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Pasture feeding of lambs with and without supplements in the conditions of Lapland

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Abstract. The need for feeding supplements to lambs on pasture was studied in 1977–1979 in northern Lapland at 69° 40' N and 27° 05' E, where the pasture period lasts from mid June to mid September. Lambs fed on pasture alone were compared with animals whose diet was supplemented with a barley-oats meal mixture (1:1), given at the level of 400–500 g/animal/day, or large-leaved turnip (Teutoburger), offered *ad libitum*. The age of the lambs at the beginning of the experiments averaged three months.

The live-weight gain of the lambs receiving supplemental feeds did not differ significantly ($P < 0.1$) from that of the lambs on only pasture feeding, though the supplements tended to have a favourable effect during the second part of the pasture period, or at the beginning of August. The slaughter criteria were better, however, for the lambs receiving supplements.

Teutoburger turnip proved to be a good and palatable feed for lambs on pasture. Since it gives good yields even in northern Lapland, Teutoburger can be recommened for northerly regions where cereal crops do not ripen. The growth of lambs in Lapland seems to be decreased by mosquitoes and gnats.

Introduction

In the most important sheep husbandry countries, the feeding of sheep is based on large pasture areas, and the sheep are left out on pasture nearly all the year round. In Finland the climatic conditions restrict the pasture period to 3–5 months.

Such conditions greatly decrease the economic feasibility of raising lambs on pasture, especially in Lapland, a region lying at the limit of crop cultivation. Special attention has to be paid to the productivity of the pasture, grazing techniques and supplemental feeding. The production of lamb meat on pasture feeding alone can rarely compete with that based on high-concentrate feeding. However, if the aim is to depend entirely on local resources, grazing is almost the only possibility in areas where grain production is not successful.

The purpose of this study was to investigate the growth of lambs on pasture in the conditions of northern Lapland. The experiments were made in 1977–79 at Muddusjärvi experimental farm, owned by the University of Helsinki. This farm is one of the world's most northerly agricultural stations, being situated in Inari commune at 69° 40' N and 27° 05' E. In that area, the growing period, or the period when the average daily temperatures are permanently over +5°C, lasts

approximately 125 days (in Helsinki 175 days). In summer the sun does not set for 64 days, the time of continual light lasting from 22 May until 24 July. The pasture period is usually the time from the middle of June to the middle of September.

Materials and methods

Animals and feeding

The lambs were born in March–April and their age at the beginning of the experiments averaged three months. In 1977 the experiment comprised 34 lambs, in 1978 47 lambs and in 1979 22 lambs. In 1979 only female lambs were used (SYRJÄLÄ 1981a), and the male and female lambs used in 1978 and 1979 were kept separate. All the lambs were finnsheep. They were weaned from their mothers and put out to pasture in the middle of June. The experimental periods started one or two weeks later and lasted until the end of the grazing season. The periods were about 10–12 weeks, as follows:

20. 6.–12. 9. 1977
3. 7. –14. 9. 1978
3. 7.–10. 9. 1979

Before the beginning of the experiments the lambs were divided into two groups with similar distributions by sex, parents, age and weight: a pasture group and a concentrate group. In the pasture group the animals were raised throughout the experiment on pasture grass alone. In the concentrate group they received supplemental feed. During the first part of the experiment in 1977 the feed consisted of a grain concentrate mixture (barley-oats meal mixture 1:1), offered at the average rate of 500 g/animal/day, and in the second part of the experiment large-leaved turnip (Teutoburger) was given *ad libitum*. In 1978 and 1979 the same barley-oats meal mixture was given as supplemental feed throughout the experiment, at the average rate of 400 g/animal/day. The concentrates were offered twice a day.

A mineral mixture was available to all the animals in the form of licking stone. It consisted mainly of NaCl, with small amounts of Mg, Mn, Zn, Cu, Co and J.

The lambs were weighed every second week.

Pastures

The pasture for the lambs was planted with a seed mixture in which timothy predominated. A basic fertilizing mixture was applied in spring, to give the rates of 90 kg P, 90 kg K and 90 kg N per hectare, and later in summer at the rate of 70 kg N.

