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POST WEANING FEEDING MANAGEMENT AND PERFORMANCE OF MERINO EWES GRAZING ON NATURAL AND IMPROVED PASTURES AT MATING SEASON

MANEJO ALIMENTAR PÓS-DESMAME E PERFORMANCE DE OVELHAS MERINO EM PASTAGENS NATURAIS E ARTIFICIAIS NA ÉPOCA DE ENCARNEIRAMENTO

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SUMMARY

In the uruguayan Basalt region, the reproductive performance of 300 Merino ewes and the effect of 3 post-weaning feeding managements (PWFM: I: 1.2 cm height of available forage and 16 ewes/ha; II: 2.03 cm height of available forage and 5 ewes/ha; III: 2.5cm height of available forage and 1 ewe/ha) as well as 2 feeding levels before and during the breeding season (FLM: native pastures: green DM/ha: 883kg, CP: 114g/kg DM, NDF: 781g/kg DM and improved pastures: DM /ha: 1270kg, CP: 194g/kg DM, NDF: 598g/kg DM) were studied with a factorial arrangement of treatments. The PWFM extended for 70 days, ewes were mated in the period from 13/4/96 to 13/5/96 and FLM were applied for 30 days, starting 15 days before beginning of breeding. There were not differences on the ovulation rate (P>0.05); however, the P values might indicate some effect of the treatments. The number of born lambs/ewe served increased with the ovulation rate because the higher number of ovulations balanced their less viability, individually considered. Actually, the number of born lambs/ewe served was higher with animals coming from PWFM III (1.18, 1.11 and 0.96, PWFM III, II and I, respectively; P = 0.02) and with the animals grazing on improved pastures at mating period (1.13 and 1.03, improved pastures and natural pastures, respectively; P = 0.10), were those which showed slight higher ovulation rate.

Key words: *body condition, mating, reproduction.*

RESUMO

Na região de solos de Basalto (Salto, Uruguai: 32.5º de latitude sul e 58º de longitude oeste), estudou-se, em um delineamento em blocos casualizados com arranjo fatorial, o efeito de 3 manejos alimentares pos-desmame (MAPD: I : 1,2cm de altura da forragem disponível e 16 ovelhas/ha; II: 2,03cm de altura da forragem disponível e 5 ovelhas/ha; III: 2,5cm de altura da forragem disponível e 1 ovelha/ha) e 2 níveis de alimentacão no período de encarneiramento (NAE: campo natural: 883kg MS verde/ha, PB: 114g/kg MS e FDN: 781g/kg MS; pastagem artificial: 1270kg MS/ha, PB: 194g/kg MS e FDN: 598g/kg MS), no desempenho reprodutivo de 300 ovelhas Merino. O MAPD estendeu-se por 70 dias. O período de encarneiramento foi de 13/4-13/5/96 e os NAE foram aplicados por 30 dias, iniciando-se 15 dias antes do início do período de cobertura. O número de cordeiros nascidos/ovelha cobertas incrementou-se ao aumentar a taxa ovulatória devido ao fato de o maior número de óvulos liberados compensar a menor viabilidade destes. O número de cordeiros nascidos/ovelha coberta foi maior nas ovelhas provenientes do MAPD III (1,18, 1,11 e 0,96, MAPD III, II e I, respectivamente, P = 0,02) e naquelas que foram submetidas às pastagens artificiais durante o período de encarneiramento (1,13 e 1,03, pastagem artificial e natural, respectivamente, P = 0,10). Essas foram as que apresentaram uma tendência de valores superiores em taxa ovulatória.

Palavras-chave: *estado nutricional, período de encarneiramento, reprodução.*

INTRODUCTION

Animal response to the practice of overfeeding ewes at the time of mating (often referred to as flushing) with the objective of

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increasing reproductive performance, depends on several factors. One of the most important of these factors is the previous nutritional status of the ewes (FERNÁNDEZ, 1993 a).According to data from Great Britain (GUNN, 1983; GUNN ***et al.***, 1991a; 1991b), there is an intermediate specific range of body condition where the ovulation rate of ewes seems to respond better to increased food intake. Below and above this range (that may vary with the genotype) of body condition, there is no additional effect of increased food intake.

