Productivity of the Libyan Barbary Sheep in Relation to Face Color

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ABSTRACT

The Libyan Barbary breed is generally white in color with black, brown, white or more rarely pied face and legs. Over the course of several thousand years, the breed has become fully suitable to the semi-arid and desert conditions of Libya. An experiment was carried out at Al-Fateh University Sheep Experiment Station near Tripoli to compare the productivity of the three main face colors. The flock was sorted according to face color into four groups, representing the black, brown, white and mixed face color ewes. The animals of each group were mated with rams of the same color for two consecutive years. The traits measured on ewes were fertility, greasy fleece weight and staple length, while those measured on lambs were survival and weights at birth, weaning and at monthly intervals over a period of three months post weaning.

The results obtained showed no significant differences in fertility, birth weight, survival of lambs to weaning and weaning weight between the different face color. The lack of superiority of any face color in these traits was exaplained by the hypothesis that there is probably little genetic differences between the three main face colors.

Face color was associated with significant variation in post weaning weights and fleece weight. Lambs from the brown faced ewes were from 2.0 to 6.0 kg heavier in post weaning weights than lambs from the white faced ewes. There appeared to be no difference between lambs from brown and black faced ewes. White faced ewes produced 0.30, 0.35 and 0.23 kg more fleece than the black, brown or mixed color ewes, respectively. Further studies are recommended to establish the inheritance of color in the Libyan barbary sheep before selection could be applied to develop strains within the breed that excelling in postweaning weights or those excelling in wool production. The effects of sex and environmental factors on the different traits studied were also evaluated.

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INTRODUCTION

Of the estimated 4.5 million sheep in Libya, probably over 95 per cent belong to the fat-tailed, coarse-woolled Barbary breed. Over the course of several thousands of years, the Libyan Barbary has become fully adapted to the semi-arid and desert conditions of Libya. The weight of unimproved Barbary rams varies between 40 and 60 kg and of ewes 35 to 50 kg (22). The head of the Libyan Barbary is usually straight in profile, though it may be slightly convex in rams. The ears are long, flat and pendulous. Rams nearly always carry large horns that are strongly striated and curve backward and downward with tips directed outward. Rams with four horns are occasionally encountered in some flocks. Ewes are usually polled, but scars or rudimentary horns are common. The fat tail is wide and relatively short, usually ending above the hocks. It is a simple pendulous tail without the sigmoid flexure that characterizes some fat tail breeds such as the Awassi. Its fat content may vary greatly (up to 4-5 kg) depending on the animal's condition.

The Libyan Barbary is generally white in color with brown, black, white or more rarely pied face and legs. The color extends occasionally to cover the neck. The dominant types, however, are the black, brown or white face and they exist in approximately equal proportion among flocks. Surveying many flocks, it has been the author's observation that the black or brown face animals tend to be heavier sheep, while the white face sheep are better in wool quantity and quality. The present work was designed to compare the three main colors with respect to variation in the economically important traits. Such information could be of assistance in planning breeding schemes for improving sheep in the country.

MATERIALS AND METHODS

Experimental groups and management:

This work was carried out at the University of Al-Fateh Sheep Experiment Station located near Tripoli at latitude 32° 52′N and longitude 13° 13′ E. In 1982, the flock was sorted according to face color into four groups. Group 1, 2 and 3 were ewes with black, white and brown faces, respectively. Ewes of group 4 included pied ewes, together with some mixed black and brown face ewes (to serve as control). The number of animals in each group was 30 ewes. Animals in which the fleece color extended to cover the neck and shoulder, or those with spots on their bodies were excluded since their existence in common flocks is very rare.

The ewes of each group were joined with rams of the same colour (pen-mating) for a period of 45 days commencing early May. In 1983, the same procedure was followed and 16 black faced ewes were added to group 1. It was established that the average performance of group 4 was not different from the mean of the population and therefore was not repeated in 1983.

After joining, all groups were maintained and managed as one flock. They were vaccinated against enterotoximia and sheep pox, drenched and dipped once a year to control internal and external parasites, and shorn once a year during the month of April.

The sheep were fed a concentrate mixture that contained 14% CP (0.5 kg per head) and wheat or barley straw (2-3 kg per head) on a daily basis except during the summer months when the ration was increasd up to 0.7 kg. During the spring months the flock

was grazed on limited natural pasture for 2-3 hours daily.

Throughout lambing, the new born lambs were identified, eartagged and weighed within 12 hours of birth. Lambs remained, with their dams until weaning age at 120 days. After weaning, the lambs were fed about 200g of concentrate mixture increasing gradually to reach 500-600g per head daily in addition to 2-3 kg of wheat or barley straw.

