SPACE ALLOWANCE AND HOUSING CONDITIONS INFLUENCE THE WELFARE AND PRODUCTION PERFORMANCE OF DAIRY EWES

CAROPRESE, M., SANTILLO, A., MARINO, R., BRUNO, A., MUSCIO, A., SEVI, A.

DIPARTIMENTO PRIME AND UNIVERSITÀ DI FOGGIA.

CORRESPONDING AUTHOR: DR. MARIANGELA CAROPRESE, DIPARTIMENTO PRIME, UNIVERSITÀ DI FOGGIA, VIA NAPOLI, 25, 71100 FOGGIA, TEL: 0881589332, FAX: 0881589331, E-MAIL: m.caroprese@unifg.it

Introduction

Space allocation and housing conditions are critical factors for health and welfare of housed animals and it is well known that sheep are less easily accustomed to confinement than other farmed animals (Sevi et al., 1999, 2001). The experiment was conducted to determine the effects of 2 different stocking densities and 2 different housing conditions on welfare, and on production performance of dairy ewes.

Material and methods

Three groups of 15 each, which were separately penned in the same building and balanced in terms of age, body weights and time of lambing. The treatments were:

i) high stock density (HD) with individual ewe having 1.5 m^2,

ii) low stock density (LD) with individual ewe having 3 m^2,

iii) low stock density with external paddock (LDP) with individual ewe having 3 m^2 divided into 1.5 m^2 inside the building and 1.5 m^2 in the external paddock.

Chicken egg albumin (OVA) was injected subcutaneously to assess the humoral immune response. Antibody titers to OVA were determined in blood samples collected immediately before the first antigen injection and then at 20, 40, 60 and 80 days of the study period. The cell-mediated immune status of sheep was evaluated by means of skin-tests which were performed on all the animals at the beginning of the trial, and then during the dry period, the first phase of pregnancy, the transition period and the beginning of lactation. Behavioral observations were recorded once monthly by two trained observers equipped with video cameras. Scan samples were taken every 15 min from 0830 to 1230 and from 1330 to 1730 . After lambing and weaning of lambs, the ewes were machine milked twice daily and milk yield was recorded daily Milk samples were individually collected weekly in 200 ml sterile plastic containers after cleaning and disinfection of teats (70% ethyl alcohol) and discharging the first streams of foremilk. Samples were analyzed for their chemical composition. Data were processed by analysis of variance, using the GLM procedure of SAS (1999).

Results - 1

A higher number of LDP ewes was observed standing and drinking than LD ewes ($P < 0.001$ and $P < 0.01$, respectively). Higher proportions of LD than HD ewes were observed in ambulatory activity ($P < 0.01$). On the contrary, lower proportions of LD than HD were observed drinking ($P < 0.01$); a tendency in higher number of aggressive activities was recorded in HD than in LD ewes ($P < 0.1$). Cell mediated immune responses detected in LDP ewes were higher than LD responses ($P < 0.001$). Mean antibody concentration was higher in LDP ewes than in LD ewes ($P < 0.05$), and in LD than in HD ewes ($P < 0.001$).

Table 2. Least squares means ± SEM of behavioural activities recorded in Comisana ewes subjected to high stocking dendity (HD), low stocking density (LD) and low stocking density with free access to external paddock (LDP).

					Effects, P	
	HD	LD	LDP	SEM	Contrast 1 HD vs LD	Contrast 2 LD vs LDP
Standing, %	79.73	79.82 b	86.51 a	1.37	0.9633	0.0001
Standing idling, %	35.69	33.84	35.03	1.39	0.3442	0.5522
Walking, %	1.02 b	2.05 a	1.48	0.27	0.0072	0.1798
Eating, %	41.42	43.4	44.89	1.89	0.4599	0.5808
Drinking, %	2. a	1.50 b	2.36 a	0.2	0.0012	0.0049
Ruminating, %	18.41	18.63 a	15.23 b	1.1	0.8914	0.0187
Allogrooming, %	0.07	0.11	0.04	0.04	0.6082	0.1724
Selfgrooming, %	0.47	0.47	0.55	0.09	0.9898	0.6017
Crib biting, %	0.02	0.01	0.02	0.01	0.3022	0.3455
Aggresive interactions, n	0.48	0.26	0.41	0.09	0.0884	0.2546

a, b, Means within a row with different superscripts differ ($P < 0.05$).

