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STUDIES ON INBREEDING IN SHEEP

III.—The Effects of Inbreeding on Fleece Weight and Staple Length of No-Tail Sheep

By

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SUMMARY

The records of a closed no-tail flock of sheep raised by the South Dakota Agriculture Experiment Station, covering a period of 13 years and five generations were analyzed. The aim of this study was to evaluate the effect of inbreeding of individual, dam and sire on fleece weight and staple length on no-tail sheep.

It was found that Inbreeding of the individual had a slight detrimental effect on staple lenght, with no effect on grease fleece wieght. A decrease of 1.15 inch in staple length was caused by an increase of 10% in the inbreeding of the individual. Inbreeding of dams and sires had no significant effect on fleece wieght and staple length of their offspring.

INTRODUCTION

The cheif genetic effect of inbreeding is to decrease heterozygosity, or in other words to increase the purity of the inbred flock. Increased purity of flock is sought because it tends to increase uniformity in breeding performance.

Fleece weight and staple length are two of the important characters in determining the wool value of breeding sheep since they influence the price as well as the amount of clean wool. The effects of inbreeding of lamb, dam and sire on fleece weight and staple length of no-tail sheep were studied in this work.

MATERIAL AND METHODS

Data used in the present study were taken from the breeding records for no-tail sheep flock raised by the South Dakota Agriculture Experiment Station Yearling fleece weight and staple length records covering a period of 13 years (1947–1960) were taken in this study. Records on 249 individuals were used. The yearling fleece weight was recorded to the nearest 0.1 pound, while the yearling staple length was measured to the nearest 0.1 inch on the sheep before shearing.

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The animals included in the study were sired by 33 different rams. The methods used for calculating the coefficient of inbreeding were previously reported by Ghoneim and McCarty (1967). The methods suggested by Snedecor (1959) for statistical analysis were followed.

RESULTS AND DISCUSSION

The Effect of Inbreeding of Individual, Dam and Sire on Fleece Weight of the Individual

Inbreeding of individual effect.

The results presented in Table 1 show that inbreeding of individuals increased gradually from 9.7% in the first generation to 23.6% in the fifth generation. There was a slight increase in fleece weight during this period of time.

No significant correlation or regression was found between fleece weight and inbreeding of individuals, except for the fifth generation for which significant negative correlation was observed. This might be due to the few number of animals available in the fifth generation (Table 2).

The pooled regression coefficient for the five generations (—.153) was non-significant. This means that inbreeding of the individual did not affect grease fleece weight significantly in the no-tail flock. This is in accordance with the results of Hazel and Terrill (1946) and Terrill *et al* (1948) on Rambouillet yearling ewes and Columbia and Targhee rams. However, the present results are not in agreement with those reported by Terrill *et al* (1947 & 1948) who stated that inbreeding had a significant effect on grease fleec weight in yearling Columbia and Targhee ewes and Rambouillet rams.

Inbreeding of dam effect.

Inbreeding of dams decreased from 13.2% in the first generation to 8.6% in the second generation. It increased gradually thereafter till the fifth generation (Table 1).

TABLE. 1.—Inbreeding, fleece weight and staple length for the generations studied

Generation	No. of animals	No. of sires	Average inbreeding for			Fleece weight pounds	Staple length inches
			Individuals %	Dams %	Sires %		
1	42	8	9.7	13.2	10.9	7.29	3.01
2	76	18	15.9	8.6	20.1	7.33	3.07
3	80	17	19.5	14.7	19.8	7.38	3.68
4	43	9	23.5	19.8	19.3	7.38	3.87
5	8	5	23.6	21.5	18.3	7.51	3.81

TABLE 2.—RELATIONSHIP BETWEEN INBREEDING AND FLEECE WEIGHT

Generation	d.f.	For inbreeding of individual		For inbreeding of dam		For inbreeding of sire	
		r	b	r	b	r	b
1	40	—.229	—.363	—.370*	—.808*	—.014	—.027
2	74	—.013	—.026	—.039	—.025	—.128	—.117
3	78	—.055	—.145	—.001	—.003	—.151	—.332
4	41	—.035	—.087	—.116	—.514	—.182	—.761
5	6	—.725*	—2.352	—.599	—4.538	—.155	—.153

* $P<.05$.

