

A note on the performance of crossbred lambs fed a concentrate mixture containing a high level of double improved rapeseed oilmeal

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ABSTRACT

Two groups ($n=30$) of crossbred lambs (25% Polish Merino, 25% Booroola and 50% Suffolk) were intensively fattened from the age of 8 weeks until reaching a body weight of 35 kg. Group II received a pelleted concentrate containing 207 g of crude protein (CP)/kg of dry matter (DM) and 12.5 MJ of metabolizable energy (ME)/kg DM and group I was fed a concentrate with a similar nutritional value (202 g CP/kg DM and 12.7 MJ ME/kg DM) but soyabean oilmeal and dried sugar beet pulp were substituted by solvent-extracted rapeseed oilmeal (25% in mixture) and oats, respectively. Lambs of both groups consumed a similar quantity of DM, CP and ME (respectively 85 g, 17g and 1.1 MJ/kg $W^{0.75}$ and 77 g, 16 g and 1.0 MJ/kg $W^{0.75}$ for group I and II), irrespective of the type of concentrate offered. Daily weight gains of lambs from group I (290 g) were lower ($P<0.05$) than those of lambs from group II (325 g). No significant differences between groups were observed in the intake of CP or ME per kg of weight gain (group I – 649 g and 40.8 MJ and group II – 595 g and 35.9 MJ). The cost of concentrate used for the production of 1 kg of liveweight was similar in both groups.

KEY WORDS: lambs, fattening performance, rapeseed oilmeal

INTRODUCTION

Solvent extracted rapeseed oilmeal obtained from double improved rapeseed is a valuable feed due to its high protein content and favourable amino acid composition (Gwiazda et al., 1996). However, the comparatively high content of crude fibre and the presence of antinutritional components in rapeseed oilmeal (Sionek

et al., 1994; Gwiazda et al., 1996) restricts its use as a substitute for soyabean oilmeal in concentrates designated for suckling lambs (Potkański et al., 1991; Urbaniak and Potkański, 1991). The results of other investigations (Potkański et al., 1987 a,b; Pakulski and Osikowski, 1993) point to the possibility of total replacement of soyabean oilmeal with rapeseed oilmeal in concentrates for older lambs, weaned at the age of 3 or 4 months and fattened to a liveweight of 40-45 kg. However, there is insufficient information on the use of solvent-extracted rapeseed oilmeal as the main protein source in concentrates for the intensive fattening of young lambs. On the other hand, substituting soyabean oilmeal with rapeseed oilmeal markedly decreases the cost of concentrates. This problem is gaining importance since the meat utilization of sheep directed at the production of slaughter lambs is steadily increasing in Poland.

The present work was aimed at determining the production results of growing crossbred lambs, intensively fattened on a concentrate in which, in order to lower feed price, soyabean oilmeal and dried sugar beet pulp were substituted by solvent extracted rapeseed oilmeal and oats, respectively.

MATERIAL AND METHODS

The experiment was conducted on 30 crossbred lambs (25% Merino, 25% Booroola and 50% Suffolk) born in twin (n=9), triple (n=10) and quadruple (n=11) litters. After weaning at the age of 8 weeks the lambs were kept in individual pens and fattened intensively until reaching a liveweight of 35 kg (± 1 kg). During the fattening period the lambs were allocated to groups by similar liveweight, age and type of birth (8 rams and 7 ewes in each group) and were fed *ad libitum* a pelleted (0.5 cm) concentrate (Table 1) in which rapeseed oilmeal obtained from double

TABLE 1

Composition of concentrates, %

Ingredient	Concentrate mixture	
	I	II
Rapeseed oilmeal	25.0	0
Soyabean oilmeal	0	17.0
Ground field bean	10.0	13.0
Ground barley	44.1	47.0
Ground oats	17.0	10.0
Dried sugar beet pulp	0	9.1
Minerals	2.9	2.9
Beet molasses	1.0	1.0
Price of concentrate, %	100	110

improved rapeseed (Group I) or soyabean oilmeal (Group II) constituted the main source of protein. In order to ensure proper rumen function, the lambs additionally received about 100 g of hay/day (not recorded), which they did not consume in full. During the fattening period the quantities of concentrates consumed were recorded individually.

The proximate analysis of feeds was performed using standard methods. The metabolizable energy of feeds was calculated on the basis of the results of chemical analysis using the equation proposed by MAFF (1975). The results obtained were elaborated statistically using analysis of variance (Harvey, 1990).

