ANNALI

DELLA FACOLTÀ DI AGRARIA DELL'UNIVERSITÀ

SASSARI

studi sassaresi

ORGANO UFFICIALE
DELLA SOCIETÀ SASSARESE DI SCIENZE MEDICHE E NATURALI

Ann. Fac. Agr. Univ. Sassari (I): 1988-1992, 34: 13-21

TRIAL ON USE OF A COMPLETE PELLETED FEED (UNIPELLET) IN LACTATING EWES: metabolic profile results.[1]

Antonio SERRA[2] - Luigi CALAMARI[3] - Vittorio CAPPA[4]
Antonello CANNAS[5] - Giancarlo ROSSI[6]

SUMMARY

A trial was carried out to examine the metabolic and productive effects of a complete pelleted feed (Unipellet) in dairy ewes feeding. 24 Sardinian lactating ewes were divided in 3 groups (A, B, C) and fed with: group A = pasture + pelleted concentrate; group B = alternatively either pasture + Unipellet ad libitum or only Unipellet ad libitum; group C = pasture + Unipellet ad libitum . The intake of concentrate was 756 g/d in the group A, whereas the intake of Unipellet was 998 g/d in the group C and 858 g/d in the group B when the ewes grazed and 2277 g/d when the Unipellet was the only fed. The milk yield of the 3 groups did not differ significatively (g/d 906 vs 1044 vs 975); the milk fat content was highest in the group B (6.42% vs 7.08% vs 6.33%); the milk protein content was highest in the group A and lowest in the group B (6.32% vs 5.55% vs 5.92%). The body weight increased more in the group B. The metabolic profile showed that the Unipellet did not seem to have an adverse effect on the alimentary canal, whereas the function of the liver appeared to be slightly impaired.

Keywords: Dairy ewes, Metabolic profile, Unipellet.

RIASSUNTO

Prova sull'impiego di un alimento unico pellettato (Unipellet) nell'alimentazione delle pecore da latte: risultati dei profili metabolici.

24 pecore in lattazione di razza Sarda sono state divise in 3 gruppi (A, B, C) e alimentate con: gruppo A = pascolo + concentrato pellettato; gruppo B = periodi con pascolo + Unipellet a

---

[1] Lavoro eseguito con il contributo finanziario dell'Assessorato alla Programmazione della Regione Autonoma della Sardegna; Coordinatore del progetto: Prof. G. Rossi; comunicazione presentata al 41° congresso E.A.A.P., Tolosa 9-12/7/1990.

[2] Coordinatore generale - Istituto di Zootecnica - Universita' di Sassari - via De Nicola - 07100 Sassari - Italy; tel. 079/229301-5.

[3] Ricercatore confermato - Istituto di Zootecnica - Universita' Cattolica del Sacro Cuore - via Emilia Parmense 84 - 29100 Piacenza - Italy; tel. 0523/62600.

[4] Professore ordinario di Zootecnica speciale. Ibidem.

[5] Ricercatore - Istituto di Zootecnica, Università di Sassari.

[6] Professore ordinario di Zootecnica generale e miglioramento genetico. Ibidem.

volontà alternati a periodi con solo Unipellet a volontà; gruppo C= pascolo + Unipellet a volontà.
L'ingestione di concentrato è stata di 756 g/d nel gruppo A; l'ingestione di Unipellet è stata di 998 g/d nel gruppo C, mentre nel gruppo B è stata di 858 g/d quando le pecore utilizzavano anche il pascolo e di 2277 g/d quando l'Unipellet costituiva l'unico alimento. La produzione lattea non è stata significativamente differente tra i 3 gruppi (g/d 906 vs 1044 vs 975); il suo contenuto lipidico è stato più alto nel gruppo B (6, 42% vs 7, 08% vs 6, 33%); il suo contenuto proteico è stato più alto nel gruppo A e più basso in quello B (6, 32% vs 5, 55% vs 5, 92%). Il peso vivo è aumentato in misura maggiore nel gruppo B. L'esame dei profili metabolici non ha messo in evidenza effetti negativi dell'Unipellet sul canale alimentare, ma ha mostrato una leggera alterazione della funzionalità epatica.

