morand-Fehr, 1981). Litter weight at birth and weaning are significantly influenced by location, sex of litter, and dam's parity (Sapkota, 2007). The indication of the significant effect of parity on litter weight at birth and weaning is also made on Khari goat in Tanahu district by (Pandey, 2007).

To increase pre-weaning kid survivability, litter birth weight needs to be improved (Husain et al., 1995). Different Authors have different findings regarding the relationship between Parity and litter weight at birth. Data on the table3discovered by (Nirajan Bhattarai & Sapkota, 2012) that non- significance influence of Dam's parity on Litter weight at Birth. (Sapkota et al., 1995) states the highest litter body weight at birth exist from 3rd parity -5th parity. Other earlier authors like (Husain et al., 1997) states increasing litter weight follows 1st,2nd, 3rd, and 4th parity. (Hoque et al., 2002) also revealed to have the highest litter weight of Black Bengal does at 4th parity and lowest at 1st parity.

Table 3: Least Square mean ± Standard Error of Effect of dams' parity on Litter Weight on birth, pre-weaning, weaning and post-weaning weight of Terai goat kids

Parity No.	At birth	At 2 months (Pre-Weaning)	At 4months (Weaning)	At 6months (Post Weaning)	At 8 months (Post Weaning)
1-2	2.08±0.07	5.37±0.26	9.75±0.42	14.18±0.48	17.13^{a} ±0.88
3-4	2.18±0.08	5.66±0.26	10.49±0.39	14.35±0.46	19.14^{ab}±0.88
5-6	2.36±0.09	6.27±0.34	10.68±0.48	13.31±0.62	20.87^{b} ±0.88
>6	2.32±0.11	5.92±0.40	9.98±0.52	12.82±0.69	20.11^{b} ±0.88
Significance	NS	NS	NS	NS	*

Note: * significant at 5% (p<0.05) NS-non significant ***Source:*** *(Nirajan Bhattarai & Sapkota, 2012)*

Effect of parity on Litter Weight at Weaning

Regarding the effect of parity on litter weight Table 4 with source by (N. Bhattarai et al., 2018) revealed that parity and litter weaning weight been significantly influenced (P>0.001) such that higher litter weight for mid-parity (3^{rd}-6^{th}) as compared to early parity and Late parity (>7^{th} Parity). This could be due to the reaching of physiological maturity of does during mid parity (Mengistie et al., 2011) and degeneration of associated reproductive organs (Deribe et al., 2014) for late parity. However, (Nirajan Bhattarai & Sapkota, 2012) established parity significantly influencing (P<0.05) litter weight for post-weaning at 8 months age with non-significance effect at weaning as seen from Table 3.

Table 4: Effect of parity on litter weight at weaning of Khari does in Nawalparasi, Nepal

Parity	Weaning Weight of Litter (4 months) LSM±SEM
1^{st} -2^{nd}	17.50^{b}±0.36
3^{rd}-6^{th}	18.58^{a}±0.36
>7^{th}	18.54^{a}±0.39

Note: Least Square Mean ± standard Error mean Significant at 0.1%level (P<0.001) ***Source:*** *(N. Bhattarai et al., 2018)*

Effect of Parity onPre- Weaning Kids Survivability

(Sherman, 1987) states kid mortality, a major factor that affects herd productivity. (Devendra & Burns, 1970) revealed neonatal death makes a large percentage among kid mortality due to cold, food scarcity, and sickness. During the research entitled "Effect of different factors on pre-weaning survivability of Black Bengal kids" (Husain et al., 1995) concluded the growing trend of pre-weaning kid survivability with increasing parity (i.e. Table 5) due to advance in the dam's weight and increased in milk production on increasing parity. However, some other authors come with a contrary type of relationship between parity and Pre-weaning survivability of Kids. (Moaeen-Ud-Din et al., 2008) resolved with the survival rate of the Matou goat breed negatively co-related with parity. The authors revealed so because, with an increase in parity, litter size also increases. Increments in litter size causes decreased litter weight at birth as twin/triplets have less weight than single (R Trevor Wilson & Murayi, 1988). Kids with low litter weight during birth have less reserved energy and can't adopt in harsh surroundings causing their deaths (Curtis, 1969).

Table 5: Effect of parity on the Survival rate of Kid of Black Bengal Goat

Parity	No. of Observation	Birth- 3months LSM±SEM
1	258	$68.0±4.1^{a}$
2	235	$71.6±3.8^{a}$
3	176	$75.3±4.4^{a}$
4	155	$71.8±4.9^{a}$
5	78	$71.7±6.7^{a}$

Note: LSM- Least Square Mean, SEM- Standard Error Mean Level of significance = 5% (P<0.05)
Source: (Husain et al., 1995)

III. CONCLUSION

This assessment concludes that litter traits like Litter size at birth and weaning, Litter weight at birth, and weaning and Pre-Weaning Kid Survivability are economic traits that are influenced by non-genetic/ environmental factors like Parity. Findings from different journals, research articles, proceeding, review papers that are mentioned in this review paper conclude that mid parities among different goat breeds are important for superiority in litter traits than early and late parities. Farmers are advised not to cull the does from the herd until their prolificacy is fully expressed. To increase the overall productivity of the herd, these litter traits are to be considered and is possible through an effective breeding plan, selection, and culling of the non-productive doe from the herd.

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