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Variations of the color of coat in two autohtonous goat breeds in Southwest Bulgaria

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SUMMARY

The present study shows a summary analysis of variations in the color of coat in two Bulgarian autohtonous goat breeds – Kalofer longhaired and Bulgarian screw-horned longhaired goat breeds, reared in Southwest Bulgaria. The specimens included in the investigation, form a representative sample of breeds – 120 typical animals (60 of each breed). For the purposes of the study were selected purebred animals, without common grandparents from 10 herds, representing the full diversity of color of the coat, typical for the populations of both breeds. On the base of this investigation conducted on the hair coverings of specimens from the populations of the Kalofer longhaired and Bulgarian screw-horned longhaired goat grown in Southwestern Bulgaria, the results show that 5 basic colorations of the coat can be differentiated – Black, Red-brown, Silver-gray, Paacock "barza", Black and tan. Two of them (black and red-brown) have been determined by the B-locus, defining the Eumelanic pigmentation, and three (silver-gray, "barza", black and tan) have been determined by Agouti-locus.

Key words: autohtonous goat breeds, color of coat

INTRODUCTION

The color of the goat's coat is an important element of their exterior, and is often a defining sign. There is an extraordinary variety in the coloring of the coat in goat breeds in the world.

This problem has been of interest and in the past many authors have tried to systematize the different colors and look for the genetic condition in some of them (Asdell et al., 1928; Adalsteinsson et al., 1994; Berge, 1966; Eidregevic, 1941; Lauvergne, 1985, Lauvergne et al., 1987; Lush, 1926). In addition to a purely exterior feature, the color of the coat is important for thermoregulation in goats (Kant et al., 1985).

The hair coloration of goats is determined by two different melanin pigments – Eumelanin and Pheomelanin. Pigments are derivatives of the oxidation and polymerization of two amino acids – Tyrosine and Tryptophan. They are synthesized by the melanocytes in the hair bulb and distributed into the fiber. In the absence of melanin grains, there is no pigment in the fiber, and a white color appears. Melanin pigment Eumelanin causes black or brown coloration of the coat. Like brown, it can be dark (deep) brown or light brown.

With this type of pigmentation, the animal is always fully colored in one of the main colors – black or brown. As the dominant allele is B + in the "B" locus, and defines the black color. Several recessive alleles define the different nuances of brown (Adalsteinsson et al., 1994).

The melanin pigment Pheomelanin is responsible for the appearance of the cream, red and orange-brown color in the goat's coat. The nuances of this type of pigmentation are extremely variable, and unlike the Eumelanin type, they have individual variability. Some specimens

(Asdell et al., 1928; Adalsteinsson et al., 1994; Berge, 1966; Eidregevic, 1941; Lauvergne, 1985, Lauvergne et al., 1987; Lush, 1926).

(Kant et al. 1985).

– Eumelanin

Pheomelanin.

Eumelanin

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+ „ ”

(Adalsteinsson et al., 1994).

Pheomelanin

Eumelanin,

(Vuchkov et al., 2011; Vuchkov and Dimov, 2012).

the local breeds of Kalofer longhaired and Bulgarian screw-horned longhaired goat, a detailed determination of the shades of the coat (Vuchkov et al., 2011; Vuchkov and Dimov, 2012).

The lack of classification of the types of the color of coat in the local goat breeds – Kalofer longhaired and Bulgarian screw-horned longhaired goat necessitates to study and describe in detail the different variants of the coloring of their hair cover.

MATERIAL AND METHODS

For the needs of the survey, the existing population of the Bulgarian, longhaired goat, was monitored in the natural distribution area – settlements in the mountainous regions of Southwest Bulgaria (the slopes of Southern Pirin, Ograzhden, Malashevka Mountain). The population of the Kalofer long-haired goat grown in the area of Southwestern Bulgaria was also surveyed. There were 5 flocks of Bulgarian screw-horned goats in the Blagoevgrad region, located in the following villages – Kresna, Karnalovo village of Drenovo, Petrich, Hursovo municipality Sandanski, Ploshki village, Sandanski.

A total of 45 female and 15 male specimens (maturated) have been examined. Similarly, 45 females and 15 males were selected from 5 herds from Kalofer long-haired goats in the region of Bansko, Simitli, Vlahi, Kresna, Dolna Gradeshnitsa village, Kresna.

A detailed description of the type of coat pigmentation of each specimen of the study was noted, showing depigmentation (white spots) in the cases where it was expressed. The selected specimens from a representative sample of the two breeds embodying the full variety of coloration of their coat.

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As a variation of the pure black color in the two local breeds, called "cherno-mustavi" That it is known among the local people in region of South West Bulgaria. In this version, small white spots are observed in the form of "splashes" only in the area of the muzzle and ears. This specific pigmentation can also be observed in the "black and tan" color of coat.

Red-brown pigmented coat. The color of this type of pigmentation ranges from dark chocolate brown to very light-brown. Typical of this color is that the mucous membranes of the lips, nose and eyelids are deeply tanned brown. There is no black pigment (Figure 2). It occurs in both autochthonous breeds, and in some areas the local people calls goats with such "plavi". It is necessary to note that the kids are born brown-reddish and subsequently the hairs on the body can lighten.



(1) (2)
Fig. 2. Red-brown pigmented coat of Bulgarian screw-horned longhaired (1) and Kalofer longhaired (2) goats

„brown” Adalsteinsson et al. (1994).

Dark and intense, the red-brown pigment remains on the fur on the head and lower limbs. The reddish-brown pigmentation of the hair cover in the two local breeds in our country corresponds to the eumelanin-type, pigmentation marked like "brown" by Adalsteinsson et al. (1994).