Traits studied:

The performance traits measured on ewes were % ewes lambing to ewes joined (fertility), greasy fleece weight and average staple length (from mid side, back and shoulder areas of each fleece). The traits measured on lambs were birth weight, weaning weight and live weight at monthly intervals over a period of three months post weaning. Survival of lambs to weaning was scored as 1 = alive at weaning and 0 = dead at weaning.

Statistical procedure:

The least squares procedure for data with unequal subclass numbers as described by Harvey (14) was used for the analysis of all traits measured on ewes and lambs. The statistical model for ewe traits included the main effects of face color, age of ewes and years. The model for birth weights and survival of lambs included effects of face color, years, sex, type of birth and age of ewe. The model for analysis of lambs' growth traits was the same as that for lamb survival except it included weaning age as a continuous variable. Tests of significance for differences between individual means were estimated using Duncan's multiple range test (9). Interactions between different factors in the models were found to be of little importance and were excluded.

RESULTS AND DISCUSSION

Fertility, fleece weight and staple length:

Table 1 presents the effects of face color, age of ewe and year on ewe traits. There were differences ($P < .01$) between face color groups in grease fleece weight but no significant differences in either fertility or staple length. White faced ewes produced 0.30, 0.35 and 0.23 kg more fleece than the black, brown and mixed colour ewes, respectively. Magid and Zaied (21) reported that the wool production from the Libyan Barbary sheep ranges from 2.6 to 3.3 kg with an average of 3.1 kg and the staple length ranges from 12.3 to 16.6 cm with an average of 14.8 cm in agreement with the results of this study.

While the effect was not statistically significant, the black faced ewes tended to be more fertile than the white, brown and mixed colour groups by 12%, 16% and 6%, respectively. An average fertility estimate of 58.8% was reported for a group of Libyan Barbary ewes joined at two-monthly intervals throughout the year (20). In that study the fertility estimate for ewes joined in May-June (i.e. at the same time as the persent study) was 94.4%. The difference could be attributed to nutritional differences as well as to previous reproductive activities of ewes.

Age of ewe significantly ($p < .01$) influenced fertility, fleece weight and staple length while years influenced significantly ($p < .01$) fleece weight and staple length but not fertility (Table 1). In general, 3 year old and 4 year old ewes were the most fer-

tile (99 and 92%) and the eldest age group (8 years +) were the least fertile (49%). These results are in general agreement with those reported widely in the literature for a variety of breeds including the Libyan Barbary (16, 20, 24, 25).

Fleece weights were highest for 4 year old ewes and staple length were maximum for 5 year old ewes. These results are in agreement with many studies (5, 8, 13, 21). Yearly variation in fleece weight and staple length reflect differences in feeding, management and health of the flock and in accordance with the results obtained by several investigators working with different breeds of sheep (5, 7, 13, 15).

Table 1 — Least squares means for fertility, grease fleece weight, staple length by face colour, age of ewes and year

Source	No.	Fertility %	Grease fleece weight kg	Staple length cm
μ	221	74.6	2.72	13.5
Face color		NS	**	NS
Black	76	82.9	2.64a	13.5
White	59	71.1	2.94b	13.5
Brown	57	67.3	2.59a	13.2
Mixed	29	76.9	2.71a	13.7
Ewe age		**	**	**
2 yrs old	7	79.1ac	2.74ac	13.6bc
3 yrs old	36	99.0a	2.87a	13.8ab
4 yrs old	47	92.9a	2.97a	14.3a
5 yrs old	37	77.7ac	2.74ac	14.4a
6 yrs old	26	62.8bc	2.77a	13.1b
7 yrs old	30	61.1bc	2.54ab	12.9bc
8+ yrs old	38	49.3b	2.43bc	12.4c
Year		NS	**	**
1982	119	69.2	2.54	12.2
1983	102	79.9	2.90	14.8

NS-Not significant

** $p < .01$

abc Those means followed by same letters are not significantly different from one another, otherwise they do differ ($P < .05$).

Birth weights and survival:

The results presented in Table 2 for lamb birth weight and survival of lambs to weaning indicate no significant differences due to face color . However lambs from brown faced ewes were the heaviest at birth (3.95 kg) followed by lambs from black faced ewes (3.89 kg). Lambs from the white faced ewes were the lightest at birth (3.76kg) but survived better (79%) than lambs from the brown face (77%) and lambs from the black faced ewes (75%), yet the differences were not significant. Magid *et al* (20) reported 80% survival rate for lambs born in October-November and Magid and Zaied (21) reported an average birth weight for the Libyan Barbary breed of 3.7 kg in broad agreement with the estimates reported in this study.