Parole chiave: Pecore da latte, Profili metabolici, Unipellet.

INTRODUCTION

The alimentation of dairy ewes is grazing supplemented by concentrates fed twice a day at milking time.
If the grazing is poor, it is necessary to feed more concentrates which however does not always produce the expected quantity of milk due to digestive and metabolic disorders caused, more often than not, by the quantity and quality of the fibre and the fact of not being able to feed the concentrates more than twice a day.
The problem can be resolved by using a new type of concentrate that can be fed ad libitum.
Rossi et al. (8) have created a "continuous feeding" pellet, called "Unipellet" and dairy ewes were fed exclusively on this for 20 weeks. Milk production was high and there were no adverse effects either on the health of the sheep or on the quality of the milk (5)(7)(8).
This trial was carried out to examine the effects on milk production of Unipellet in conjunction with grazing. We also studied the effect it had on the metabolism of lactating ewes.

MATERIALS AND METHODS

24 two-year old Sardinian ewes in the second half of lactation were divided into 3 equal groups (A, B, C) and the following feeding program was carried out for 65 days, divided into 5 periods (table 1).
Group A = Grazing during the day + ad lib. ordinary pelleted concentrate at milking time (about 2 hours a day); **group B** = Periods of ad lib. feeding exclusively on Unipellet (*) alternated by periods of grazing during the day and ad lib. Unipellet at night; **group C** = Grazing during the day + ad lib. Unipellet (*) at night.

The chemical composition of the grass grazed, of the ordinary concentrate and of the Unipellet was analysed by ASPA methods (1) and for these last two feeds the average intake for each group was measured.
The milk quantity and quality (fat, protein, lactose and somatic cells) were checked with individual sampling carried out at the end of each experimental period and analysis using Milkoscan 605 and FOSSOMATIC 306.
Each sheep was weighted at the end of 1st, 3rd and 5th period.
Some individual blood samples were taken at the end of 2nd, 3rd, 4th and 5th experimental periods and subjected to haematological analysis (Metabolic Profile). The blood samples were taken from the jugular in the morning before the animal had been fed and Li-heparin was used as an anticoagulate. The samples were centrifuged immediately and the plasma frozen at -20 °C until it was analyzed by Calamari et al. (4).
The data underwent variance analysis for each experimental period and the differences among the groups were tested with Tukey test, after logarithmic change for SCC.

RESULTS AND DISCUSSION

Table 2 shows the chemical composition of the feeds used. The fall in the quality of the grazing as the dry season approached should be noted.
Group C showed the highest daily *intake* (table 1), probably because of a longer access time vs group A and because of it had costant diet during the trial vs group B.

Table 1 - Experimental periods, diets and average individual daily intake of concentrate and Unipellet.

		GROUP A		GROUP B		GROUP C	
			concentrate		Unipellet		Unipellet
N.	days	diet	intake (g)	diet	intake (g)	diet	intake (g)
1	12	P+C	911	U	1683	P+U	787
2	13	P+C	517	P+U	772	P+U	1162
3	13	P+C	703	U	2170	P+U	1229
4	13	P+C	810	P+U	944	P+U	922
5	14	P+C	841	U	2978	P+U	891
Average		P+C	756.4	P+U	858	P+U	998.2
				U	2277		

P = grazing; C = concentrate; U = Unipellet.

Table 2 - Chemical composition (on dry matter) of feeds.