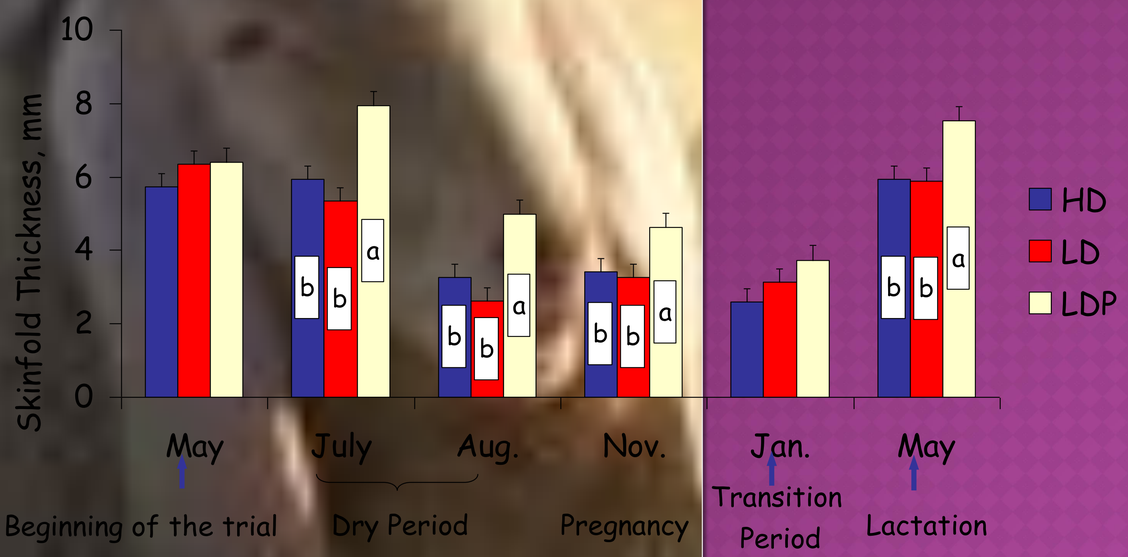

Figure 1 Skinfold thickness (LSM±SE) after phytohemagglutinin injection in Comisana ewe; a,b: $P < 0.05$

Table 3. Least squares means ± SEM of milk yield and milk composition from Comisana ewes subjected to high stocking dendity (HD), low stocking density (LD) and low stocking density with free access to external paddock (LDP).

					Effects, P	
	HD	LD	LDP	SEM	Contrast HD vsLD	Contrast LD vsLDP
Milk yield, g/d	787.18b	973.09a	979.17	53.83	0.0106	0.9420
pH	6.73a	6.66b	6.63	0.02	0.0063	0.1813
Fat, %	6.34	6.19	6.03	0.19	0.5635	0.5784
Lactose, %	4.48	4.57b	4.77a	0.05	0.2395	0.0033
Protein, %	5.54	5.26b	5.53a	0.10	0.0601	0.0300
Casein, %	4.07	3.95	4.01	0.09	0.3530	0.6183
Whey protein, %	1.32	1.23b	1.37a	0.04	0.1185	0.0434
SCC, Log_{10} cells/ml	5.86a	5.61b	5.36c	0.08	0.0362	0.0261

a, b, c Means within a row with different superscripts differ ($P < 0.05$).

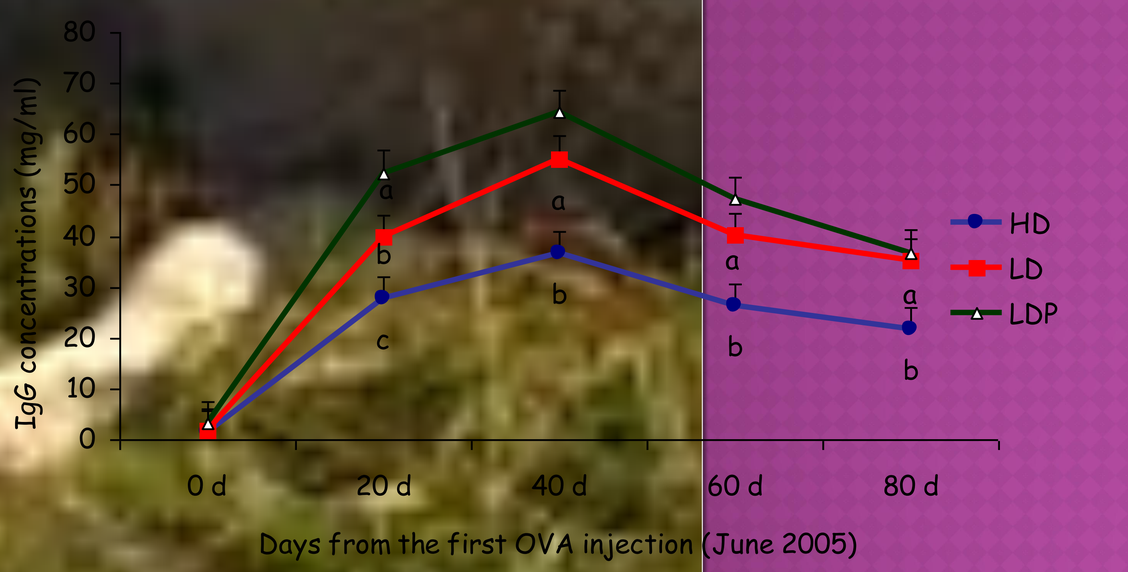

Figure 2 - Antibody response to chicken egg albumin injection (OVA); a,b,c: $P < 0.05$.

Results - 2

Milk yield was lower in HD than in LD ewes ($P < 0.05$); milk from HD animals displayed higher Somatic Cell Count (SCC) than milk from LD ewes ($P < 0.05$). Milk from LDP ewes had higher protein and whey protein contents ($P < 0.05$), and contained more lactose and less SCC than milk from LD ewes ($P<0.01$ and $P<0.05$, respectively).

Conclusions

Data from the present trial showed that a stocking density of 1.5 m^2/animal negatively influenced ewe welfare and production performance, and caused detrimental effects on milk composition and on hygienic quality of milk. The external paddock enhanced cell-mediated response and hygienic quality of milk.

References

SAS User's Guide: Statistics, Version 8.1 Edition. 1999. SAS Inst., Inc., Cary, NC.

Sevi A., Massa S., Annicchiarico G., Dell'Aquila S., Muscio A. 1999. Effect of stocking density on ewes milk yield, udder health and microenvironment. J. Dairy Res., 66, 489-499.

Sevi A., Taibi L., Muscio A., Albenzio M., Dantone D., Dell'Aquila S. 2001. Quality of ewe milk as affected by stocking density and litter treatment with bentonite. It. J. Food Sci., 13, 77-86.

EAAP 2010
61st Annual Meeting of the European Association for Animal Production
AUGUST 23rd-27th, 2010 - HERAKLION, CRETE ISLAND, GREECE