RESULTS

Concentrates fed to both groups (Table 2) had a similar content of crude protein (202 g and 207 g/kg DM for groups I and II, respectively) and ME (12.7 MJ and 12.5 MJ/kg DM for group I and II respectively). The concentrate containing rapeseed oilmeal had a higher content of crude fibre and ether extract (78 and 52 g/kg DM, respectively) than that composed of soyabean oilmeal (65 and 17 g/kg DM, respectively). The acid detergent lignin content was twice as high in the concentrate containing rapeseed oilmeal (37 vs 16 g/kg DM). Calculated per metabolic body weight ($W^{0.75}$), consumption of DM of both concentrates (Table 3) was similar (85 vs 77 g). Also, there were no significant differences between groups in the consumption of CP (17 vs 16 g) and ME (1.1 MJ vs 1.0 MJ). However, lambs receiving the concentrate with rapeseed oilmeal (group I) consumed significantly ($P < 0.01$) more crude fibre and ether extract (7 and 5 g, respectively) than did

TABLE 2

Chemical composition (g/kg DM) and energy value (MJ/kg DM) of feeds

Item	Concentrate mixture		Meadow
	I	II	hay
Dry matter, g/kg	873	869	857
Organic matter	922	943	933
Crude ash	78	57	67
Crude protein	202	207	122
Crude fibre	78	65	312
Ether extract	52	17	19
N-free extractives	590	654	480
NDF	208	201	632
ADF	111	87	355
ADL	37	16	43
Metabolizable energy, MJ	12.7	12.5	10.3

animals fed the concentrate containing soyabean oilmeal (4 vs 1 g, respectively). Despite the same age (54 days) and similar liveweight (16-17 kg) at the beginning of the fattening period (Table 4) lambs receiving the concentrate with rapeseed oilmeal achieved significantly ($P < 0.05$) lower daily weight gains (290 g) than those fed soyabean oilmeal (325 g). The intake of CP and ME per kg of liveweight gain from both the concentrates offered was similar (Table 5) and amounted to 649 g and 40.8 MJ, respectively for group I and 595 g and 35.9 MJ, respectively for group II. In both groups the relative cost of concentrate consumed per kg of weight gain was similar (I – 100 and II – 98%).

TABLE 3

Intake of dry matter, nutrients and metabolizable energy, g and MJ/kg $W^{0.75}$

Ingredients	Group		Sex		Type of birth			SEM
	I	II	males	females	2	3	4	
Dry matter	85	77	78	85	82	80	82	2.4
Organic matter	79	73	73	79	77	75	76	2.3
Crude protein	17	16	16	17	17	18	17	0.5
Crude fibre	7 ^A	5 ^B	6	6	6	6	6	0.2
Ether extract	4 ^A	1 ^B	3	3	3	3	3	0.1
N-free extractives	50	51	48	53	51	50	51	1.5
NDF	18 ^a	16 ^b	16	17	17	16	17	0.5
ADF	10 ^A	7 ^B	8	8	8	8	8	0.3
ADL	3 ^A	1 ^B	2	2	2	2	2	0.1
ME, MJ	1.1	1.0	1.0	1.1	1.0	1.0	1.0	0.03

^{a, b} – $P < 0.05$; ^{A, B} – $P < 0.01$

TABLE 4

Age, liveweight and liveweight gain of lambs

Indices	Group		Sex		Type of birth			SEM
	I	II	males	females	2	3	4	
Age, days								
initial	54	54	54	54	54	54	55	0.5
final	118	113	114	117	114 ^a	109 ^A	123 ^B	1.8
Days of fattening	64	59	60	63	60	55	68	1.8
Liveweight, kg								
initial	17.1	16.0	15.5 ^a	17.6 ^b	15.6 ^a	18.5 ^b	15.6 ^a	0.48
final	35.2	34.8	35.2	34.8	35.4	34.9	34.7	0.17
daily gain, g	290 ⁱ	325 ^h	335 ^A	280 ^B	332	305	285	8.2

^{a, b} – $P < 0.05$; ^{A, B} – $P < 0.01$

TABLE 5

Utilization of dry matter, nutrients and metabolizable energy, g and MJ/kg gain

Indices	Group		Sex		Ty pe of birth			SEM
	I	II	males	females	2	3	4	
Dry matter	3210	2874	2855	3230	3011	3096	3020	93.5
Organic matter	2961	2711	2660 ^a	3011 ^b	2808	2886	2813	86.5
Crude protein	649	595	583 ^a	660 ^b	616	633	617	18.9
Crude fibre	250 ^A	187 ^B	206	231	215	222	218	7.1
Ether extract	166 ^A	49 ^B	103	112	102	109	111	4.5
N-free extractives	1896	1880	1768 ^a	2008 ^b	1875	1922	1867	56.2
ME, MJ	40.8	35.9	36.0	40.7	37.9	39.0	38.1	1.18
Cost of concentrates, %	100	98						