	Concentrate	Unipellet	Grazing periods				Concentrate	Unipellet	Grazing periods		
	gr. A	gr. B and C	1-2	3-4	5		gr. A	gr. B and C	1-2	3-4	5
Dry matter (%)	88.79	89.09	16.44	17.03	23.49	Ca (%)	1.21	1.19	0.40	0.45	0.43
Crude protein (%)	17.60	20.42	18.72	15.41	10.92	P (%)	1.22	0.60	0.56	0.53	0.43
Ether extract (%)	2.30	7.80	4.53	3.98	2.85	Mg (%)	0.50	0.29	0.17	0.18	0.19
N-free extract (%)	61.27	41.87	46.19	48.05	52.28	Na (%)	0.59	0.40	0.19	0.22	0.21
Ash (%)	9.18	10.18	12.68	11.36	10.03	K (%)	0.98	1.39	3.60	3.18	1.77
Crude fibre (%)	9.65	19.73	17.88	21.20	23.92	Cu (ppm)	14.57	13.00	7.67	8.68	5.65
NDF (%)	41.71	43.08	36.08	41.57	46.76	Fe (ppm)	233.01	333.00	162.35	123.93	123.31
ADF (%)	11.91	25.61	22.29	25.43	26.99	Zn (ppm)	183.49	226.00	33.94	32.68	19.04
ADL (%)	2.70	5.40				Mn (ppm)	60.19	98.00	92.85	126.76	170.43

Table 3 - Production and chemical composition of milk and ewes body weight.

	MILK YIELD (g/d)			MILK FAT (%)			MILK PROTEIN (%)		
Periods	A	B	C	A	B	C	A	B	C
Prexperimental	921±363	1149±382	1101±343						
				a	b	c			
1	841±379	957±356	1027±337	5.99±0.73	7.36±0.69	5.81±0.74	6.24±0.45	5.59±0.62	6.04±0.15
							a	b	a
2	1028±465	1159±389	1066±348	5.78±0.85	6.06±0.90	5.74±0.70	6.22±0.42	5.30±0.40	5.82±0.41
							a	b	b
3	886±398	1109±490	928±304	6.89±0.70	7.54±0.97	6.97±0.46	6.64±0.39	5.78±0.29	6.07±0.51
4	991±416	951±290	977±331	6.60±1.08	6.80±1.40	6.48±0.65	6.29±0.066	5.60±0.35	5.92±0.44
				a	b	c			
5	784±395	1044±301	877±360	6.72±0.84	7.71±1.00	6.84±0.50	6.22±0.44	5.56±0.37	5.78±0.51
							a	b	b
Average	906±374	1044±356	975±324	6.42±0.70	7.08±0.88	6.33±0.54	6.32±0.43	5.55±0.36	5.92±0.36
	LACTOSE (%)			SCC (n/ml, *1000)			BODY WEIGHT		
Periods	A	B	C	A	B	C	A	B	C
Prexperimental							45.26±2.76	41.58±6.85	43.68±5.59
1	5.55±0.26	5.26±0.75	5.57±0.21	1550±1477	1372±1967	1326±2047	42.81±2.98	43.39±6.12	42.44±5.48
2	5.63±0.31	5.79±0.26	5.68±0.18	2216±2050	802± 867	1902±2676			
3	5.29±0.21	5.42±0.27	5.35±0.20	2935±2445	1678±1914	1034±1564	45.39±2.80	46.95±6.67	46.11±6.40
4	5.50±0.29	5.48±0.50	5.65±0.23	1973±2305	4554±6129	1663±2797			
5	5.35±0.40	5.42±0.27	5.43±0.34	5061±4351	2136±1913	2406±5168	47.00±3.43	47.40±6.84	47.55±4.19
Average	5.47±0.27	5.49±0.34	5.55±0.19	2662±1542	2035±1426	1652±2416	46.07±2.99	45.31±6.66	45.78±5.27

a, b $\leqslant$ P 0.05.