The total pasture area ranged from 2 to 3 ha in the different years and it was divided with net or electric fences into eight blocks, four for each experimental group. Not all the blocks were used for grazing, however, the surplus grass in some blocks was cut for silage or hay.

During grazing the blocks were changed 2–3 times a month. Before the lambs were put on a new block, grass samples were taken from this block to measure the

yield, chemical composition and feeding value of the pasture (ERIKSSON et al. 1972, SYRJÄLÄ 1972, 1975, SYRJÄLÄ et al. 1978).

Results

Feeding value of the pastures

The chemical composition and nutritive value of the pasture grass was good during all the experiments (Table 1). The crude protein content was more than 20 % and the crude fibre content less than 25 % of the dry matter. The dry matter content varied, however. In most samples it was about 20 %, but it sometimes decreased to about 16%, especially towards the end of August. In 1979 it was also as low as this at the beginning of July.

The *in vitro* digestibility of the organic matter was about 70 % at the beginning of the experiments, but had decreased to 60 % by the end of the experiments. This decrease was clearest in 1979.

The total yields from the pasture were high, over 3000 f.u./ha. In some cases this value is based on both the grass used for grazing and the grass used for silage and hay.

Live-weight gain

There were no significant differences in the growth of the lambs between the pasture and concentrate groups ($P > 0.1$). In 1977 the daily live-weight gain of the animals in both groups was best at the end of June; in the pasture group it averaged 286 g/animal and in the concentrate group 221 g (Fig. 1). The average daily live-weight gain for the whole experiment in 1977 was exactly the same in the two groups, 135–136 g/animal.

Table 1 The mean chemical composition and nutritive value of the pasture grass in differet years.

	1977	1978	1979
Dry matter	21.9	19.1	17.7
% of dry matter:			
Ash	7.7	8.2	8.7
Organic matter	92.3	91.8	91.3
Crude protein	21.5	20.4	21.1
Crude fat	3.7	4.2	4.2
N-free extract	44.1	42.3	42.0
Crude fibre	23.0	24.9	24.0
kg/f.u.[1]	5.4	6.6	6.0
DM kg/f.u.[2]	1.19	1.21	1.21
DCP g/f.u.[3]	189	184	189
DCP % in DM	15.8	15.6	15.4
Digestibility of OM[4]		66.6	63.8

[1] 1 feed unit (f.u.) = 0.7 starch unit

[2] DM = dry matter

[3] DCP = digestible crude protein

[4] OM = organic matter

In 1978 the lambs in the concentrate group grew a little better, especially after July, than those in the pasture group (Fig. 2), but the difference was not significant ($P > 0.1$). The average daily live-weight gains for the whole experiment in 1978 were 112 g/animal in the pasture group and 135 g in the concentrate group. In 1979, on the other hand, the average growth was better in the pasture group than in the concentrate group, though not significantly so ($P > 0.1$), the respective daily gains being 129 and 119 g/animal (Fig. 3).

Slaughter results

Slaughter results are available for only 41 lambs in 1978 and 16 in 1979. There were some differences in the criteria between the groups (Table 2). The carcass percentage of the lambs in the concentrate group in 1978 was 38 % and differed significantly ($P < 0.1$) from that in the pasture group, which was 35 %. In

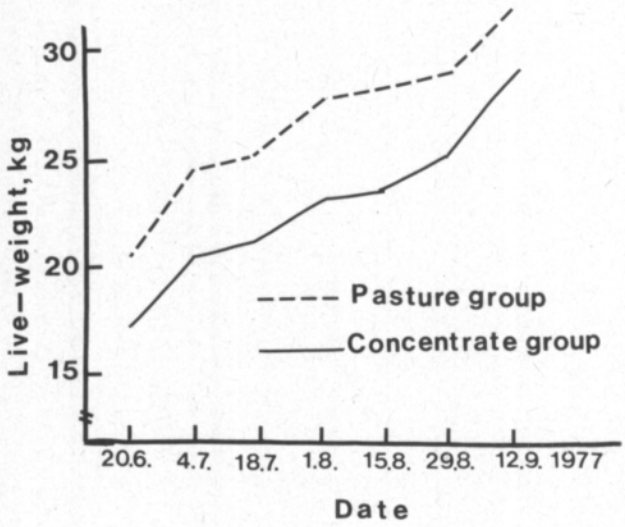

Fig. 1. Live-weight gain of lambs in 1977.

