Small Ruminant Research 133 (2015) 17–20

Contents lists available at ScienceDirect

Small Ruminant Research

journal homepage: www.elsevier.com/locate/smallrumres

Short communication

Effect of weaning method on lamb behaviour and weight gain

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ARTICLE INFO

Article history:
Received 27 July 2015
Received in revised form 21 October 2015
Accepted 26 October 2015
Available online 1 November 2015

Keywords:
Weaning methods
Lamb
Stress
Weight gain

ABSTRACT

This study aimed to evaluate effects of age at weaning in combination with different weaning procedures on lamb behaviour and performance. Thirty-two single-born male Balouchi lambs were weaned at 6 or 12 week of age. Within each age group ($n = 16$), the lambs were weaned using either a two-stage or a traditional one-stage method. In traditional one-stage weaning, lambs were abruptly separated from ewes, whereas in two-stage weaning, lambs were first prevented from nursing their dam for 1 week (stage 1) before their separation (stage 2). Lamb weights and behaviour were recorded before and after separation. Lambs weaned at week 6 were heavier and had greater ($P < 0.05$) average daily gain (ADG) until week 16 compared to lambs weaned at week 12. However, neither the traditional nor the two-stage weaning affected body weight and ADG at week 16. Bleat frequencies were greater in traditional method at age of 6 week compared to traditional method at an age of 12 week, two-stage method at an age of 6 week or 12 week ($P < 0.05$). Lambs weaned using the two-stage method had lower ($P < 0.05$) agitation scores compared to traditionally weaned animals. We concluded that the two-stage weaning resulted in less distress than the traditional one-stage weaning, however ADG up to 16 week of age was not affected by weaning method.

1. Introduction

The largest enterprise of Iranian animal agriculture is sheep production which is highly dependent on pasture availability. In most parts of Iran, low rainfall and availability of water resources have resulted in limited pasture land. Furthermore, continuous grazing with high stocking rate has resulted in bare pasture, soil erosion and native pasture deterioration. In such situations, several strategies have been proposed to maximize animal productivity in particular lamb production. One common intensive lambing systems is early weaning at 35–60 days of age which includes removing lambs from pasture and feeding concentrate instead (Miranda-de la Lama et al., 2014). However, early weaning can result in growth shock in kids (Sena et al., 2013), lambs (Orgeur et al., 1997; Schichowski et al., 2008) and calves (Haley et al., 2005). Both dams and lambs express their distress by an increase in bleating and locomotion activity (Alexander, 1977), suppression on some aspects of the immune system, negative effects on animal health, welfare, and performance (Orgeur et al., 1997). An alteration in growth rate may also result from the decrease of the quantity of feed ingested or from an impairment of digestive function caused by weaning stress (Dantzer and Mormède, 1979).

In some rural zone of Iran, the farmers prevent nursing by providing a barrier between lamb's mouth and the ewe's teat. In this method, lambs are kept with their dams and after the morning milking the lams are allowed to suckle the udder. Based on this indigenous knowledge, this study was designed to measure lamb behavior and average daily gain following 2 different weaning procedures including traditional weaning by abrupt separation of the mother-lamb pair and a two-stage treatment that lambs were prevented from nursing their dam for 1 week before their separation.

2. Materials and methods

Balouchi is among the predominant sheep breeds in Iran and adapt well to harsh conditions. They are fat-tailed sheep reared mainly for meat production. Thirty-two single-born male Balouchi lambs (birth weight, 3.5 ± 0.5) were used in this study. Animals were either weaned at 6 or 12 week of age in two-stage or with the traditional method. Traditional weaning method was by abrupt separation of ewe and lamb. In the two-stage, lambs were first prevented from nursing their dam for 1 week (Stage 1) before their separation (stage 2). Nursing was prevented by covering the ewe's udder with a net, which was fixed on the back of the animals. Ewes and lambs were kept indoor and had ad libitum access to

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http://dx.doi.org/10.1016/j.smallrumres.2015.10.028
0921-4488/

Table 1
Description of the recorded behaviours.

Behaviour	Description
Maintenance Behaviours	
Eating	Chewing of starter in mouth
Ruminating	Chewing regurgitated food, either in standing or in lying position
Drinking	Swallow water
Standing	Standing without any movement or behaviour
Walking	Walking in pen
Playing	Different body movements, sounding, jumping, buck- kicking and touching or contacting equipments and floor and lambs next to point lamb
Resting	Lying without ruminating activity
Others	Defecation, urination, etc.
Agitation Score	
Score 1	No agitation: normal behavior, i.e. feeding, resting, lying, standing or play behavior
Score 2	Agitation: no normal behavior, i.e. moving around, head or leg moving
Score 3	High agitation: continuously moving, restlessness, vocalization

Table 2
Body weight (BW) and average daily weight gains (ADG) of lambs weaned at 6 and 12 week of age by traditional or 2-stage methods.

