CROSSING EXPERIMENTS WITH THE THOKA GENE FROM ICELANDIC SHEEP

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INTRODUCTION

The detection of a major gene for fecundity in Icelandic sheep (Jonmundsson and Adalsteinsson, 1983) has revealed a potentially valuable source of increased prolificacy. This discovery in a dual purpose breed makes the Thoka gene more immediately useful than that of other major genes in other breeds, such as the Booroola gene in Merinos. The benefits of using rams homozygous for the gene to sire more prolific daughters has been demonstrated by Adalsteinsson et al, (1989). The present report describes preliminary experiments with the introduction of the gene to some British breeds.

MATERIAL AND METHODS

Through the kind cooperation of the Agricultural Society of Iceland and a great deal of help from Dr. O.R.Dyrmundsson deep frozen semen was obtained from two Icelandic rams. The first ram, No 81001 was homozygous for the Thoka gene and the second, No 83002 was believed to be heterozygous. Recipient ewes were synchronised with sponges and a small dose of PMS. Inseminations were carried out by the laparoscopic intra-uterine method.

In the first year ewes of three breeds were inseminated as follows: 30 North Country Cheviots, 30 Welsh Speckedfaces and 25 Scottish Blackfaces. All the ewes were mature except for the Scottish Blackfaces which included 10 ewe lambs. The number of live lambs obtained from each breed were 12 Cheviot, 8 Speckleface and 3 Blackface crosses. In the next year a few more Welsh Speckledface breed were inseminated producing 4 lambs. Why the overall pregnancy rate was so low is not known but the conditions for AI were not optimal. All surviving ewe lambs were kept for breeding and also a selection of ram lambs. The reproductive performance of the first cross females to date has been summarised.

Second crosses to the Cheviot breed were produced by mating 4 of the first cross rams to Cheviot ewes. These ewes were crosses between the North Country and the smaller South Country Cheviot. From these matings a total of 76 ewe lambs were kept as potential breeding animals. When they were approximately 18 months of age they were all sponged and given a low dose of PMS in order to synchronise oestrous to allow the determination of ovulation rate by laparoscopic examination. Due to pressures on space it was necessary to reduce numbers and all ewes not coming into heat (14) and those with a single ovulation (12) were culled.

Second crosses to the Speckledface breed were also made using 4 first cross rams. One of the rams used, (A), proved to be sub-fertile but nevertheless produced some progeny. The daughters obtained from all these matings were challenged with 500 i.u. HCG when prepubertal (approximately 5-6 months of age) and the number of corpora lutea counted by laparoscopy.

RESULTS

The reproductive performance of all the first cross females surviving to breeding age is summarised in Table 1

Table 1 Performance of first cross females
Numbers born/ewes exposed

Breed cross	Sire	Nos	1 Year Old	2 Years Old	3 Years Old
Cheviot	81001	5	n e	14/5	9/5
	83002	2	n e	4/2	4/2
Welsh Speckledf.	83002	5	7/5	12/5	4/2
Scot. Blackface	83002	1	2/1*	2/1*	4/1

n e not exposed to ram * ewe aborted in both years

The average levels of performance are all high compared to those expected for young sheep of the maternal breeds.

Table 2 Ovulation rates of second cross ewes

Breed	Sire	Grandsire	Failed to ovulate	Ovulated No	Ovulated Av. count
Chev.	6501	83002	6	19	2.05
Chev.	6504	83002	3	11	2.18
Chev	6508	83002	4	16	2.13
Chev.	6514	81001	1	15	2.07
Spkl.	405	83002	0	6	1.83
Spkl.	407	83002	0	2	2.00
Spkl.	A	83002	0	5	2.80*
Spkl.	B	83002	3	10	1.40

* includes one count of 9 corpora lutea.

The second crosses of the Cheviots and the Welsh Speckledfaces were measured for ovulation rate and the results are shown in Table 2 grouped according to their sires.

Although the average number of corpora lutea in those ewes that ovulated was quite high the range of numbers observed was low with two exceptions : one example of 4 in the Cheviot crosses and a remarkable 9 in one Speckledface ewe.

The lambing results are shown in Table 3. For the Cheviot crosses contemporary results were available for North Country, South Country and North Country x South Country Cheviots of the same age kept on the same farm. (Sourhope in Roxburghshire).

Table 3 Lambing results of second cross ewes

Sire	Grandsire	No of ewes exposed	No of ewes lambing	Av number lambs born
Cheviot crosses (lambing at 2 years of age)				
6501	83002	14	14	1.78
6504	83002	10	10	1.20
6508	83002	12	11	1.45
6514	81001	12	11	1.73
All 2nd cross ewes		48	46	1.56
N Country Cheviot		41	41	1.20
S Country Cheviot		47	47	1.08
N x S C. Cheviot		146	135	1.12
Speckledface crosses (lambing at 1 year of age)				
A	83002	15	13	1.08
B	83002	35	19	1.26
C	83002	13	12	1.08
All 2nd crosses		63	44	1..16

The average performance of all second cross Cheviot ewes compared favourably with that of both North and South Country Cheviot ewes. The numbers will have been enhanced a little by the culling of ewes that, prior to mating, failed to ovulate or were found to have only one corpus luteum. This effect will have been small but probably useful in arriving at a more productive flock. The potential effectiveness of this form of culling is shown by comparing the subsequent litter sizes of ewes retained with their ovulation rates pre-mating. Ewes with ovulation rates of 2 averaged 1.40 lambs born while those with 3 or more ovulations averaged 1.79.

If the sire 83002 was indeed heterozygous then segregation would be expected in his progeny. This seems to be borne out in that the son No 6504 produced daughters with a low litter size, although this difference was not apparent from the earlier counts of corpora lutea in those ewes that had ovulated.

The Speckledface crosses lambed at one year of age so that high litter sizes are not expected. However, 7 of these ewe lambs that produced twins were kept for a second lambing and produced 15 lambs showing that high levels of prolificacy are potentially available with this cross.

CONCLUSIONS

The results from introducing the Thoka gene from the Icelandic breed to two British breeds suggest that useful increases in prolificacy can be obtained. In the young ages of ewe reported on here the increases in litter size are not excessive and should be capable of accommodation within existing husbandry systems where provision is made for multiple births.
Following the segregation of the gene is not easy but can be helped by measurement of ovulation rates. These measurements should be particularly useful in building up homozygous stocks which would appear to be the key to widespread application of this technology.

REFERENCES

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