

Wool Characteristics of Romanov × Targhee Crossbred Ewes in Comparison to Finn × Targhee Crossbred Ewes

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Summary

Fleeces of 41 Romanov × Targhee (RT) ewes and of 34 Finn × Targhee (FT) ewes collected at the Spooner Agricultural Research Station in Wisconsin were analyzed at the Wool and Mohair Research Lab, Texas Agricultural Experiment Station, San Angelo, TX. Each fleece was weighed, subsampled and tested for yield, fiber diameter, staple length, medullated and colored fibers. The FT ewes produced heavier ($P < 0.05$) fleeces but RT fleeces were higher ($P < 0.05$) yielding. Average fiber diameter was not different ($P > 0.05$) between crosses but the standard deviation was higher ($P < 0.05$) in the case of RT wool. Staple length was not different ($P > 0.05$) between genotypes. The percentage of medullated fibers was higher ($P < 0.05$) in RT compared to FT fleeces. Further work is required to more accurately establish colored fiber content in RT and FT fleeces.

Key words: Finn, Romanov, Targhee, wool.

Introduction

Reduction in the quantity and an increase in average fiber diameter (AFD) and average staple length (ASL) of Rambouillet, Targhee and Columbia wool resulted from the introduction of $\frac{1}{4}$ and $\frac{1}{2}$ of the prolific Finn breed (Drummond et al.,

1980; Ercanbrack and Knight, 1985). Nevertheless, the Finn has been used commercially in the U.S. because the loss in value of wool production is economically of much less importance than the gains made in weight of lamb weaned. Although wool from FT crosses is substantially coarser ($> 3 \mu\text{m}$ in yearlings) than from purebred Targhees, the coarser wool has generally proved acceptable to the wool textile industry because of the absence of colored fibers and the low content of medullated fibers. In contrast, the 1986 introduction of another prolific breed, the Romanov, to North America immediately raised concerns that crossbreeding to increase prolificacy would concurrently result in non-saleable wool since the Romanov fleece is typically composed of a colored, coarse (40 to 150 μm), medullated outercoat and a relatively fine (16 to 22 μm) and usually white undercoat (McClelland, 1990). McClelland pointed out that such concerns were not justified because first crosses between Romanov and white-face breeds produce white adult fleeces even though many lambs appear black, gray or fawn at birth. Unfortunately, many white-face sheep (commercial and purebred) carry genes for color and such sheep, though white in appearance, will invariably produce offspring with colored wool when crossed with the Romanov. To date, very little objec-

tive data are available for Romanov crossbred wools to either sustain or placate strong concern expressed by the textile industry. This study was conducted to generate baseline information concerning the quantity and quality of the wool produced by Romanov crossbreds in comparison to that of contemporary Finn crossbreds.

Material and Methods

Romanov × Targhee (RT) and Finn × Targhee (FT) ewes were produced at the Agricultural Research Station, University of Wisconsin in Spooner, WI, by mating Targhee ewes of mixed age with either Romanov rams or Finn rams. Matings took place in the fall of 1987, 1988, 1989 and 1990. Romanov and Finn rams were borrowed from the USDA Meat and Animal Research Center, Clay Center, NE. Each year, four different rams of each breed were used in order to minimize a possible ram effect. From birth and throughout their lives, RT and FT ewes were kept under identical intensive farm management. As a general practice, all ewes were half-crutched (removal of soiled wool

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around the vulva, udder and half-belly) in early January in preparation for the February/March lambing. Ewes were shorn in mid-April.

In May of 1991, the fleeces of 41 RT ewes (18 from three-year-old, third shearing; 23 from two-year-old, second shearing) and of 34 FT ewes (16 from three-year-old, third shearing; 18 from two-year-old, second shearing) were sent to the Wool and Mohair Research Lab, Texas Agricultural Experiment Station, San Angelo, TX. Each fleece was weighed, subsampled (Johnson and Larsen, 1978) and tested for clean wool fiber present (CWFP; American Society for Testing and Materials [ASTM], 1990a), average fiber diameter (AFD) and distribution (Lynch and Michie, 1976), average staple length (ASL) and distribution (ASTM, 1990b), medullated (med and kemp) and colored fibers (ASTM, 1990d).

Data were analyzed using the General Linear Model Procedure of SAS (SAS, 1985). Duncan's Multiple Range Test (SAS, 1985) was used to identify

significant differences ($P < 0.05$) between mean values.

Results and Discussion

The wool characteristics of FT ewes in this study (Table 1) are quite similar to the values given for the same type of crosses by Drummond et al. (1980), Ercanbrack and Knight (1985), and even to 1/4-Finn ewes as given by Lewis and Burfening (1988). Since the FT ewes used in this study appear to be typical, the comparison of these fleeces to the fleeces of RT ewes appears to be valid.

