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FOCUSED HIGH-PROTEIN SUPPLEMENTATION TO EWES GRAZING CAMPOS GRASSLAND DURING MID GESTATION: EFFECTS ON CARCASS AND MEAT QUALITY OF THE PROGENY

Javier Ithurralde*[1], Rafael Delpiazzo[2], Alejandro Bielli[2], Ana Inés Trujillo[1], Carlos Batista[1], Ezequiel Jorge-Smeding[3], Raquel Pérez Clariget[1], Ana Laura Astessiano[1]

[1] Agronomy Faculty, Universidad de la República, Montevideo, Uruguay.
[2] Veterinary Faculty, Universidad de la República, Montevideo, Uruguay.
[3] Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement (INRAE), Saint-Genès Champanelle, France
*Corresponding author email: javiithu@gmail.com

I. INTRODUCTION

Focus feeding implies providing short and targeted periods of specific nutritional supplements to positively impact on animal performance [1]. In sheep, muscle mass and meat characteristics can be affected by focused feeding particularly during mid gestation, since skeletal muscle fiber hyperplasia occurs approximately between days 40 and 80 of gestation [2]. Thus, the aim of the present study was to evaluate the effect of a focused high-protein supplementation to ewes grazing Campos grassland during mid gestation on carcass and meat quality of their lambs.

II. MATERIALS AND METHODS

All animal procedures were approved by the Comisión de Ética en el Uso de Animales (CEUA) of the Universidad de la República (UdelaR), Uruguay, (Res. Nº1804). The experiment was performed at Estación Experimental Bernardo Rosengurtt (Facultad de Agronomía, Universidad de la República, Uruguay, 32º S, 54º W) using 37 single-bearing multiparous Corriedale ewes grazing *Campos* grassland *ad libitum*. Ewes were randomly assigned in two nutritional treatments between 55 and 80 days of gestation: supplemented ewes (SUP; n= 22, 12 carrying female and ten carrying male fetuses) received daily individual supplementation with soybean meal at 1 % of their body weight (BW), and control ewes (CON; n= 15, nine carrying female and six carrying male fetuses) grazed adjacent sub paddocks without supplementation. After 80 days of pregnancy all ewes were managed as the same flock and continued grazing on the same paddock of Campos grassland until 100 days of pregnancy when they were sheared and transferred to a multi-year pasture until lambing. After lambing all ewes and lambs continued being managed as one flock grazing on a seeded annual pasture of ryegrass and winter oat until lamb slaughtering (90-day-old lambs). Carcass conformation measurements were performed in 24 h cooled carcasses according to Cañeque et al. [3]. Meat quality determinations were performed in 24 h aged samples from the left side *Semitendinosus* (ST) and *Longissimus lumborum* (LL) muscles. Muscle pH was measured using a pH meter (LT Lutron pH-201) and instrumental meat color (Commission Internationale de l'Éclairage lightness (L), redness (a) and yellowness (b)) was determined using a colorimeter device (Minolta CR-10, Osaka, Japan). For tenderness determinations samples were tested with a Warner–Bratzler shear device mounted on an Instron series 3342 after cooking in a thermostatic water bath at 75ºC until the internal temperature reached 71ºC. After cooking in plastic bags, samples were dried with paper towel and re-weighed to determine cooking losses. The nutritional treatment was applied individually; therefore, the experimental unit is each sheep. Data were analyzed considering a completely randomized design using the SAS Systems software (SAS 9.0V; SAS Institute, Cary, NC, USA). The models included the treatment (SUP vs. CON), the progeny sex, and their interaction as fixed effects and the ram or father as the random effect. Post-hoc comparisons were done with the Tukey–Kramer test. Statistical differences were considered significant when $P \leq 0.05$, and tendencies when $0.05 < P \leq 0.10$. Data are expressed as LS means ± s.e.m.