The *milk production* (table 3) of the three groups did not differ significantly even though there were important differences between group B and the other two groups which were always kept at grazing.
A decrease in milk production was noted when Unipellet was fed exclusively for the first time (1st period), whereas the milk production increased when the ewes grazed (2nd period). A fall in the milk production which occurred when the grazing was poor (in May, 4th period) was followed by a rise in the final period when only Unipellet was fed. The *milk fat* content (table 3) was always higher in group B (statistically significant in periods 1 and 5) especially when only Unipellet was fed, due probably to the higher intake of protected fat (8); the average level in this group was always higher than usually found in milk of Sardinian ewes, whereas in groups A and C the level was similar to the average of this breed.
The *milk protein* content (table 3) was always higher in group A than in group C, which in its turn was higher than group B. The pattern is irregular but it shows clearly the negative influence of Megalac ltd, contained in the Unipellet (5) (8).
The *lactose* content did not vary at all.
The *somatic cells count* fluctuated strongly throughout all the periods and rose considerably as the lactation advanced.
The *body weight* of group B increased during all 5 periods whilst groups A and C showed only slight variations in body weight.

Metabolic profile

The average values of the metabolic profile of the 4 controls (periods 2-5) made in the experiment are shown in table 4.
The energy metabolism did not seem to be affected by the different feeding regimes of the three groups. The *glucose* levels were more or less the same in each group and tended to be low, indicating a lack of energy in the ration, even though this parameter is not particularly indicative of the energy status in ruminants.
The *cholesterol* content was significantly higher in the group B due to the higher average intake of Unipellet in the periods 1, 3 and 5, whose effects continued in the periods 2 and 4. The *urea* is an indicator of the protein metabolism and it was much higher in group B from 3rd period and also in the group C from 4th period. These differences can no doubt be explained by the higher protein intake of the groups being fed on Unipellet, chiefly in the final periods when the grazing became poorer, and also due to the different composition of the energy fraction of concentrate and Unipellet. In fact the higher amounts of fat and structured carbohidrates in the diets B and C could have limited the utilisation of nitrogen in the rumen and help caused an increase in haematic urea. The amount of urea in all three groups is high due not only to the high protein content in the diet but probably also to a higher gluconeogenesis caused by a lack of energy.

Table 4 - Average data of metabolic Profile during the trial.

