

Tan Rabbit Color Genetics - Just the Basics!
Steve Roush, Ph.D.- ARBA Judge #475

Introduction

The simplest way to assist the Tan breeder in making sense of the color genetics of a Tan rabbit is to reduce all discussions to two basic variables.

Variable #1. The color of a Tan is either black or brown. (I KNOW there are also blue and lilac. See #2)

Variable #2. When black is diluted it becomes blue and when brown is diluted it becomes lilac.

In genetic notation, color is designated as a capital B for black, and a pair of small b's (bb) as chocolate. (You do not need to remember this unless you want to do so! The article is written around genetic notation.) Intensity is designated a large D and lack of intensity (dilution) is designated as two small d's (dd). (You do not need to remember this unless you want to do so either, same reason!)

The Intense black is Black. The dilute black is Blue. (And crossing them doesn't give a darker blue!)

The Intense brown is Chocolate. The dilute Brown is Lilac.

Discussion

Recently I bred a black Tan buck (out of a lilac doe and a black buck) to a lilac Tan doe. She had five young. There were 4 does (black, blue, chocolate, and lilac) and a blue buck. A lovely mix. How did that happen?

The key is in the mother of the buck. She was lilac. That means she was dilute AND chocolate. Crossing her to the original black buck (he was black AND intense) made all of the young **look black**, like the father. Crossbreeding a pure black Tan to a lilac will always result in all Black tans. However, they will carry genes for chocolate and dilution.

Note the earlier sentence. The conditions were a PURE black Tan. Black out of black out of black. He does not have any blue parents or grandparents and is thus homozygous (or pure). Also note, no mention was made of a PURE lilac. Why not?

If a rabbit is a Lilac it is already PURE (meaning it cannot carry any genes for intense or black, as it is a dilute chocolate.)

So, does this mean that a blue Tan is also PURE simply because it is blue? No. A blue Tan could have a blue (or a black) parent and if the other parent was Lilac (or chocolate), the blue would be PURE for dilution but would also carry a chocolate gene, making it heterozygous (or not pure.) So what does this mean? It means breeding a lilac to a lilac will always result in 100% Lilac (Yes, always, always!)

The Details

This is not meant to explain color genetics. However, the reader needs to accept that a capital letter represents a dominant gene trait and a small letter represents a recessive gene trait. Only when two recessive genes are together will that trait express itself. For Tans, it is relatively simple. A few rules apply.

Rule #1: Black can be the color of the rabbit, even when combined with chocolate gene. No chocolate rabbit can carry a black gene. Chocolate is the color of the rabbit ONLY when there is NO black gene present.

Rule #2: Blue and lilac rabbits are produced ONLY when the black or chocolate genes are diluted. A black that is diluted is blue. A chocolate that is diluted is lilac.

Rule#3: Breeding blue to blue will never produce black or chocolate, but it MAY produce lilac.

Rule#4. Breeding lilac to lilac will ONLY produce lilac.

Rule#5. No black or chocolate will ever come from crossing a lilac and a blue rabbit.

Rule#6. A chocolate and a lilac can never produce a black or a blue rabbit.

See the six basic pairs of genes below:

	Color	Expression
BB	Black	Pure black
Bb	Black	Black gene with chocolate (still looks black)
bb	Chocolate	Pure chocolate
DD	Intense	Present in blacks or chocolate
Dd	Intense	Present in blacks or chocolate
dd	Dilute	Only present in blue or lilac

There are nine possible combinations of these six basic pairs:

Gene Pair (genotype)	Rabbit Appearance (Color)
----------------------	---------------------------

BBDD	Black (Pure)
BBdD	Black(Carries a dilute gene)
BBdd	Blue (Pure)
BbDD	Black (carries a chocolate gene)
BbDd	Black (Carries a chocolate and a dilute gene)
Bbdd	Blue (Carries a chocolate gene)
bbDD	Chocolate (Pure)
bbDd	Chocolate (carries a dilute gene)
bbdd	Lilac (Pure, and lilacs are ALWAYS pure)

Note that a Black Tan always looks the same, whether it is pure or whether it carries a chocolate or a dilute gene. A Chocolate Tan always looks the same, whether it is pure or carries a dilute gene. A Blue Tan always looks the same, whether it is pure or carries a chocolate gene.