In our conditions, the importance of the nutritional status before breeding as a factor conditioning the response to preferential nutritional treatments has also been reported (BIANCHI ***et al.,*** 1994). However, no previous studies regarding range of critical body condition for breeds and environments of Uruguay have been found. The objective of this research was to study the effect of three feeding/grazing management systems during 70 days period from weaning to 15 days before breeding on the reproductive performance of Merino ewes that were then allowed high or low feed levels (flushing) by grazing native or improved pastures.

MATERIAL AND METHODS

The study was carried out on a farm on typical Basalt soils (latitude 32.5º south; longitude 58.0º west). Three hundred Merino ewes (age > 2 years) coming from a flock mated in March and April and weaned in December 1995 were used. At the beginning of the trial, the animals were stratified by live weight (33,5 ± 2,7kg) and body condition (2,7 ± 0,2; JEFFERIES, 1961). They were assigned at random to different post - weaning feeding management treatments (PWFM) for 70 days , to create three groups of ewes with different body condition (body condition scores to ≤ 2,25, 2,5 to 2,75 and ≥ 3) at the beginning of breeding. To this end 3 fields with native grasses and with different average height of available forage and different stocking rate (PWFM I: 16 ewes/ha; PWFM II: 5 ewes/ha; PWFM III: 1 ewe/ha). In PWFM I, grazing was restricted to 1h/d during the last 25 days to reach the target body condition.

Each group of ewes was further divided by weight and condition score into two lots that received different feeding levels for 30 days, starting 15 days before the beginning of breeding as follows: native pastures with distribution of forage Autumn - Winter - Spring, and improved pastures of third year of ***Lotus corniculatus*** and ***Trifolium repens*** which took place from April 13, 1996 to May13, 1996. There were six treatments resulting from 3 X 2 factorial arrangement the three different management in the post - weaning period (PWFM I, II, III) and 2 levels of feeding at mating (FLM: native or improved pastures). At the end of the mating - lambing period all the ewes grazed on natural pastures. Measurements of live weight and body condition of ewes were carried out at the beginning of the trial, 15 days before mating and during breeding.

During the breeding season, services were registered weekly, by recording ewes that were marked by rams (coloured earth paste was painted on the brisket of rams, and the colour was changed weekly). Ovarian activity was diagnosed twice through endoscopic techniques (THIMONIER & MAULEON, 1969) using a Wolf laparascope: at 10 and 20 days from the beginning of mating (ewes served in the first and second week respectively). Ovulation rate (OR= number of ovulations/ewe served) and those follicles that did not ovulate were determined. Ovarian activity (OA) was defined as the sum of the number of the corpora lutea , the pre-ovulatory follicles and the totally or partially luteinized follicles. Ovulatory Efficiency (OE) was defined as OR / OA.

During lambing, the number of lambs born per ewe was recorded. With this data and the result of the endoscopy for the ewes that did not repeat heat, the ratio of OR to lambs born (reproductive efficiency = RE), and the number of lambs born per ewe served (litter size, LS) was also determined. In each of the fields used in the post - weaned period, the height of the available forage at the point of maximum concentration of grass was periodically measured by means of a rule.

Before and during the mating, the available forage was determined twice by cutting with shears at ground level in $0,10m^2$ squares selected at random in each of the 5 areas of the natural pastures chosen because of their vegetation and the soil type. The available forage was separated into green and dry material and dried at 60ºC in an oven until constant weight was reached. In the improved pasture, two determinations of available forage were made using a double sampling technique (HAYDOCK & SHAU, 1975).

Dried samples from corresponding to native and improved pastures were ground in a Wiley mill with a 1mm screen to determine content of crude protein (CP) and neutral detergent fibre (NDF) (HARRIS, 1970). The effect of treatments on live weight and body condition of ewes was studied by analysis of variance for a linear model with a 3 X 2 factorial arrangement of treatments. For the

following variables: incidence and distribution of heath, return rate at the first service, OA, OR, OE, RE and LS log - linear models were used. The relation between OR and OA was studied by Contingency Table with Chi-square.