The estimates of correlation and regression for inbreeding of dam and fleece weight of its offspring were not statistically significant, except for the first generation (Table 2). The pooled regression coefficient for the five generations (—.161) was not significant. Therefore, inbreeding of dam had no significant effect on fleece weight of its offspring in the no-tail flock.

Inbreeding of sire effect.

The inbreeding of sires increased from 10.9% in the first generation to 20.1% in the second generation and then decreased slightly through the fifth generation (Table 1). All the estimates for correlation and regression for fleece weight and inbreeding of sires were very small and non-significant. Also, the pooled regression coefficient for the five generations (—.165) was not significant. It was concluded that the inbreeding of sire had no effect upon the fleece weight of his offspring.

THE EFFECT OF INBREEDING OF INDIVIDUAL, DAM AND SIRE ON STAPLE LENGTH OF THE INDIVIDUAL

Inbreeding of individual effect.

There was a slight increase in staple length from the first to the fifth generation (Table 1). A significant negative correlation and regression was observed between the inbreeding of individuals and staple length for the first generation. The estimates for the other generations were not statistically significant (Table 3).

The pooled regression coefficient for the five generations (—.115) was statistically significant. This means that one should expect a decrease of 1.15 inch in staple length with every increase of 10 per cent in the degree of inbreeding of the individual.

The present results which show a depressing effect of inbreeding of the individual on staple length are in agreement with those reported by Hazel and Terrill (1945 & 1946) on Rambouillet lambs at weaning age and Rambouillet yearling ewes. However, Hazel and Terrill (1946) studying weanling traits of Columbia, Corriedale and Targhee lambs, and Terrill *et al* (1947 & 1948) with yearling Columbia and Targhee ewes and rams, stated that staple length was not effected by the percent of inbreeding to any measurable extent.

Inbreeding of dam effect.

The estimates for correlation and regression for staple length and inbreeding of the dam were statistically significant for the fourth generation only. The estimates for the other generations were not significant (Table 3). The pooled regression coefficient for the five generations (—.076) was non-significant. Hence, inbreeding of dams had no significant effect on staple length of their offspring.

Inbreeding of sire effect.

All the estimates for correlation and regression (Table 3) for staple length and inbreeding of sires were very small and non-significant. The pooled regression coefficient for the five generations (-.046) was not significant. Therefore, inbreeding of sire had no effect on the staple length of his offspring.

TABLE 3.—RELATIONSHIP BETWEEN INBREEDING AND STAPLE LENGTH

Generation	d.f.	For inbreeding of individual		For inbreeding of dam		For inbreeding of sire	
		r	b	r	b	r	b
1	40	—.363*	—.193*	—.161	—.118	—.203	—.134
2	74	—.039	—.032	—.130	—.083	—.101	—.093
3	78	.030	.046	.079	.091	.013	.017
4	41	—.225	—.282	—.539**	—1.05**	.113	.209
5	6	—.171	—.232	.122	.384	.045	.018

* P<.05 ** P<.01.

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دراسات عن تأثير تربية الأقارب فى الأغنام

٣ ـ تأثير تربية الأقارب على وزن الجزة وطول الخصلة فى الأغنام عديمة الذيل

الملخص

حللت سجلات قطيع الأغنام عديمة الذيل التى تربى بمحطة تجارب جامعة سوث داكوتا بأمريكا لدراسة تأثير تربية الأقارب على كمية الصوف وطول الخصلة .

وقد وجد أن زيادة معامل تربية الأقارب فى الأفراد وقد سبب نقصا فى طول الخصلة بينما لم يكن له تأثير معنوى على كمية الصوف التى ينتجها الحيوان . فكل زيادة قدرها ١٠٪ فى معامل تربية الأقارب للفرد يسبب نقصا فى طول خصلة الصوف بمقدار ١٥و١ بوصة . كما وجد أن معامل تربية الأقارب للآباء والأمهات لم يؤثر تأثيرا معنويا على كمية الصوف وطول الخصلة فى أبنائها .