Fleece Weight

The FT ewes produced more ($P < 0.05$) grease wool than RT ewes (3.87 and 3.08 kg, respectively). Although the estimated CWFP of FT ewes was slightly lower ($P < 0.05$) than RT ewes (62.52 and 65.25%, respectively), FT ewes produced more ($P < 0.05$) clean wool (2.42 and 2.00 kg, respectively).

Three-year-old FT ewes produced more ($P < 0.05$) grease and clean wool than two-year-old FT ewes

whereas no difference due to age was observed between two- and three-year-old RT ewes.

Average Fiber Diameter

In this experiment, RT ewes produced somewhat finer wool than FT ewes but the observed difference was not significant ($P > 0.05$). Wool from both genotypes had an average fiber diameter in the range 26 to 27 μm . However, the variability (standard deviation, SD) of fiber diameter was greater ($P < 0.05$) in RT ewes than in FT ewes (6.91 and 5.96 μm , respectively) but not above the allowable range (7.09 to 7.59 μm) for wool of such diameter (ASTM, 1990e). For RT ewes, the range of individual fleece AFDs was 23.06 to 30.48 μm (with corresponding SD ranging from 4.68 to 8.35 μm), this being very similar to the range for FT ewes, which was 23.36 to 30.37 μm (SD: 3.94 to 8.00 μm).

Among FT ewes, no difference ($P > 0.05$) in AFD was found between two- and three-year-old ewes whereas two-year-old RT ewes produced finer

Table 1. Least square means of wool characteristics of Romanov \times Targhee (RT) and Finn \times Targhee (FT) crossbred ewes.

Breed	Number	X (SE)								
		Grease fleece wt., kg	Clean fleece wt., kg	Estimated CWFP, %	Average fiber diameter, μm	SD of fiber diameter, μm	Staple length, cm	SD of length, cm	Kemp fibers, %	Med fibers, %
FT	34	3.87 ^a (0.14)	2.42 ^a (0.09)	62.52 ^a (0.69)	26.81 (0.34)	5.96 ^a (0.16)	10.54 (0.22)	1.27 (0.05)	0.07 ^a (0.03)	0.13 ^a (0.04)
FT, 2nd shearing	18	3.44 ^b (0.13)	2.15 ^b (0.09)	62.70 (1.10)	26.21 (0.42)	5.89 (0.24)	10.23 (0.13)	1.27 (0.10)	0.08 (0.06)	0.13 (0.08)
FT, 3rd shearing	16	4.36 ^a (0.19)	2.72 ^a (0.13)	62.32 (0.84)	27.48 (0.50)	6.05 (0.20)	10.90 (0.28)	1.27 (0.08)	0.06 (0.03)	0.14 (0.04)
RT	41	3.08 ^b (0.09)	2.00 ^b (0.06)	65.25 ^b (0.56)	26.09 (0.32)	6.91 ^b (0.13)	10.06 (0.22)	1.32 (0.08)	0.48 ^b (0.08)	0.75 ^b (0.12)
RT, 2nd shearing	23	3.15 (0.08)	2.05 (0.06)	64.98 (0.59)	25.32 ^b (0.33)	6.74 (0.17)	10.51 ^b (0.23)	1.37 (0.10)	0.45 (0.11)	0.83 (0.19)
RT, 3rd shearing	18	2.97 (0.19)	1.94 (0.11)	65.58 (1.05)	27.08 ^a (0.52)	7.12 (0.19)	9.47 ^a (0.46)	1.24 (0.10)	0.51 (0.10)	0.65 (0.15)

^{a,b} For a specific comparison, means within the same column with different superscripts letter differ ($P < 0.05$).

($P < 0.05$) and more uniform wool than the three-year-olds.

Staple Length

No difference was observed in the overall ASLs of the FT and RT fleeces. Both genotypes produced staples measuring between 9.5 and 10.9 cm, which is quite adequate for wools of this type.

Staples were longer ($P < 0.05$) for the two-year-old RT compared to the three-year-old RT ewes. However, there was no difference ($P > 0.05$) in ASL between two- and three-year-old FT ewes.

Medullated Fibers

A medullated fiber is one that includes a medulla, the more or less continuous cellular marrow inside the cortical layer. By definition (ASTM, 1990d), a med fiber is a medullated fiber in which the diameter of the medulla is less than 60% of the diameter of the fiber. A kemp fiber is a medullated fiber in which the diameter of the medulla is 60% or more of the diameter of the fiber. Knowledge of the incidence of med and kemp fibers in wool is of importance to manufacturers of woven and knitted fabrics because of the apparent dye resistance and light reflectance qualities of these fibers. From a practical point of view, kemp fibers produce greater visual and esthetic problems than med fibers.