RESULTS

The characteristics of the different feeding treatments during the post - weaning period and the effect of these management on weight and body condition of ewes before mating are shown on table 1. The PWFM caused important differences on the nutritional status of ewes before mating. In this way, the pre -fixed body condition - especially for those animals coming from less severe feeding management- could be reached. Ewes from PWFM I showed body condition values higher than those pre-fixed, but nevertheless, they were lower than those from the other two lots (2,4 vs. 2,7 and 3,4; P≤ 0,05). Live weight differences among lots were also important, especially between extreme treatments (32,8 *vs.* 40,8kg; P≤ 0,05).

Table 2 shows forage characteristics of the feeding planes applied 15 days before mating and during the first 15 days of services. In general, a good availability of forage in all the fields used during mating was registered, natural pastures showed a high ratio green / dried forage. The differences between the two feeding levels resulted from the different chemical composition of pastures. The figures of CP found in the imporved pastures almost doubled the already good values recorded in the natural pastures, specially those belonging to the green fraction of the dry forage. In turn, improved pastures NDF values were the lowest.

Table 3 shows least square means of weight and body condition of ewes at the beginning and end of mating period for all treatments. Data shows as well the nutritional condition changes of ewes from 15 days before the mating until the end of the services. At the beginning of services, and independently of FLM, the constant of significant differences regarding nutritional condition of ewes coming from different post - weaning management, mainly between extreme treatments, was observed. When weight evolution and body condition of ewes in different treatments during services are analyzed, it can also be observed an important effect of PWFM independently from FLM, but in this case the effect is favourable to ewes coming from the most severe post - weaning treatment (+ 5,6 vs. 3,2 and 0,88kg; + 0,5 vs. 0,38 and – 0,01, respectively; P≤0,01). The FLM also determined differences in the body condition at the beginning of mating (2,9 and 3,0 natural pastures and improved pastures, respectively; P≤0,05) and in the evolution of live weight (+2,8 and +3,6kg natural pastures and improved pastures, respectively; P≤0,01), but their biological importance is very little.

The influence of ewes in oestrum during mating period (>95%) and its distribution within it (80% ewes in the first 15 days in oestrum) attained the expected values for the season and the conditions under which the work was performed, not being affected by the treatments (P>0,05). Return rates at first service was low (17%) and independent from PWFM and FLM (P>0,05).

Table 4 shows the effect of the post weanning fedding management and the feeding level at mating on the reproductive performance of the ewes. Ovarian activity, according with laparascopic observations, was affected by FLM, showing a grater OA the ewes grazing improved pastures (2,18 ***vs.*** 1,89; P = 0,02), particularly those coming from PWFM I (PWFM I: 1,58 to 2,32; PWFM II: 2,03 to 1,97; PWFM III: 2,11 to 2,26, natural and improved pastures, respectively; P = 0,009). The relation between the OA and the OR showed a clear connection between both variables (V. of Cramer = 0,54;

Table 2 - Forage characteristics of pastures used during mating period.

Feeding levels at mating	Forage Availability KgDM / ha	kgDM green forage/ ha	Chemical Composition CP (g/kgDM) Total	CP (g/kgDM) Green	NDF (g/kgDM) Total	NDF (g/kgDM) Green
Native Pastures	1272	883	95	114	753	781
Improved Pastures	1270	---	194	---	598	---

Table 1 - Characteristics of post – weaning feeding management and their effect on live weight and body condition of ewes before mating.

Post-weaning **Feeding Management** (70 days)	n	**Forage** Height (cm)	Stocking Rate (ewes/ ha)	Pre-mating measurements Live weight (kg)	Body condition (0-5)
PWFM I [1]	100	1,20 (± 0,30)	16	32,80 c	2,40 c
PWFM II	100	2,03 (± 0,90)	5	37,40 b	2,70 b
PWFM III	100	2,50 (± 1,60)	1	40,80 a	3,40 a

1: Feeding restriction, 1h/day grazing.
Least squares means in the same column followed by a different superscript differ significantly (P ≤ 0,05).

Table 3 - Effect of post – weaning feeding management and of feeding level at mating period on live weight (LW) and body condition (BC) of ewes around services.