III. RESULTS AND DISCUSSION

Maternal supplementation did not affect any of the carcass traits (Table 1). However, the SUP treatment reduced meat redness in the ST muscle ($P=0.03$) and reduced meat pH in the LL muscle ($P=0.05$), while it tended to increase meat lightness in the ST muscle ($P=0.08$; Table 2). Previous research from our own team indicates that improved nutrition in pregnant sheep grazing natural pastures under restrictive conditions has very positive effects on carcass traits, especially in the male progeny [4]. However, our present results indicate that under non restrictive natural

pasture grazing conditions, a focused high protein supplementation during the critical period for hyperplasic myogenesis has no impact on carcass traits. On the other hand, results of the present study indicate that some very relevant meat quality traits such as pH and color could be affected by maternal focused high protein supplementation. These findings are consistent with previous results from our reserach team [5] and may be related with changes in prenatal skeletal muscle development that could affect postnatal muscle composition with changes in muscle fiber types.

Table 1 – Carcass traits in lambs born to control (CON) and supplemented (SUP) ewes.

	CON	SUP	P *values*		
			Treatment	Sex	Treatment*Sex
Cold carcass weight (kg)	11.7 ± 0.38	11.6 ± 0.31	0.88	0.01	0.69
Carcass width (cm)	17.9 ± 0.35	17.9 ± 0.31	0.84	0.24	0.58
Buttock width (cm)	17.7 ± 0.27	17.9 ± 0.22	0.60	0.03	0.45
Buttock perimeter (cm)	53.4 ± 0.63	53.4 ± 0.51	0.95	0.02	0.36
Subcutaneous fat thickness (mm)	3.9 ± 0.42	4.1 ± 0.66	0.97	0.92	0.76
Hindlimb length (cm)	31.8 ± 0.32	32.0 ± 0.26	0.53	0.01	0.37
Internal carcass length (cm)	55.1 ± 0.60	55.2 ± 0.48	0.97	0.07	0.90
Carcass compactness	0.21 ± 0.005	0.21 ± 0.004	0.83	0.01	0.49

Table 2 – Meat quality traits in muscles *Semitendinosus* and *Longissimus lumborum* from male and female lambs born to control (CON) and supplemented (SUP) ewes.

	CON		SUP		P *values*		
Meat quality traits	Males	Females	Males	Females	Treatment	Sex	Treatment*Sex
Semitendinosus ST							
pH	5.7 ± 0.08	5.8 ± 0.07	5.7 ± 0.06	5.8 ± 0.06	0.76	0.33	0.92
L*	47.5 ± 0.83	47.2 ± 0.71	49.7 ± 0.68	47.3 ± 0.64	0.08	0.03	0.09
a*	16.7 ± 0.65	15.6 ± 0.62	14.7 ± 0.59	15.6 ± 0.53	0.03	0.86	0.04
b*	7.7 ± 0.47	6.5 ± 0.39	6.7 ± 0.37	7.0 ± 0.33	0.50	0.29	0.08
Cooking losses (%)	11.9 ± 2.83	14.4 ± 2.34	15.4 ± 2.23	17.0 ± 2.05	0.19	0.37	0.86
WB (kg/cm^2)	2.2 ± 0.14	2.1 ± 0.11	2.3 ± 0.11	2.1 ± 0.10	0.42	0.35	0.59
Longissimus lumborum LL							
pH	5.7 ± 0.04	5.7 ± 0.03	5.6 ± 0.03	5.6 ± 0.03	0.05	0.71	0.60
L*	41.4 ± 1.08	40.4 ± 0.98	42.2 ± 0.96	41.1 ± 0.84	0.38	0.22	0.96
a*	17.7 ± 0.49	18.4 ± 0.40	17.4 ± 0.38	17.4 ± 0.35	0.14	0.41	0.36
b*	6.4 ± 0.43	6.4 ± 0.35	6.3 ± 0.33	6.6 ± 0.30	0.76	0.61	0.62
Cooking losses (%)	17.6 ± 1.39	17.6 ± 1.18	16.6 ± 1.14	18.7 ± 1.06	0.97	0.32	0.30
WB (kg/cm^2)	2.7 ± 0.51	2.8 ± 0.46	3.0 ± 0.44	3.4 ± 0.40	0.21	0.56	0.70

L*= lightness, a*= redness, b*= yellowness

IV. CONCLUSION

Focused high-protein supplementation offered to ewes grazing *Campos* grassland during the second third of gestation did not affect carcass characteristics of the progeny while it affected some important meat quality traits such as color and pH. Further research will be needed to explore the specific mechanisms underlying these effects.

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