Breeding Notes

Here are some charts that make it fairly easy. Top and side (bold print) are parents colors. In the boxes are what may come out of the crosses. Chart #1 shows Pure colors only. Chart #2 shows parents who may have almost any background (except lilac which is ...always pure, remember?!)

Chart #1- Pure color genetics

	Black (BBDD)	Blue (BBdd)	Chocolate(bbDD)	Lilac (bbdd)
Black(BBDD)	Black(100%) BBDD	Black(100%) BBdD	Black(100%) BbDD	Black(100%) BbDd
Blue(BBdd)	Black(100%) BBdD	Blue(100%) BBdd	Black(100%) BbDd	Blue(100%) Bbdd
Chocolate(bbDD)	Black(100%) BbDD	Black(100%) BbDd	Chocolate(100%) bbDD	Chocolate(100%) bbDd
Lilac(bbdd)	Black(100%) BbDd	Blue(100%) Bbdd	Chocolate(100%) bbDd	Lilac(100%) bbdd

Chart #2- Mixed color genetics (Carry the other color genes, if possible)

	Black(BbDd)	Blue (Bbdd)	Chocolate(bbDd)	Lilac(bbdd)
Black (BbDd)	Black(56.25%) Blue (18.75%) Chocolate(18.75%) Lilac(6.25%)	Black (37.5%) Blue (37.5%) Chocolate (12.5%) Lilac (12.5%)	Black,(37.5%) Blue (12.5%) Chocolate(37.5%) Lilac (12.5%)	Black(25%), Blue(25%) Chocolate(25%) Lilac(25%)
Blue (Bbdd)	Black(37.5%) Blue(37.5%) Chocolate(12.5%) Lilac(12.5%)	Blue(75%), Lilac(25%)	Black (25%) Blue(25%) Chocolate(25%) Lilac(25%)	Blue(50%), Lilac(50%)
Chocolate (bbDd)	Black(37.5%) Blue(37.5%) Chocolate(12.5%) Lilac(12.5%)	Black(25%), Blue(25%) Chocolate(25%) Lilac(25%)	Chocolate(75%), Lilac(25%)	Chocolate(50%), Lilac(50%)
Lilac (bbdd)	Black(25%),Blue (25%), Lilac(25%) Chocolate(25%)	Blue(50%), Lilac(50%)	Chocolate(50%), Lilac(50%)	Lilac (100%)

In Chart #3 below, we cross a pure colored Tan (top row) to a genetically mixed color Tan (side row)*.

Chart #3- Mixed color genetics (Carry the other color genes, if possible) bred to Pure color genetics

	Black(BBDD)	Blue (BBdd)	Chocolate (bbDD)	Lilac (bbdd)
Black (BbDd)	Black (100%)	Black (50%), Blue(50%)	Black (50%), Chocolate (50%)	Black(25%),Blue(25%), Chocolate (25%), Lilac (25%)
Blue (Bbdd)	Black (100%)	Blue(100%)	Black (50%), Chocolate (50%)	Blue(50%), Lilac(50%)
Chocolate (bbDd)	Black (100%)	Black(50%), Blue(50%)	Chocolate (100%)	Chocolate(50%), Lilac(50%)
Lilac (bbdd)	Black (100%)	Blue (100%)	Chocolate (100%)	Lilac (100%)

These Tans are ALL pure Tans, they just have different color genes. I have tried to make this an easy to understand article. The percentages attached are not litter by litter, but are rather over a number of litters, this is how the percentages will come out breeding the type genes mentioned to the type genes mentioned, over a few times!

If this is useful, copy it and paste it on the wall of the rabbitry. After looking at it a few times, you will come to realize that it is not really all that difficult to understand Tan rabbit color genetics.

- Note: No mention is made of wideband genes, rufus factors, or their influence on the "tan" coloration. This is a fundamental explanation of the transmission of basic color groups for breeders who are interested only in "What will I get if I cross a "XXX" with a "YY" ?"

SR 6/30/03