POST – WEANING FEEDING MANAGEMENT AND FEEDING LEVEL AT MATING	EVALUATION PERIOD					
	BEGINNING OF MATING		END OF MATING		15 DAYS BEFORE MATING	
	LW (kg)	BC (0-5)	LW (kg)	BC (0-5)	Change of LW (kg)	Change of BC (0-5)
N° of observations	296	296	291	291	291	291
Post–weaning feeding management	**	**	**	**	**	**
PWFM I	35,20 c	2,60 c	38,40 c	2,90 c	5,60 a	0,50 a
PWFM II	39,30 b	2,90 b	40,80 b	3,10 b	3,20 b	0,38 b
PWFM III	40,30 a	3,40 a	41,80 a	3,40 a	0,88 c	- 0,01 c
Feeding level at mating	NS	*	NS	NS	**	NS
Native pastures	38,30	2,90	39,90	3,10	2,80	0,27
Improved pastures	38,20	3,00	40,70	3,10	3,60	0,30
PWFM x FLM	NS	NS	NS	NS	NS	NS
SME	14,17	0,06	14,40	0,07	3,68	0,06
CV (%)	9.84	7,94	9,43	8,46	59,30	83,80
R^2	0,26	0,66	0,14	0,34	0,52	0,45

NS: P>0,05; (*): P≤0,05; (**): P≤0,01; (a, b, c): P≤0,01.
Least squares means in the same column followed by a different superscript differ significantly (P≤ 0,05).

P≤0,0001). The probability of multiple ovulation increased together with the ovarian activity: from 15,6% in ewes with OA = 2, to 54% in those with OA = 3 and 66,6% for OA = 4. The treatments did not affect the ovulation rate (P>0,05), but P values obtained (P = 0,12 – 0,14) indicate that the different treatments had some effect. The ovulatory efficiency was only affected by FLM. The ewes that remained in natural pastures during service showed the higher values of OE (0,72 ***vs.*** 0,65; P≤0,05). The rate lambs born/ ovulation was only affected by PWFM (P=0,04), the higher values (0,94, 0,96 and 0,74, PWFM III,II and I, respectively; P≤0,05) belonging to ewes coming from the less severe treatments.

Furthermore, the influence of the ovulation rate on the variable was studied, and it was found that the probability that an ovule coming from a single ovulation may give birth to a lamb was greater than that of an ovule coming from a double ovulation (0,88 ***vs.*** 0,72; P = 0,002). Nevertheless, the number of lambs born increased with the ovulation rate. In fact, the rate lambs born / ewe served showed the higher records in the ewes coming from PWFM III (1,18, 1,11 and 0,96, PWFM III, II and I, respectively; P = 0,02) and in those grazing improved pastures during mating period (1,13 and 1,03, improved and natural pastures, respectively; P = 0,10), which also were those showing a trend to higher values of ovulation rate.

DISCUSSION

The higher response to feeding change during mating period exhibited by ewes from PWFM I under ovarian activity is probably due to a different content crude protein in pastures. LINDSAY (1976); FERNÁNDEZ (1993b) pointed out that when the proteic level of a certain diet increases, the number of supplied follicles increases and, consequently, increases the ovarian activity of the ewes.

The fact that the ewes grazing natural pastures during mating period showed a higher ovulatory efficiency than those grazing improved pastures determined that the ovulation rate was affected by no treatments. Probably, the treatments applied during services were not different enough to allow significant differences in this respect. In fact, the natural pastures used in this study had superior forage characteristics related to the conditions usually found in our country. The differences in chemical composition among the various pastures used at mating period and the high contents of ***Lotus corniculatus*** found in several samplings carried out in the improved pastures (70% of forage supply), related to the high of tannin of this leguminous (MONTOSSI, 1995), as well as the consequent increase of available aminoacids at intestinal level (BLACK, 1988), are factors which must be considered. In this regard, CRUIKSHANK ***et al***. (1988) and CATALANO & SIRHAN (1993) point out significant increases in the ovulation rate of ewes which were fed with diets of high contents of non - degradable proteins at rumen level. On the other hand, the variable under discussion is discrete and P values found in treatments (0,20 > P > 0,10) are not negligible.