	PERIOD 2			PERIOD 3			PERIOD 4			PERIOD 5		
	A	B	C	A	B	C	A	B	C	A	B	C
Glucose (mmol/l)	3.60	3.79	3.70	3.32	3.13	3.18	3.87	3.61	3.58	3.24	3.39	3.13
	0.26	0.52	0.29	0.34	0.57	0.30	0.50	0.26	0.25	0.39	0.30	0.30
Urea (mmol/l)	10.00	10.95	10.57	8.83a	12.38b	9.82a	8.20a	10.54b	11.30b	7.18a	10.96c	9.11b
	0.73	0.98	0.65	1.14	1.42	1.04	0.76	0.85	1.18	1.35	0.56	1.27
Calcium (mmol/l)	2.50a	2.86b	2.83b	2.48a	2.98b	2.93b	2.51	2.70	2.83	2.43a	2.83b	2.68ab
	0.22	0.14	0.11	0.32	0.16	0.27	0.29	0.16	0.27	0.28	0.15	0.19
Phosphorus (mmol/l)	2.19	2.04	1.97	1.82ab	2.03a	1.61b	1.91a	1.43b	1.72ab	1.88	1.68	1.55
	0.25	0.30	0.41	0.39	0.43	0.36	0.49	0.48	0.20	0.40	0.42	0.45
Magnesium (mmol/l)	1.04	1.04	1.04	1.09	1.03	1.06	1.02	1.01	1.03	1.08	1.08	1.09
	0.10	0.04	0.04	0.05	0.04	0.04	0.10	0.01	0.04	0.04	0.06	0.05
Sodium (mmol/l)	153.20a	157.00b	154.45a	153.18	152.60	152.56	153.41a	156.24b	158.79c	151.68	151.65	149.80
	1.89	3.12	1.53	2.28	2.46	2.19	1.49	1.94	2.74	6.84	3.17	5.07
Potassium (mmol/l)	4.58	4.78	4.65	5.09	5.08	4.97	5.08	4.67	4.67	4.64	4.91	4.83
	0.38	0.21	0.44	0.62	0.40	0.40	0.42	0.38	0.79	0.63	0.46	0.68
Chloride (mmol/l)	103.29	104.50	104.13	107.00	104.38	104.75	110.25	109.50	111.50	121.25	116.50	118.63
	1.80	1.85	1.36	2.39	2.45	3.54	1.75	1.93	1.77	13.63	11.34	10.60
Zinc (mmol/l)	17.74	19.52	18.61	17.29	21.50	19.56	17.85a	19.32ab	21.36b	17.97	18.95	17.39
	3.30	2.87	2.34	2.77	4.69	2.02	3.11	1.82	2.63	2.43	2.12	3.66
Ceruloplasmin (mmol/l)	2.88	3.01	3.35	3.24	2.91	3.25	2.83	3.23	3.21	2.95	3.05	3.64
	0.50	0.75	0.59	0.89	0.72	0.44	1.07	0.43	0.39	1.10	0.65	1.18
Total protein (g/l)	75.06	75.41	78.74	76.59ab	74.77a	78.47b	76.31a	76.50a	80.59b	74.27	73.92	77.86
	4.40	3.31	2.16	2,54	3.11	2.42	0.49	4.33	3.29	3.44	4.02	3.09
Globulin (g/l)	44.29	44.35	47.46	45.79	43.76	46.81	45.04	44.86	48.36	43.49	42.88	46.31
	4.19	3.27	2.16	2.45	3.02	2.12	2.52	4.04	3.15	2.99	3.70	3.39
Albumin (g/l)	30.77	31.06	31.27	30.80	31.01	31.66	31.27a	31.64a	32.23b	30.79	31.05	31.55
	0.52	0.59	0.75	0.46	0.71	0.89	0.54	0.85	0.63	0.72	0.67	0.63
GOT (U/l)	152.91	177.99	182.82	125.28	129.34	130.35	147.54	156.31	181.70	138.17	147.48	148.66
	46.23	50.47	47.09	16.57	14.62	30.36	29.43	83.94	48.27	31.01	22.64	40.31
GGT (U/l)	80.51	87.44	89.54	81.9	107.13	90.39	79.70	107.67	85.94	74.01	102.44	75.59
	21.41	20.21	18.30	21.27	40.26	21.22	21.10	53.72	16.63	14.58	48.75	12.06
Cholesterol (mmol/l)	1.58a	2.78b	1.93a	1.69a	2.91b	1.91a	1.72a	2.12b	1.94ab	1.47a	2.81b	1.67a
	0.24	0.75	0.28	0.29	0.94	0.23	0.26	0.42	0.13	0.21	0.87	0.16
Bilirubin (mmol/l)	1.91a	3.07b	3.03b	2.22a	2.88ab	3.41b	1.91a	2.26ab	3.03b	2.00a	3.41b	2.74b
	0.27	0.87	1.25	0.81	0.91	1.35	0.26	0.54	0.59	0.44	1.14	1.01

a, b, c $\leq$ P 0.05.

The haematic *phosphorus* shows a pattern difficult to interpret; many ewes in the groups B and C had less than 1.3 mmol/l, which is the minimum for dairy cows (4), even if theoretic requirements are met (6).
Magnesium, *sodium*, *potassium* and *chloride* levels were normal with very slight differences among the groups. An impaired function of alimentary canal of the sheep in group A could have produced endotoxins with resultant low levels of *calcium* and *zinc* (2) (3).
The *total proteins* were highest in the group C; however this may not be significant as the time variations of this parameter are rather slow and because there were already differences at the start of the trial.
Concerning the hepatic function the *bilirubin* content was always lower in the group A, the *GOT* did not vary at all and the *GGT* , at first similar, show a tendency to increase ($0.1 \leqslant P \leqslant 0.2$, in the 5th period). Instead the *albumin* are always higher in the group C. It is difficult to judge the hepatic function on the basis of these parameters because there were already differences, except for the GOT, from the beginning.