Overall, RT fleeces contained higher ($P < 0.05$) proportions of kemp (0.48 vs. 0.07%, respectively) and med (0.75 vs. 0.13%, respectively) fibers than the FT fleeces, irrespective of animal age.

The percentages of ewes with medullated fibers and the amount and range of medullated fibers in the fleeces are presented in Table 2. Kemp fibers were found in 29% of the FT fleeces in amounts ranging from 0.1 to 1.1%. In contrast, kemp fibers were found in 88% of the RT fleeces in amounts ranging from 0.1 to 2.5%. However, 58% of these fleeces had 0.5% or less, which is the upper level of the acceptable limit for a wool of this grade. This wide range of kemp levels in these 41 ewes indicates that a selection program against kemp might be feasible. However, such a program would likely not be of interest to commercial Romanov breeders whose primary concern is lamb production.

Med fibers are present in both FT and RT fleeces but in a significantly greater amount ($P < 0.05$) in RT fleeces. Med fibers were found in 47% of FT fleeces in an amount ranging from 0.1 to 1.4% and 88% of RT fleeces in an amount ranging from 0.1 to 3.8%.

Neither kemp nor med fibers were found in 47% of FT fleeces compared to 5% for RT fleeces. Wool from RT

ewes was significantly more medullated than wool from FT ewes.

Medullated fibers are not uncommon in other commercially important breeds such as the Polypay and Dorset. Stobart et al. (1986) found that in samples of wool taken from the U.S. Sheep Experiment Station Polypay flock, all age groups contained some medullation in amounts ranging from 0.2 to 1.6%.

Colored fibers. Thirty-two half-inch core samples were removed from each fleece. These cores were completely homogenized during a scouring operation to determine CWFP. After drying, a small sample of clean fiber was removed from the bulk, sectioned and distributed on a microscope slide. Colored (stained and pigmented) fiber content was estimated concurrently with determination of medullated fibers. One thousand individual fiber snippets (being representative of the whole fleece) were projected and inspected for color on a white screen, using a magnification of 500X. Colored fibers were observed in none of the FT fleeces and in only one of the RT fleeces in the amount of 0.7%. The general absence of colored fibers in the fleeces of mature RT ewes was somewhat surprising considering that 67% of all RT lambs were born with bi- or tri-colored coats. However, this color was observed to disappear two to three months after birth (Berger, 1991). This observation is similar to the one made earlier by McClelland (1990).

Although superficially encouraging, these observations should not allay industry fears concerning colored fiber content of fleeces from RT crossbred ewes. Where colored fiber content is important in white and pastel shades, the industry discriminates against wool top containing only four colored fibers per ounce. Assuming 26- μ m fibers each 10 cm long having a density of 1.304 g/cm³, one ounce would contain more than 409,000 fibers. Obviously, the industry is discriminating at a much lower level than was used to estimate colored fibers in this experiment. The presence of one RT fleece (3.00 kg) containing 0.7% colored fibers in a bale of white wool would be enough to contaminate over

Table 2. Proportion of ewes with medullated fibers, and means and ranges for FT and RT ewes.

Percentage of	Breed (SE)	
	FT	RT
Ewes with kemp fibers	29	89
Ewes with med fibers	47	88
Ewes with medullated fibers	53	95
Mean kemp content ^a	0.24 (0.10)	0.54 (0.08)
Range of kemp content	0.1 to 1.1	0.1 to 2.5
Mean med content ^b	0.28 (0.08)	0.85 (0.08)
Range of med content ^b	0.1 to 1.4	0.1 to 3.8
Mean total medullation ^c	0.40 (0.10)	1.25 (0.16)
Range of total medullation ^c	0.1 to 2.5	0.1 to 4.5

^a For the fleeces containing kemp.

^b For the fleeces containing med.

^c For the medullated fleeces.

1400 kg of clean wool at the level of four fibers per ounce. Further work is required to more accurately establish colored fiber content in fleeces of this type. This might be achieved by scouring and carding individual fleeces and measuring colored fiber content on card sliver using a standard method (e.g., ASTM, 1990c).

Conclusions

Compared to Targhee ewes, RT crossbreds produce less, coarser and more medullated wool. The RT crossbred ewes in this experiment also produced less wool than their FT counterparts. However, average fiber diameters were similar although the variability of diameter was greater in the RT fleeces. This experiment suggested low incidence of colored fibers in this particular Romanov × Whiteface crossbreed. However, actual levels were not accurately established. Excessive amounts of kemp (and med) fibers in individual RT fleeces is cause for concern since this alone will disqualify RT wool from certain end uses. Over time, selection against kemp might result in less medullation in the RT crossbreed. In the meantime, we expect more producers will use Romanov breeding to increase lamb production, despite the anticipated loss of wool income. Those producers would be well advised to package their Romanov, Romanov crossbred and other whiteface wool separately to avoid downgrading their whole clip.

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