Measurement	Group[a]				SEM	*P* value
	1	2	3	4		
BW until week 16, kg	17.25a	17.50a	16.70b	16.75b	0.87	<0.05
ADG until week 16, g/d	154.5a	156.2a	149.1b	149.6b	8.24	<0.05

[a] Group (1) 6 week Traditional, (2) 6 week 2-stage, (3) 12 week Traditional, (4) 12 week 2-stage.

hay (0.5 kg alfalfa) and concentrate (0.3 kg; 2.6 Mcal ME/kg, 14.5% CP), and at second day of postpartum, they were allowed to graze at pasture for 6 h a day. At the time of weaning, groups of lambs were separated from their mothers by moving them to a different barn with pens, prohibiting visual contact and vocal communication. For behavioral observations, lambs were observed for 3 h/d (from 0900 to 1200) for four consecutive days after weaning. Scan sampling was used at 30 min intervals to count the total number of vocalizations (bleats) coming from each lamb for 1 min (Schichowski et al., 2008) and maintenance behaviour activities. The maintenance behaviour activities were included eating, ruminating, drinking, walking, standing, playing, resting and others (defecation and urination). At the start of each 30 min interval, agitation scores were recorded for each lamb. The descriptions of behavioural categories are given in Table 1 (Napolitano et al., 2004).

A log transformation was used to normalize skewness in behaviour data (Napolitano et al., 2004). The data were analyzed by SAS 9.1 version statistical package. Because, the data measured over time, a repeated measures approach using ANOVA with mixed linear models in SAS was used. Interactions between treatment and time (days 1–4) were tested. The following model was used:

$$Y = \mu + t_i + T_j + (t \times T)_{ij} + e_{ijk}$$

where Y = mean of observation, μ = overall mean, t_i = weaning method, T_j = day of observation, $(t \times T)_{ij}$ = interaction between weaning method and days of observation, e_{ijk} = random residual.

When differences were significant ($P < 0.05$), means were separated using Duncan's test.

3. Results

Lambs weaned at week 6 were heavier and had greater ($P < 0.05$) ADG until week 16 compared to lambs weaned at week 12. However, neither the traditional nor the two-stage weaning affected body weight and ADG at week 16 (Table 2). Bleat frequencies differed ($P < 0.05$) between treatments (Table 3) and were greater in lambs weaned with the traditional method at the age of 6 week (2.75 ± 0.04/min) compared to lambs weaned in the traditional method at the age of 12 week (2.05 ± 0.04/min), two-stage method at the age of 6 week (1.75 ± 0.04/min) or 12 week (1.46 ± 0.04/min).

Table 3
Average frequencies of bleats (/min) and matainace behavior activities in lambs during the observation period.

Measurement	Group[a]				SEM	Effect	
	1	2	3	4		Group	Time
Bleats/min	2.75a	1.75c	2.05b	1.46d	0.04	<0.001	<0.001
Matainance behaviour							
Eating	0.22c	0.27b	0.29b	0.35a	0.005	<0.001	<0.001
Ruminating	0.11c	0.13b	0.14ab	0.15a	0.004	<0.001	<0.001
Drinking	0.008	0.01	0.02	0.01	0.005	0.13	0.50
Standing	0.19a	0.20a	0.13b	0.10c	0.006	<0.001	<0.001
Walking	0.28a	0.15c	0.17b	0.14c	0.005	<0.001	<0.001
Playing	0.11	0.12	0.12	0.13	0.006	0.12	<0.001
Resting	0.08b	0.11a	0.12a	0.11a	0.004	0.002	<0.001
Others	0.008	0.009	0.008	0.008	0.002	0.99	0.96

[a] Group (1) 6 week Traditional (2) 6 week 2-stage, (3) 12 week Traditional, (4) 12 week 2-stage.

Table 4
Average frequencies of agitation scores in lambs during the observation period.

Score[b]	Group[a]				SEM	Effect	
	1	2	3	4		Group	Time
1	0.46d	0.76c	0.91b	0.95a	0.005	<0.001	<0.001
2	0.46a	0.20b	0.07c	0.04d	0.004	<0.001	<0.001
3	0.08a	0.04b	0.02c	0.008d	0.003	<0.001	<0.001

[a] Group (1) 6 week Traditional (2) 6 week 2-stage, (3) 12 week Traditional, (4) 12 week 2-stage.
[b] 1 = No agitation, 2 = agitation, 3 = high agitation.

Number of bleats were different ($P < 0.001$) between the observation days and were greater on the day of weaning (3.27 ± 0.04/min, $P < 0.05$) compared to day 2 (2.31 ± 0.04/min), day 3 (1.67 ± 0.04/min) or day 4 (0.74 ± 0.04/min) after weaning.

On the day of weaning the greatest mean bleat rate occurred for lambs weaned in the traditional method at the age of 6 week (3.74 ± 0.38/min) or 12 week (3.77 ± 0.31/min; Fig. 1).

The bleat frequency decreased until the fourth day after weaning to 0.72 ± 0.30/min and 1.00 ± 0.06/min for lambs weaned in the traditional method at an age of 6 or 12 week, respectively (Fig. 1).

The main effects of time and group, and the interaction between time and group for maintenance behaviour are presented in Table 3. There was an effect of the group for eating, ruminating, standing, walking and resting ($P < 0.05$). All behaviours except drinking water and other (defecation, urination, etc.) changed with time and the interaction between time and group for these parameters were significant ($P < 0.05$).

Animals weaned in two-stage had a lower ($P < 0.05$) agitation score compared to traditionally weaned animals (Table 4). On