^{a, b} - P<0.05; ^{A, B} - P<0.01

DISCUSSION

The concentrate feeds used in the present investigations were of a similar nutritional value and met the recommendations for intensive fattening of lambs (Ryś, 1996). As shown by other authors in experiments conducted on lambs (Pakulski and Osikowski, 1993), substituting soyabean oilmeal with rapeseed oilmeal had no detrimental effect on the palatability of the concentrate. During fattening, lambs from both groups consumed a similar quantity of DM when calculated per kilogram of metabolic body weight ($W^{0.75}$). Also, no significant differences were observed when analyzing the consumption of CP and ME. In turn, the differences in the consumption of crude fibre, its fractions, and ether extract, observed in favour of lambs fed the concentrate with rapeseed oilmeal resulted from the mentioned difference in the content of those components in the concentrates tested. Lambs receiving the concentrate containing rapeseed oilmeal (the rapeseed oilmeal CP constituted about 48% of the total CP in the concentrate) had lower growth rate and their daily weight gains were about 10% lower than those of lambs fattened on the concentrate containing soyabean oilmeal (the soyabean oilmeal CP constituted about 41% of the total CP in the concentrate). Similar relations were reported by Potkański et al. (1991) in an experiment on lambs fattened with their dams from birth to 100 days of life. This negative reaction of suckling lambs to the total substitution of soyabean oilmeal by rapeseed oilmeal (20% in the concentrate) was eliminated if about 10% of soyabean oilmeal was retained in the concentrate (Urbaniak and Potkański, 1991). When fattening older lambs (over three months old) the inclusion of 20-30% of rapeseed oilmeal (Potkański et al., 1987 b) or in a quantity introducing even 56% of total protein in the concentrate (Pakulski and Osikowski, 1993) did not negatively affect the fattening results (daily liveweight

gains from 225 g to 250 g). No significant differences were also observed in apparent digestibility and nitrogen retention between lambs fed concentrates containing rapeseed or soyabean oilmeal (Potkański et al., 1987 a). However, in another work (Żebrowska et al., 1991), in which the CP of rapeseed oilmeal constituted about 40% of the total CP in the diet, a significantly higher apparent digestibility was observed for the diet containing soyabean oilmeal as well as a generally higher nutritional value of the soyabean protein. The lower body weight gains obtained in the present investigations by lambs fed a concentrate with rapeseed oilmeal were probably caused by its poorer nutritional value and substitution of dried sugar beet pulp by oats. Similarly as in the investigations reported by Ringdorfer and Niżnikowski (1993), the concentrate containing rapeseed oilmeal ensured daily weight gains of about 300 g. However, in other investigations conducted on the same flock (Janiuk et al., 1998), the three-breed lambs showed a greater potential for growth (over 350 g/day). Thus, in case of intensive fattening of lambs, where daily weight gains are expected to exceed 300 g, feeding concentrates containing 25% of rapeseed oilmeal may mean poorer fattening results.

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STRESZCZENIE

Produkcijność jagniąt-mieszaińców intensywnie tuczonych mieszanką treściwą z udziałem poekstrakcyjnej śrutę rzepakowej „OO”

Dwie grupy (n = 30) jagniąt-mieszaińców (25% merynos polski, 25% booroola i 50% suffolk) po odłączeniu od matek w wieku 8 tygodni intensywnie tuczono granulowanymi mieszankami treściwymi o zbliżonej wartości pokarmowej (Grupa I – 202 g białka ogólnego (b.og.)/kg suchej masy (sm) i 12.7 MJ energii metabolicznej (EM)/kg sm; Grupa II – 207 g b.og./kg sm i 12.5 MJ EM/kg sm) do uzyskania masy ciała 35 kg. W okresie tuczu jagnięta (8 tryczków i 7 maciorek w każdej grupie) żywiono do woli (indywidualna kontrola pobranych pasz treściwych) mieszanką treściwą z udziałem poekstrakcyjnej śrutę sojowej i suszonych wysłódków buraczanych lub mieszanką treściwą, w której śrutę sojową i wysłódki zastąpiono poekstrakcyjną śrutą rzepakową „OO” (25%) i ziarnem owsa. Jagnięta podczas tuczu pobrały w przeliczeniu na 1 kg metabolicznej masy ciała ($W^{0.75}$) zbliżoną ilość suchej masy, białka ogólnego i energii metabolicznej (Grupa I - odpowiednio 85 g, 17 g i 1.1 MJ; Grupa II - odpowiednio 77 g, 16 g i 1.0 MJ) niezależnie od rodzaju skarmianej paszy treściwej. Dobbwe przyrosty jagniąt żywionych mieszanką treściwą z 25% udziałem śrutę rzepakowej (290 g) były istotnie ($P \leq 0.05$) niższe niż przyrosty jagniąt otrzymujących mieszankę ze śrutą sojową (325 g). Typ urodzenia nie miał istotnego wpływu na wyniki tuczu.

Koszt paszy treściwej potrzebnej do wyprodukowania 1 kg żywca był zbliżony w obydwóch grupach jagniąt.