Agouti – „striped grey”
 Adalsteinsson et al. (1994).
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Agouti-

Silver-gray pigmented coat. The hair cover consists of uniformly distributed white and black fibers, giving a uniform silver gray hue to this type of color. May vary from light to dark depending on the ratio of white and black fibers in the coat. There is lightening around the eyes to the muzzle, the inner part of the ears and the back of the limbs (Figure 3). It occurs widely in both autochthonous breeds. It corresponds to a type of pigmentation determined by Agouti – locus, and denoted as "striped gray" by Adalsteinsson et al. (1994). In this type of color (silver-gray), reddish-brown areas should not be seen on the head, feet, or body. The presence of these is a sign of a combination of different types of stains caused by the "Agouti-locus" and different genetic interactions.



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(1)

(2)

Fig. 3. Silver gray pigmentation of Bulgarian screw-horned longhaired (1) and Kalofer longhaired (2) goats

Pigmentation “barza” type. Extremely specific color that the local population defines with the name "barza".

The combination of zonal bright coloration of the front half of the body, the back is dark – black, forming a "dark/black cloak" on the croup and the loin. Because of the long coat of the two

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„paecock”

Agouti –

Adalsteinsson et al. (1994).

local breeds, the black "cloak" can descend almost to the ground at the back of the body. The coat of the lower leg is dark to black. On the front of the head there are very specific longitudinal black strips – one above the eye and the other under it (Figure 4, 5). This type of coloring is also found in the Kalofer longhaired and Bulgarian screw-horned longhaired goat, as in the second breed being more widespread. Some variation occurs in the light area of this coloration of the coat. It can be almost creamy-white to tern-brown.

In some variants of this color, the "black cloak" at the back may be less pronounced, but other specific elements are present. This type of coat pigmentation corresponds to the "paecock" variant of the Agouti-locus group, according to the classification of Adalsteinsson et al. (1994).



Fig. 4. Variation of „barza” pigmentation of Bulgarian screw-horned longhaired goats



Fig. 5. Variation of „barza” pigmentation of Kalofer longhaired goats

„black and tan”,
Agouti- . Adalsteinsson et al. (1994)

: 1. Lightbelly –

. 2. Swiss markings –

. 3. Lateral stripes –

4. Red cheek –

„black and tan”.

Black and tan (Cherno-garest in Bulgarian) pigmented coat. A characteristic of hair pigmentation in goats in which the black background of the body has specific localized spots with a lighter brownish color. The specific locations of the light spots are on the face of the head, the inside of the ears, the lower parts of extremities, the abdomen and the tail. Light stains may vary in color from deep tall brown to off-white. The local people call this type of color with the common name "cherno-garest" goats (Figure 6).

This coloring is mainly found in the Bulgarian screw-horned longhaired goat. It is extremely rare in the population of the Kalofer long-haired goat, and is often seen as a sign of crossing with other breeds. Some authors, depending on the size and distribution of the light spots on the body, define this coloring as "black and tan," as determined by Agouti-locus. Adalsteinsson et al. (1994) consider this coloration as four distinct types: 1. Lightbelly – it is expressed in a light abdomen, a light lower part of the tail, a light back of the limbs, in the black pigmented front. 2. Swiss markings - it is expressed in a black belly, bright longitudinal strips through the eyes, a bright inner part of the ears, completely lightened lower limbs, a light lower part of the tail. 3. Lateral stripes - it is expressed in a light abdomen, a light lower limb, light longitudinal lines on the face, a bright inner part of the ears. 4. Red cheek - it is expressed in bright spots only on the cheeks of the head, the abdomen and the limbs are black. There are no typical clear expressed variants for the Bulgarian screw-horned longhaired goat. Different combinations of individual elements of the quoted colors are observed, which necessitates their unification in one type of "black and tan".



. 6.

Fig. 6. Variation of black and tan (garesto in Bulgarian) coat pigmentation of Bulgarian screw-horned longhaired goats

Agouti-

Intermediate forms of pigmentation of the coat. Genetic interactions under the influence of Agouti-locus determine an extremely varied pigmentation, combining different elements of the basic colors. There are, therefore, a number of forms of pigmentation of the coat of autochthonous goats, combining elements of the basic types of shades, and their determination is significantly hampered. This variety of intermediate forms are expressed of a considerable extent of the population of the Bulgarian screw-horned longhaired goat.

Depigmentation zones (white spotted) on the coat. In addition to the underlying pigments described in fully pigmented animals, the populations of the two autochthonous goat breeds also include specimens with areas of depigmentation on the hair covering, which are expressed in white spots on the body. They may vary in size - from small spots on the limbs or forehead to almost entirely depigmented specimens with small pigmented areas (usually on the head) (Figure 7). Pure white specimens with no pigment are the exception for both breeds. With almost totally depigmented specimens, it is difficult to determine the type of body coloration as the basic features of the

corresponding types of shades can be masked by the depigmented areas.



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(1)

(2)

Fig. 7. Areas of depigmentation (white spots) on the hair cover of Bulgarian screw-horned longhaired (1) and Kalofer longhaired (2) goats

CONCLUSIONS

Based on the research conducted on the hair coverings of specimens from the populations of the Kalofer longhaired and Bulgarian screw-horned longhaired goat grown in Southwestern Bulgaria, 5 basic colors can be differentiated - black, red-brown, silver-gray, "barza" type and Black and tan.

"Black and tan" are characteristic for the Bulgarian screw-horned longhaired goat and are considered unusual for the Kalofer long-haired goat.

In the cases of both autochthonous goat breeds there was a zone of depigmentation (white spottedness), expressed in varying degrees.

Totally white specimens in the two autochthonous breeds are an exception.

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