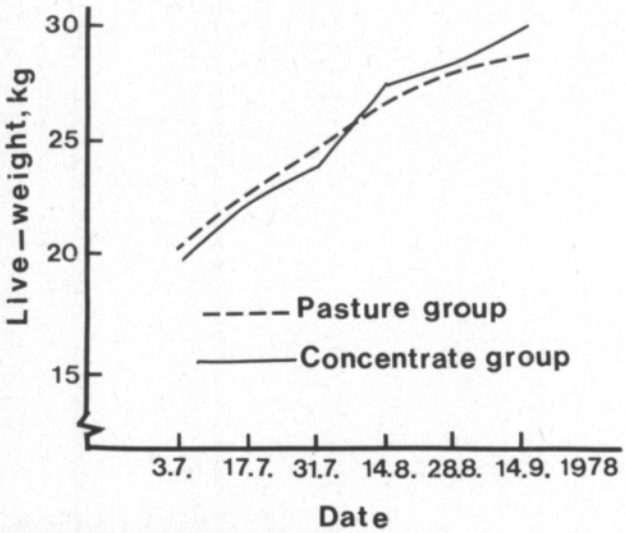

Fig. 2. Live-weight gain of lambs in 1978.

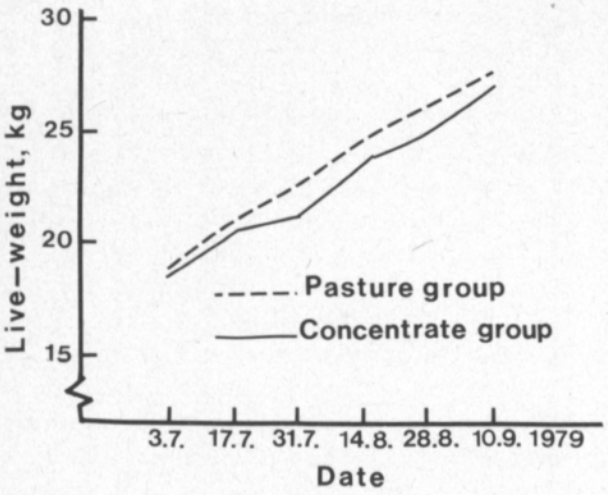

Fig. 3. Live-weight gain of female lambs in 1979.

1979 this value was the same in the two groups, about 36 %. The carcasses had more lean meat in the concentrate group than in the pasture group, in which the lambs were somewhat thinner. The amount of fat was also fairly good in the concentrate groups, whereas in the pasture groups it was poor.

Discussion

The live-weight gains of the lambs were rather small, in spite of the the fact that the pastures were fairly good throughout the experiments and the grazing density was not very high, generally 15—20 lambs/ha. In experiment made in central Finland (SORMUNEN 1979) better growth was obtained at a grazing density of 17 lambs/ha than of 25 or 33 lambs/ha.

The barley-oats mixture used in these experiments contained 1.1 f.u./kg and 86 g DCP/f.u. In the concentrate groups the lambs daily received about 0.4 f.u. and 32—40 g DCP from this mixture. These values represent about half of their energy

Table 2. Slaughter results.

	1978		1979	
	Pasture group	Concentrate group	Pasture group	Concentrate group
Live weight, kg	28.4	29.2	26.7	26.1
Carcass weight, kg	9.9	11.0	9.6	9.6
Dressing %	35	38	36	36
Quality points (10—20) (poor—excellent)	12.7	13.3	14.6	14.0
Qyality class, % of lambs				
I (good)	18	47	86	67
II (medium)	77	47	4	33
III (poor)	5	6	0	0
Fatness of carcass, % of lambs				
T (fat-free)	91	53	100	55
A (thin fat cover)	9	47	0	45

requirements and one third of their protein requirements, if the requirements of lambs at 20—30 kg live-weight and at daily growth rate of 200 g are assumed to be 0.76 f.u. and 99 g DCP per day (ANON 1978).

