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A STUDY ON BIRTH WEIGHT AND PRE-WEANING MORTALITY OF NEIMI LAMBS IN SAUDI ARABIA

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SUMMARY

Non-genetic effects on birth weight and pre-weaning mortality rate in Neimi lambs were studied. The flock belonged to Al-Gassim Agric. Company in the mid-region of Saudi Arabia. Age of dam, season and type of birth and sex of lamb affected significantly ($P<0.01$) birth weight. Pre-weaning lamb mortality was significantly ($P<0.01$) influenced by birth weight of lamb, age of dam, season of birth and cause of death, whereas effects of lamb age and sex were not significant. The main causes of death were enteritis, pneumonia, blockage of lamb intestine with wool tufts, white muscle disease and lamb debility.

Keywords :Lamb, birth weight, mortality

INTRODUCTION

High lamb mortality is a major cause of economic loss and constitutes a serious problem in sheep breeding programs. The effectiveness of selection and replacement of old stock depends on high survival rates in young lambs. In farm conditions, many factors may be involved in the causation of lamb mortality, and these factors may vary from farm to farm. It is important to suppress the effect of these factors on lamb crop.

The information on birth weight and pre-weaning mortality rates in Saudi Arabian Neimi lambs is meager. Since a very strong relationship exists between birth weight of lambs and their mortality rates (Hinch *et al.*, 1985, Taiwo and Buvanendran, 1985 and Singh *et al.*, 1987), the present study was undertaken to investigate the effect of some non-genetic factors on birth weight and pre-weaning mortality in Neimi lambs under the prevailing conditions in Al-Gassim area in the mid-region of the Kingdom of Saudi Arabia

MATERIALS AND METHODS

This study was carried out in the Neimi sheep farm belonging to Al-Gassim Agricultural Company in the mid-region of the Kingdom of Saudi Arabia. Data on live born lambs during the period from 13/10/1992 to 25/10/1993 were collected. This period represented three lambing seasons (autumn 1992; winter 1993 and summer 1993). The area of the agricultural project was 140 km^2. Only 73, 12 and 3 circles, each of about 100 hectares, were cultivated with wheat, barley and alfalfa, respectively.

Management

The sheep flock was run under an accelerated lambing system permits the ewe to lamb three times each two years. New born lambs were ear tagged and weighed the day after birth. Dam age was determined by dentition . Generally, ewes over 5 years were culled.

Animals were housed in open pens with metal fences. Feed troughs were fixed outside the pens along the fences. The pens were shaded with galvanized metal sheets reflective to solar rays. Six closed lambing pens were available. Each pen was divided into 30 (4x4 m) small pens that could comprise 6 ewes with their lambs. The open suckling pens were fenced with galvanized wire mesh with feed troughs placed inside the pens. Each pen contained a creep feeding device. A service area was constructed in the middle of the farm to facilitate sheep operations such as vaccination, drenching, dipping, sorting....etc. Heavy pregnant ewes as well as lambs at weaning age were vaccinated against enterotoxemia, septicaemia, sheep pox and brucellosis. Drenching against internal parasites and dipping against external parasites were practiced regularly each 6 months.

Nutrition

During spring and autumn, animals grazed the natural vegetation grown in the uncultivated area. During summer, animals grazed post-harvesting wheat and barley residues which represented a high energy pasture because of the great quantities of grains and ears left after harvesting with combines. These quantities were estimated in various circles to amount between 5 to 10 tons per each circle. In winter, animals were fed *ad lib*. wheat and barley straw plus 0.25 kg of concentrates per head daily. At any time of the year, only heavy pregnant and suckling ewes were fed *ad lib* alfalfa hay besides one kg. of concentrates. The concentrate mixture consisted of 75% yellow corn, 20% soya bean and 5% wheat bran. Water and mineral blocks were available all the time.

Animals and procedures

The overall number of live born lambs during the whole experimental period was 5528. Total number of lambs died until weaning (75 days) was 331.In order to study birth weight, 1284 lambs, including all the pre-weaning dead ones, were randomly chosen.

Post-mortem examination was performed on dead lambs by the flock veterinarian. Mortality rates were calculated as the percentages of dead lambs from live born ones in the same category. However, mortality due to age of lamb or cause of death was calculated as the percentage from total dead lambs (331). Abortive and stillborn lambs were not included in this study.

Least squares analysis of variance (Harvey, 1960) was used in the statistical analysis of data. Two fixed effects statistical models were performed. The first model included the main effects of dam age, season of birth, type of birth, sex and pre-weaning viability of lamb on birth weight. The second model comprised the main effects of dam age , season of birth , sex and age of lamb and cause of death on pre-weaning lamb mortality. Mortality percentages were transformed into arcsine before applying the analysis.