Lamb sex, type of birth and age of ewe significantly influenced birth weight but had

no influence on lamb survival to weaning (Table 2). Ram lambs were 0.26 kg heavier than ewe lambs and single born lambs were 1 kg heavier at birth than twin born lambs. Lambs born to 3, 4 and 5 year old ewes were the heaviest at birth (Table 2). Although not significant, ewe lambs, single born lambs and lambs born to 5 year old ewes had the highest survival rate to weaning.

The present results for the effects of sex, type of birth and age of ewe on birth weight are in close agreement with the results of many workers over a wide range of sheep breeds (1, 7, 10, 18, 25). The results for the effect of sex and type of birth on lamb survival to weaning are in agreement with the results obtained by other investigators (12, 17, 19, 23). Other reports (12, 24, 25) showed a significant difference in lamb survival due to age of ewe in contradiction with the results of this study. However the results for age of ewe effects are in agreement with the results reported by Magid *et al.* (20) working with the same breed.

Table 2 — Birth weights and lamb survival to weaning by face color, year, sex, type of birth and age of ewe.

Source	No.	Birth weight kg	Survival %
μ	172	3.85	76.4
Face color		NS	NS
Black	65	3.89	74.8
White	45	3.76	79.4
Brown	41	3.95	77.3
Mixed	21	3.80	73.9
Year		NS	NS
1982	89	3.87	75.2
1983	83	3.82	77.6
Sex		**	**
Males	87	3.98	75.2
Females	85	3.72	77.5
Type of birth		**	NS
Singles	160	4.35	81.3
Twins	10	3.35	71.4
Age of ewe		*	NS
2 yrs old	6	3.71a	77.6
3 yrs old	35	4.02b	78.3
4 yrs old	47	3.86ab	82.2
5 yrs old	29	4.10b	88.6
6 yrs old	16	3.95b	78.4
7 yrs old	19	3.83ab	69.8
8 + yrs old	20	3.47ac	59.6

NS Not significant
* $p < .05$
** $p < .01$
abc Those means followed by same letter are not significatly different from one another, otherwise they do differ ($p < .05$).

Weaning and post weaning weights:

Face color was associated with significant variation in postweaning weights (W_1, W_2 and W_3) but not weaning weight itself (Table 3). Lambs from brown faced ewes were 2.0 and 5.1 kg heavier in W_1, 3.0 and 5.3 kg in W_2 and 3.6 and 6.0 kg in W_3 than lambs from white faced and mixed color ewes, respectively. There appeared to be little differences in post weaning weights between lambs from the black and brown faced ewes. Although not significant, lambs from the brown and black faced ewes were also heavier at weaning. Comparing the results for weaning weight and post weaning weights with those obtained by Magid and Zaied (21), the figures are slightly higher for weaning weight (17.1 vs 21.1 kg), W_1 (24.4 vs 19.4kg) W_2 (27.0 vs 23.4 kg) and for W_3 (28.6 vs 25.1 kg).

Year, type of birth and age of lamb at weaning all had significant influences ($P < .05$) on weaning weight, but had no effect on post weaning weights (Table 3). Lambs

Table 3 — Least squares means for growth traits by face color, year, sex of lamb, type of birth, ewe age and weaning age

Source	No.	Weaning weight kg	Postweaning monthly weights, kg W_1	W_2	W_3
μ	142	21.1	24.4	27.0	28.6
Face color		NS	**	**	**
Black	52	21.3	25.7a	28.9a	30.5a
White	38	20.6	24.3 ab	26.1 b	27.6 b
Brown	35	22.2	26.3a	29.1a	31.2a
Mixed	17	20.2	21.1b	23.8b	25.2b
Year		**	NS	NS	NS
1982	72	22.1	24.9	26.9	28.4
1983	70	20.0	23.8	27.1	28.8
Sex		**	**	**	**
Males	73	22.4	26.0	28.5	30.3
Females	69	19.8	22.8	25.5	27.0
Type of birth		**	NS	NS	NS
Singles	135	22.3	25.8	28.4	29.9
Twins	7	18.8	22.9	25.6	27.3
Ewe age		NS	NS	NS	NS
2 yrs old	5	19.4	22.1	24.9	27.3
3 yrs old	29	22.7	26.1	29.0	29.9
4 yrs old	41	21.4	24.2	27.0	28.5
5 yrs old	27	21.8	26.1	29.1	30.6
6 yrs old	13	21.3	24.7	26.3	26.8
7 yrs old	12	19.3	22.5	25.3	30.3
8+ yrs old	15	21.7	24.9	27.2	27.0
b_1 (Weaning age)		*	NS	NS	NS

NS Not significant
* $P < .05$
** $P < .01$
abc Those means followed by same letter are not significantly different from one another, otherwise they do differ ($p < .05$).

born in 1982 were the heaviest at weaning and single born lambs excelled twin born lambs by 4.5 kg in weaning weight. The partial regression of weaning weight on age was 0.160 kg/day. Sex of lambs significantly influenced all traits (Table 3). Ram lambs surpassed ewe lambs by 2.6 kg in weaning weight and by 3.0 to 3.3 kg in post weaning weights. Age of ewe had no influence on weaning weights or post weaning weights, however lambs from 3 year old ewes appeared to have heavier weights than lambs from 2 year old or lambs from older age groups (4 to 8 year old). The effects of sex and environmental factors are generally in close agreement with many results reported in the literature (1, 6, 7, 10, 11, 18, 21).