Large amounts of concentrate have been shown to decrease the utilization of pasture, especially when the grazing density is low (NEWTON and YOUNG 1974). The intake of pasture grass decreased linearly, as the amount of concentrate increased (ALLDEN 1969). A daily concentrate ration of 100 g diminished the intake of pasture grass by 8 % (MARTINSON 1979). In contrast to these results in some other experiments the lambs clearly grew better if concentrate was fed as a supplement to the pasture (LARGE and SPEDDING 1964, ANTILA 1976). Supplemental feeding is necessary when the grazing density is high or in late summer, when the nutrient requirements of the lambs increase, and the production of pasture herbage slows down (STEEN et al. 1972). It is also possible that the low dry matter content of the pasture grass decreases the intake and thus reduces the energy supply from the pasture. The dry matter of some pasture samples in the present experiments was as low as 16 %.

Teutoburger turnip was roughly equivalent to grain concentrate as a supplement to pasture. It also proved to be very palatable, gaining the highest possible points in the palatability test (SYRJÄLÄ 1981b). The yields of this large-leaved turnip in Lapland conditions were fairly good, about 7—8 tons of dry matter per hectare. Since it is available for feeding just at the time when a supplement to pasture is needed, or from the middle of August, it can be strongly recommended in Lapland, when the aim is to depend solely on local resources. Cereal crops do not ripen in northern Lapland, and grain has to be brought up from the more southern parts of Finland.

The low growth rates of the lambs can also be caused by mosquitoes and gnats, which occur in great number at a certain time in Lapland. During the worst mosquito period, the lambs are restless and keep moving all the time. In a preliminary test arranged during that period, lambs treated daily with mosquito oil or spray continued to grow normally, whereas untreated lambs stopped growing (SYRJÄJÄ 1981c). All the lambs were healthy during the present experiments, and no diarrhea was observed.

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SELOSTUS

Lisärehun tarve karitsoiden laidunruokinnassa Lapin olosuhteissa

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Helsingin yliopiston omistamalla Muddusniemen Tutkimusasemalla (nyk. Muddusjärven opetus- ja koetila) Inarissa selvitettiin vuosina 1977–79 lisärehun tarvetta karitsoiden laidunruokinnassa. Kunakin vuonna oli kokeessa kaksi ryhmää: 1) Laidunryhmä, joka oli koko koekauden pelkällä laidunruoholla ja 2) Lisärehuryhmä, joka sai laitumelle lisärehuna viljaväkirehua (ohra-kauraseos 1:1) 400–500 g/eläin/pv tai naattinaurista (Teutoburger). – Laidun oli timoteivaltaista nurmea ja laiduntamistiheys 15–20 karitsaa/ha.

Vuonna 1977 oli kokeessa 34 karitsaa, vuonna 1978 47 karitsaa ja vuonna 1979 22 uuhikaritsaa. Kokeet aloitettiin kesäkuun loppupuolella tai heinäkuun alussa ja lopetettiin syyskuun puolivälissä. Karitsoiden ikä kokeiden alkaessa oli keskimäärin kolme kuukautta.

Laidun- ja lisärehuryhmien karitsoiden kasvussa ei ollut merkitseviä eroja. Vastaavat keskimääräiset päivittäiset kasvut koko kokeen aikana olivat seuraavat: v. 1977 135 ja 136 g, v. 1978 112 ja 135 g, v. 1979 129 ja 119 g. Teurastulokset sensijaan olivat lisärehuryhmien karitsoilla paremmat kuin laidunryhmien karitsoilla. Teurasprosentti oli v. 1978 laidunryhmällä 35 ja lisärehuryhmällä 38. V. 1979 se oli molemmilla ryhmillä 36. – Sääsket ja mäkäräiset heikensivät karitsoiden kasvua.

Tutkimustulokset osoittivat, että kesä- ja heinäkuun aikana lisärehu on tarpeetonta, jos laitumet ovat hyvässä kunnossa. Elokuun alkupuolelta lähtien lisärehu sensijaan parantaa kasvu- ja teurastuloksia. Naattinauris osoittautui maittavaksi sekä satoisaksi lisärehuksi Pohjois-Lapin olosuhteissa.