



## The colour inheritance of Pumi and Mudi Hungarian dog breeds Rózsa Várszegi, Zs., Posta, J. and Mihók, S.

University of Debrecen, Institute of Animal Science, Böszörményi str. 138., H-4032 Debrecen, Hungary

### Introduction:

In this material the colour inheritance was analysed two Hungarian shepherd dogs. The Pumi and the Mudi

The Pumi came into being during the 17th to the 18th century in Hungary by crossbreeding the primitive Puli with imported German and French dogs of Terrier type with prick ears. It has been recognized as an independent breed at the beginning of the 20th century. The Pumi is a cheerful, medium sized herding dog of Terrier type. His Terrier character is most obvious in his head. The foreface is elongated and the upper third of the otherwise prick ears is bending forward. The conformation is square. Because of his constant alertness, his neck carriage is higher than normal. The wavy coat of medium length forms curls.

The Mudi:

The breed came into being during the 18th to the 19th century from cross breeding Hungarian herding dogs most probably with various prick eared German herding dogs.

**GENERAL APPEARANCE :** Medium sized herding dog with a wedge shaped head. Prick ears. Body topline is distinctly sloping towards the rear. The head and the limbs are covered by short, smooth coat. The other parts of the body have a somewhat longer, very wavy to slightly curly coat. There are different variations of colour.

*We have tried to find the answers to the next questions:*

What kind of colours can be find in the stock?

What kind of genes responsible for the colour in case of these breeds?

What are the dominance relationships between the colours?

Which the combinations of colours in percentage?

Are the sign of the colours exact?



Picture 1.: Various coloured Pumies



Picture 2.: A black, a merle and a fawn Mudi  
Source: <http://hu.wikipedia.org/wiki/Mudi>

### Material and methods:

We worked with 599 puppies from 114 Mudi litter, and 1023 puppies from 193 Pumi litters. We got the data from breeders, litter notifying forms, and in case of really rear matings from shepherds. The data were classified by the type of the mating. The hypothesized, and the found fission rate was compared by Chi<sup>2</sup> probe.

Table 1. Pairing types by the Pumi

	Black	White	Fawn with mask	Grey from black	Grey
Black	27 grey from black, 16 black, 2 grey, 1 white		24 black, 2 fawn with m., 3 grey from b., 3 grey, 1 white		10 black, 15 grey from black, 4 grey, 1 fawn, 3 white
White	14 black, 10 grey from black, 2 fawn with m.,	75 white	5 white, 2 grey from b., 2 black, 2 grey		5 grey, 8 white
Fawn with mask			10 fawn with m., 1 black, 1 fawn		
Grey from black	70 grey from black, 10 white, 7 grey, 1 fawn, 1 fawn with m.,	72 grey from black, 65 white, 20 black, 7 grey, 1 fawn	56 grey from black, 8 white, fawn with m., 5 black, 1 grey	198 grey from black, 18 white, 8 fawn with m., 46 black, 27 grey, 3 fawn, 1 brown	
Grey			4 black	7 white, 2 fawn with m., 14 black, 28 grey, 2 brown, 35 grey from black	

Table 2. Pairing types by the Mudi

	Black	Grey	White	Brown
Black	340 black, 20 brown, 26 grey, 12 fawn with m., 13 white, 18 fawn, 1 mottled			
Brown	3 black, 6 brown, 2 fawn			18 brown, 7 grey
Grey	28 black, 8 brown, 7 grey, 4 fawn with m., 2 fawn, 3 mottled			
Fawn with mask	2 black, 1 fawn with m., 2 white		2 black, 4 fawn with mask	
White	1 black, 2 brown		2 white, 7 fawn	
Fawn	35 black, 3 brown, 4 white, 8 fawn	4 black, 3 brown		
Merle			1 merle, 4 white	

### Results:

The combination of the colour in the analysed Pumi stock is:

56.2% the colour at birth is black, turning grey with time  
14% black  
13% white;  
11% grey;  
3.5% fawn with mask;  
0.6% fawn;  
0.3% brown

The next genes are responsible the colour of the Pumi:

As a<sup>y</sup> E Em e  
B b S si sp  
C c I i

More than the half of the stud is black, turning grey in time, such a large proportion of white individuals are likely to be because of incorrect denomination, a part of the white is really fawn. The fawn dogs with mask are often registered as grey, or black turning into grey.

The combination of the colour in the analysed Pumi stock was:

67.4% black  
6.67 % grey  
10.18 % brown  
6.51 % fawn  
5 % white  
3.6% fawn with mask  
0.3% mottled  
0.16% merle

The next genes are responsible the colour of the Mudi:

As a<sup>y</sup> a<sup>9</sup> a<sup>1</sup> E Em e  
B b S si sp  
C c<sup>r</sup> I i  
M m

The hypothesized epistatic row in case of both breeds is the next: black---brown---grey---fawn with mask---white---fawn the colour at birth is black, turning grey with time by the Pumi must be the first in the row.

### Conclusion:

The percentage of the white dogs (13%) is quite high, which can be because of wrong colour denomination, so a part of it must be fawn. A part of the fawn dog with mask was denominated grey, or turning into grey from black. In case of Mudi, the 2/3 of the population was black. The rarest Hungarian herding dog is luckily really varicoloured. The epistatic row of the colour inheritance is the as same as by the Pumi. The brown colour must be accepted as a primal colour in this breed. The brown dogs, and the fawn dogs with mask probably were not written in the litter announce, or these were named incorrectly. The blue-merle gene does not occur in other Hungarian breeds, the appearance of it could permit of disperse.

Accurate colour denomination should be used by the pedigrees, because the examination opened up several failures, for example only those dogs are white, which was borne white.