RESULTS AND DISCUSSION

Factors Affecting Birth Weight of Lambs

1- Age of dam

Birth weight of lambs increased significantly ($P<0.01$) and progressively with increasing age of dams (Table1). This result supports the findings of Krizek and Jakubec (1985) and Olthoff and Boylan (1991). Singh *et al.* (1990) attributed the higher birth weight in kids born to older does to the improvement in body weight of dams with the advance in their age which resulted in the production of heavier kids at birth.

2- Season of birth

Season of birth had a significant ($P <0.01$) influence on birth weight of lambs (Table 1). Autumn-born lambs were the heaviest at birth whereas, summer-born ones were the lightest. Dams lambed in autumn grazed during their last stage of pregnancy period on post harvesting wheat and barley residues which were of high energy content. This resulted in higher fetal growth and higher birth weight of their lambs. Roda *et al.* (1990) and Maria (1992) reported that autumn-born lambs were significantly heavier at birth than summer-born ones.

3-Type of birth

Birth weight of single-born lambs exceeded significantly ($P<0.01$) that of twins (Table 1). This might be due to the limited uterine space in mothers of twin lambs and inadequate availability of nutrients during pregnancy. The finding obtained in this study agrees with those reported by Olthoff and Boylan (1991) and Maria (1992).

4- Sex of lamb

Table 1 shows that male lambs were significantly ($P<0.01$) heavier at birth than females, a result which is in agreement with that of Diaz *et al.* (1983).

Table 1 : Means ($\bar{x} \pm SE$) of birth weight of lambs

Effect	Subclass			
Dam age (yrs):**	**≤ 2**	**3**	**4**	**≥4**
$\bar{X} \pm SE$	3.7 ± 0.05^{a}	4.0 ± 0.05^{bc}	4.1 ± 0.04^{cd}	4.2 ± 0.04^{d}
n	319	263	440	262
Season: **	**Autumn**	**Winter**	**Summer**	
$\bar{X} \pm SE$	4.3 ± 0.04^{a}	3.9 ± 0.03^{b}	3.8 ± 0.045^{b}	
n	333	667	284	
Birth type ** :	**Single**	**Twin**		
$\bar{X} \pm SE$	4.1 ± 0.02^{a}	3.8 ± 0.06^{b}		
n	1152	132		
Sex : **	**Male**	**Female**		
$\bar{X} \pm SE$	4.2 ± 0.04^{a}	3.8 ± 0.04^{b}		
n	695	589		
Viability **	**Survived**	**Dead**		
$\bar{X} \pm SE$	4.2 ± 0.02^{a}	3.8 ± 0.04^{b}		
n	953	331		

[a, b,c] Means in rows followed by different letters differ significantly ($P < 0.05$).
** Significant ($P<0.01$).

Factors Affecting Pre-weaning Lamb Mortality

1- Birht weight of lambs

Table 1 shows that lambs died during the suckling period were significantly ($P<0.01$) lighter at birth than those survived. Hinch *et al.*(1985), Taiwo and Buvanendran (1985) and Singh *et al.* (1987) found significant and positive relationship between birth weight of lambs and their pre-weaning survival rate. Speedy (1992) concluded that lambs with heavier birth weight are more resistant to hypothermia, more vigorous and have more suckling drive, thus grow faster and become less susceptible to diseases than lighter ones.

2- Age of dam

Pre-weaning lamb mortality decreased significantly ($P<0.01$) with increasing dam age (Table 2). The increase in dam age might improve its body weight which led to production of heavier lamb at birth and availability of more milk to that lamb. Afifi *et al.* (1984) reported that lambs born to 5-year old ewes had less mortality rate than those born to younger ones . Hinch *et al.* (1985) concluded that differences in pre-weaning lamb mortality due to dam age could be explained by the differences in birth weight of lambs.

Table 2. Percentages of pre-weaning lamb mortality as affected by dam age, season of birth and sex of lamb

Dam** age (yrs.)	Mortality			Season ** of Birth	Mortality			Sex NS of Lamb	Mortality		
	LB	D	%		LB	D	%		LB	D	%
≤2	969	91	9.4	Autumn	1581	19	1.2	Males	2821	194	6.9
3	1786	105	5.9	Winter	2238	263	8.1	Females	2707	137	5.1
4	1955	116	5.9	Summer	709	49	6.9				
≥4	818	19	2.3								

LB = Number of live born lambs.
D = Number of dead lambs.
NS= Not significant.
**= Significant (P<0.01).