General Discussion:

According to a recent review (2), nine color gene loci have been described in sheep. The number of alleles at each locus varies from 2 to 9, however only four of the nine alleles have been establised in the North European Short-tailed sheep. There is considerable variation within the Libyan Barbary breed in respect to color; the differences could be attributed to natural selection. Even though, no attempt has been made to study the inheritance of coat color in the Libyan Barbary, yet studies with other breeds have revealed that alleles for the white or tan colors depress fertility by .15 lambs/ mated ewes (3) and non white ram lambs have been found to be significantly heavier than white or tan lambs (4). The results of the present study showed no significant differences in fertility, birth weight, survival of lambs to weaning and weaning weight between the three main face colors of the Libyan Barbary breed. However, significant differences were observed in fleece weight and postweaning weights. The colored faces were superior to the white face in postweaning weights, and the white faced were superior in wool production. It should be borne in mind that this evaluation is concerned with progenies up to 7 months of age. The final judgement is dependent on yearling and mature weight as well as other wool traits, and these are all now under study. The lack of superiority of any face color in preweaning growth and fertility could be explained by the hypothesis that there is probably little genetic difference between the three main colors. Further studies are recommended to establish the inheritance of color so that selection could be applied to develop strains within the Libyan Barbary that excelled in post weaning growth or wool production.

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إنتاجية أغنام البربري الليبية وعلاقتها بلون الوجه

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المستخلص

تتميز أغنام البربري عموماً بجسم أبيض ذي وجه أسود أو بني أو أبيض. وقد يكون الوجه مبقعاً بألوان مختلفة، وقد أصبحت هذه الأغنام ملائمة للظروف الصحراوية الجافة وشبه الجافة على مدى الأجيال والعصور. أجريت هذه التجربة بمحطة أبحاث الأغنام التابعة لكلية الزراعة وذلك لمقارنة بعض الصفات الإنتاجية وعلاقتها بلون الوجه، فقسم قطيع الكلية عشوائياً حسب لون الوجه إلى أربع مجموعات وهي الأسود، البني والأبيض، أما المجموعة الرابعة فشملت نعاجاً من جميع هذه الألوان إضافة إلى النعاج المبقعة لتكون كقطيع شاهد. وقد تم تلقيح كل مجموعة بكباش من لون المجموعة نفسها وذلك لمدة سنتين. وقد تم قياس كل من نسبة الخصوبة، وزن الصوف عند الجز، وطول خصلة الصوف على النعاج. أما حملانها فقد درست عليها نسبة النفوق (الحيوية)، وزن الميلاد، وزن الفطام والوزن الشهري بعد الفطام لمدة ثلاثة شهور بعد الفطام.

وقد دلّت النتائج على عدم وجود فروق معنوية بين ألوان الوجه المختلفة في كل من نسبة الخصوبة، الوزن عند الميلاد، الحيوية عند الفطام والوزن عند الفطام. ويرجع عدم تفوق أي لون بالنسبة لهذه الصفات إلى عدم وجود فروق وراثية كبيرة في ألوان الوجه الثلاثة الرئيسية. من جهة أخرى، دلت النتائج على وجود فروق معنوية بين المجموعات بالنسبة للأوزان بعد الفطام ووزن الجزة حيث كانت حملان النعاج البنية أعلى وزناً بمقدار 2-6 كجم في أوزان بعد الفطام مقارنة بحملان النعاج البيضاء الوجه، ولم نلاحظ أية فروق بالنسبة لحملان النعاج البنية والسوداء الوجه. كذلك فقد أعطت النعاج بيضاء الوجه زيادات في كمية الصوف بمقدار 0.3، 0.35، 0.23 كجم أعلى من السوداء والبنية والخليطة على التوالي. قد تستعمل نتائج هذه الدراسة لاستنباط خطوط جيدة من الأغنام الليبية لإنتاج الصوف وأخرى لإنتاج اللحم، ولكن ذلك يتطلب إجراء دراسات أخرى لتحديد وراثة لون الوجه بهذه الأغنام.