Apparently, there was some evidence that the records of ovulation rate was higher for the ewes from PWFM III and for those that grazed improved pastures, as compared with those under more severe feeding management and those grazed natural pastures, respectively. The larger ovulation balanced their less feasibility, individually considered, and determined a higher rate lambs born / ewe served in those treatments that showed a trend towards higher

Table 4 - Effect of PWFM and FLM during mating period on the reproductive performance of the ewes.

Post – weaning Feeding management and feeding level at mating	Ovarian activity	Ovulation rate	Ovulatory efficiency	Lambs born Ovulation	Lambs born Ewe served
Post - weaning feeding management	NS	NS	NS	*	*
PWFM I (1)	1,96 (±0,93)	1,20 (±0,40)	0,71 (±0,27)	0,83b (±0,33)	0,96b (±0,43)
PWFM II (2)	2,00 (±0,80)	1,18 (±0,39)	0,66 (±0,25)	0,96a (±0,14)	1,11a (±0,31)
PWFM III (3)	2,18 (±0,95)	1,32 (±0,47)	0,69 (±0,26)	0,94a (±0,19)	1,18a (±0,43)
Feeding level at mating	*	NS	*	NS	NS
Native pastures (1)	1,89b (±0,89)	1,19 (±0,39)	0,72 (±0,26)	0,90 (±0,26)	1,03 (±0,36)
Improved pastures (2)	2,18a (±0,89)	1,27 (±0,45)	0,65 (±0,25)	0,91 (±0,24)	1,13 (±0,44)
PWFM x FLM	**	NS	NS	NS	NS
1 X 1	1,58b (±0,72)	1,10 (±0,31)	0,79 (±0,26)	0,84 (±0,34)	0,89 (±0,32)
1 X 2	2,32a (±0,96)	1,29 (±0,46)	0,63 (±0,26)	0,83 (±0,34)	1,03 (±0,50)
2 X 1	2,03a (±0,85)	1,20 (±0,41)	0,66 (±0,26)	0,95 (±0,13)	1,10 (±0,30)
2 X 2	1,97a (±0,76)	1,16 (±0,37)	0,66 (±0,24)	0,96 (±0,13)	1,11 (±0,32)
3 X 1	2,11a (±0,99)	1,27 (±0,45)	0,70 (±0,26)	0,93 (±0,22)	1,11 (±0,42)
3 X 2	2,26a (±0,92)	1,37 (±0,49)	0,67 (±0,26)	0,96 (±0,14)	1,26 (±0,45)

NS: $P > 0,05$; (*): $P \leq 0,05$; (**): $P \leq 0,01$.
Least squares means in the same column followed by a different superscript differ significantly ($P \leq 0,05$).

values of ovulation rate. However, it must be noted, that values attained by the ewes coming from the most severe PWFM are acceptable, although their weight before the mating was below the minimum threshold established for the breed (37kg; MCINNES & SMITH, 1966). No previous references to critical body condition around mating period of Merino ewes were found, but data concerning other breeds (GUNN ***et al***., 1969; GUNN ***et al***., 1972; GUNN & DONEY, 1975; ÁLVAREZ MITHIEUX ***et al.*** 1991) suggest that the values attained by the ewes from PWFM I may also be critical.

Considering evolution of weight and body condition of ewes from different treatments during services, an important effect resulting from the PWFM is observed. This effect is independent from the FLM, but in this case is favourable to the ewes coming from the most severe post - weaning treatment. Of course, the balance between dynamic and static nutritional condition (LINDSAY, 1976) may be used to explain the effect of the PWFM on the reproductive performance of the ewes. The important gains in weight and body condition, during services, of the ewes coming from PWFM I, which were independent from the FLM, reflect the good forage characteristics of the natural pastures used in this work. This fact may explain the absence of a favourable differential response, concerning the final reproductive performance of the ewes coming from PWFM I, to the change in feeding during mating period, even when both the ovulation rate and the proportion lambs born / ewe served showed a similar trend towards the significant interaction among treatments found under ovarian activity.

It is probably advisable to supply a preferential diet around mating period in order to improve the reproductive performance of the flock, specially to animals that suffered post - weaning food scarceness and present body conditions inferior to the ones considered in this work. Developing local information in this respect is very important in countries like Uruguay, where good forage resources are scarce, particularly for sheep production, traditionally run in extensive form.

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