3-Season of birth

Table 2 shows that pre-weaning lamb mortality was the highest (8.1%) in winter, but the lowest (1.2%) in autumn. Summer-born lambs had a mortality percentage of 6.9%. The variability in pre-weaning lamb mortality due to season of birth was significant (P<0.01). Low mortality in autumn-born lambs might be attributed to their heavier weight at birth and better mothering ability of their dams. Winter-born lambs were lighter at birth and suffered from adverse climatic conditions created by heavy rains and cold weather. Summer-born lambs had the lightest birth weight and suffered from heat stress. Taiwo and Buvanendran (1985) and Petersson and Danell (1985) reported significant influence for season of birth on pre-weaning lamb mortality.

4- Sex of lamb

Though male lambs had higher pre-weaning mortality rate than females (6.9 vs.5.1%),differences in lamb mortality due to sex were not significant (Table 2). Poonia *et al.*(1983), Afifi *et al.* (1984) and Singh *et al.* (1987) reached the same finding.

5- Age of lamb

Pre-weaning lamb mortality decreased, though insignificantly, with increasing age of lamb until 1.5 months and increased thereafter (Table 3). The percentage of deaths in the first month of life was 45.7. Poonia *et al.* (1983) and Singh *et al.* (1987) reported that lamb mortality was higher in the first two weeks of life and decreased as lambs grew older. These findings are not in accordance with the results of the present study. The increase in lamb mortality during the last month of suckling period might due to nutritional reasons particularly lack of mineral blocks at the beginning of warm spring which drove the lambs to ingest wool tufts that blocked their intestines. Also, deaths due to white muscle disease increased during that period. However, Sharma *et al.* (1981) reported an increase in mortality rate of kids with the advancement of their age and most of deaths occurred after 30 days of age.

6- Cause of death

Percentages of pre-weaning lamb mortality differed significantly ($P < 0.01$) amongst different causes of deaths (Table 4). The main causes of mortality, in descending order, were enteritis, intestine blockage with wool, pneumonia, white muscle disease and lamb debility. These causes accounted for 79.8% of total deaths.

Table 3. Percentages of pre-weaning lamb mortality at different ages.

Lamb age[NS] (days)	Dead lambs	
	n	%
0-15	78	23.6
16-30	73	22.1
31-45	53	16.0
46-60	60	18.1
61- 75	67	20.2

NS= Not significant.

Table 4. Distribution of pre-weaning lamb mortality according to cause of death

Cause of death**	Dead lambs		Cause of death	Dead lambs	
	n	%		n	%
Enteritis	86	26.0	Coccidosis	12	3.6
Intestine blockage	56	16.9	Gastro intestinal		
Pneumonia	54	16.3	problems	10	3.0
WMD	37	11.2	Urinary calculi	9	2.7
Debility	31	9.4	Sore mouth	7	2.1
Accidents	19	5.7	Unknown	10	3.0

WMD = White muscle disease .

** = Significant ($P<0.01$).

It was observed that deaths due to pneumonia, enteritis and lamb debility occurred mostly during early stages of life, particularly during cold winter. Deaths due to white muscle disease and ingestion of wool tufts occurred when weather had become warmer and the need for more mineral salts became more necessary. These problems were controlled by adding mineral blocks with higher content of selenium, besides injecting lambs with selenium and vitamin E. Schoning and Sagartz (1986) reported that pneumonia and enteritis were the main causes of pre-weaning lamb loss.

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دراسة على وزن الميلاد ومعدل النفوق قبل الفطام فى حملان النعيمى بالمملكة العربية السعودية

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درس تأثير بعض العوامل غير الوراثية على وزن الميلاد ومعدل النفوق قبل الفطام فى حملان النعيمى التابعة لشركة القصيم الزراعية والتى تقع فى المنطقة الوسطى للمملكة العربية السعودية. وقد تأثر وزن الميلاد معنوياً (احتمال< ١٠٠.) بكل من عمر الأم وموسم الولادة ونوع الولادة وجنس الحمل. وبينما كان تأثير وزن الميلاد وعمر الأم وموسم الولادة وسبب النفوق معنويا على معدل نفوق الحملان قبل الفطام، فإن عمر الحمل وجنسه لم يكن لهما تأثير معنوى. وكانت أهم أسباب النفوق هى الالتهاب المعوى والالتهاب الرئوى وانسداد الأمعاء الدقيقة بالصوف ومرض إبيضاص العضلات وضعف الحملان العام.