CONCLUSIONS

The following conclusions can be drawn from the results obtained:
- there was a high intake of Unipellet either alone or combined with grazing;
- milk production was not adversely affected by sudden feeding changes from grazing + Unipellet to Unipellet only;
- the quality of the milk has been affected by Unipellet: the differences found in the fat can be attributed to the use of Megalac ltd;
- the use of Unipellet produced an intake of protein higher than requirements causing an increase in haematic urea, chiefly when the sheep were not at grazing;
- Unipellet did not seem to have an adverse effect on the alimentary canal. The function of the liver appeared to be slightly impaired but this has to be confirmed.

(*) Composition: beet pulp; cotton seeds; corn grain; alfaalfa hay; sugar cane molasses; barley grain; soybean meal solv-extd 44%; wheat straw; Megalac ltd; lignosulfonate; premix.

LITERATURE CITED

1) ASPA - "Commissione valutazione alimenti" (1980). Valutazione degli alimenti di interesse zootecnico. 1) Analisi chimica - (Evaluation of feeds in animal production). Zoot. Nutr. Anim., *6*:19-34.
2) BERTONI G., PICCIOLI CAPPELLI F., CALAMARI L., TREVISI E. (1989) - Digestive upsets of ruminants: possible role of endotoxins and /or histamine. Proc. VIIth Int. Conf. Production Disease in farm animals, New York : 370.
3) BERTONI G., PICCIOLI CAPELLI F., CALAMARI L., GALIMBERTI A. (1990) - On the histaminolytic role of ceruloplasmin (EC 1.16.3.1). Seventh International Symposium on trace elements in Man and Animals. Dubnovnik, 20-25 maggio 1990.
4) CALAMARI L., BERTONI G., MAIANTI M., CAPPA V. (1989) - Sull'utilità di nuovi parametri ematochimici nella valutazione del profilo metabolico nelle lattifere - (The usefullness of new hematochemical parametres in the assesemet of the metabolic profile of dairy cows). Zoot. Nutr. Anim., *15*: 191-210.
5) CAMPUS R.L., PAPOFF. C.M., CANNAS A., SERRA A. (1990) - Effetto della grassatura e della concentrazione proteica della razione sulla composizione azotata e sulla attitudine alla coagulazione del latte di pecore di razza Sarda - (The effect of fat addition and of protein level of the diet on nitrogen compounds and clotting parameters of the milk in Sarda dairy ewes). Proc. of IX Congresso Nazionale della S.I.P.A.O.C., Grado (UD), 20-22/6/1990.
6) JARRIGE (1988) - Alimentation des bovins, ovins the caprins. I.N.R.A.: 249-271.
7) PULINA G., SERRA A., CAMPUS R.L., PAPOFF. C.M.. (1990) - Effetto della grassatura e della concentrazione proteica della razione sulla composizione acidica del grasso del latte di pecore di razza Sarda - (The effect of fat addition and of the protein level of the diet on milk fat acid composition in Sarda dairy ewes). Proc. of IX Congresso Nazionale della S.I.P.A.O.C., Grado (UD), 20-22/6/1990.
8) ROSSI G., SERRA A., PULINA G., CANNAS A., BRANDANO P. (1990) - L'utilizzazione di un alimento unico pellettato (Unipellet) nell'alimentazione delle pecore da latte. I. Influenza della grassatura e del livello proteico sulla produzione quanti-qualitativa di latte in pecore di razza Sarda - (The use of a complete pelleted feed (Unipellet) in dairy ewes feeding. I. The effect of the addition of fat and of the protein level on quantity and quality of milk in Sarda ewes). Zoot. Nutr. Anim., 1990, *17*(1): 2-34.

The assistance of Mr. A. Mazza, of A.R.A. laboratories (OR) and of Dr. A. Salis (Silos e Mangimi Martini s.p.a.) is gratefully acknowledged.

Lavoro pervenuto in redazione il 30-9-1990.

Gli estratti possono essere richiesti a:
Dott. Antonio Serra - Istituto di Zootecnica - Università di Sassari - Via De Nicola - 07100 Sassari - Italy - Tel. 079/229301-8.