The Pigeon Genetics Newsletter, News, Views & Comments.

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(Founded by Dr. Willard .F. Hollander)

Editor **R.J. Rodgers** Nova Scotia Canada.
Co-Editor **Sabbir Hossain(Shoibal)** Dhaka Bangladesh.

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This Month we are "**Seeing RED**" - but we are not angry!

We have a good idea about the Black and Chocolate Pigment "eumelanin" in Pigeon colours, but what about "Phaeomelanin"? It is the pigment that appears 'reddish' to us and can range from a brownish dull brick red to a very rich coppery red tone. It is caused by a number of very different colour mutations sometimes combined, that have no direct relationship otherwise. Photos - **Mick Bassett**.

Most everyone thinks of a recessive red bird as if it is naturally a solid colour RED all over , but nothing could be further from the truth. I am certain that you have heard about the 'unimproved' recessive red. However there is an extremely rare expression of the gene mutation that does not look red at all! It is the original mutation at the scientific (sox-10 locus) which is the original recessive red. It is not completely epistatic to the wild type or anything else and it has almost no actual reddish feathers on it. It looks more creamy beige and smutty blue. Mankind has added other "RED" modifiers to create the recessive reds that we have come to know and admire. It is the combination of these traits that make the

new colour version epistatic. The original mutation is so rare that I have seen one only in 75+ years with pigeons. It is so rare that I cannot locate a photo of one to show you here. I have added a photo of a feral that MAY have been a recessive red and intense phase but it looks ash and dilute phase. It moulted to a mottle wing which is very typical of recessive reds and also had a darkened tail band matching its wing bars but which lightened later..

She produced a dark red white tailed son very similar to diagram #5 below mated to the cock below - so she may have been Ash, and the son a dark checker ash-Red rather than a recessive red, unless the dark blue check crested white tail carried recessive red. (5 photos Bob R.)

Diagram chart showing recessive red on the various patterns without enhancing modifiers.

 This bird that was labeled Blue T-Pattern (Ug) - could easily be a first time recessive red mutation at the Sox-10 locus as this is very much what one would look like if T-pattern. (from **Gibson** 1995 Edition.)

The modifiers that may enhance recessive red are : Kite Bronze, Brander Bronze, Spread blue/Black, Dirty factor, Indigo,

The Modifiers that seem to degrade recessive red are : smoky factor, grizzles, Stipple and its alleles, reduced and its alleles, Opal, recessive opal, milky, dilution and its alleles,

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Texas : A University of Texas at Arlington team exploring pigeons as a model for vertebrate evolution has uncovered that mutations and interactions among just three genes create a wide range of color variations. One of those genes, they also found, may be an example of a "slippery gene" more prone to evolutionary changes. John W. "Trey" Fondon, an assistant professor of biology, is co-author of a study that begins to unravel the molecular basis for the color palette of domestic pigeons breeds known as "fancy pigeons." Due mostly to organized breeding in Europe and Asia, there are hundreds of types of pigeons that have evolved to include numerous color variations on the blue/black model, including shades of gray, red, and brown. Shapiro's team at University of Utah published research last year in the journal Science that revealed results from the first large-scale sequencing of the pigeon genome. That collection of more than 100 billion DNA bases from 40 pigeons, provided the basis for the new work. Fondon's laboratory worked in parallel with researchers at Utah to find that coding and regulatory variations in the interactions among the genes Tyrp1, Sox10 and Slc45a2 control multiple color phenotypes, or appearances, in pigeons. For example, researchers found that the ash-red mutation in Tyrp1, a gene that plays a large role in color determination, arose just once and was spread throughout the species by selective breeding. **They also found that some color changes evolved through changes in the same gene that happened at different times – hinting at the existence of a "slippery gene." Fondon's team found two independent deletions of regulatory sequences near the Sox10 gene produce "recessive red" pigmentation. These mutations happened at different points in evolution, and researchers believe it is no coincidence they hit the same spot, as this same region is also deleted in color mutants of chickens and mice, Fondon said. There are indications of yet more independent mutations of this "hotspot." More research is needed, but Fondon expects significant progress in understanding is on the horizon.** "Texas" study" (saved from the Internet).
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Understanding all of this scientific jargon and applying it to our everyday back yard Pigeon Loft breeding programs is no easy task.

Breeding recessive red pigeons has been going on long before anyone knew anything about a 'sox -10 locus' , sequencing of the pigeon genomes , or the existence of a "Slippery gene"!

Breeders simply noticed a mutation based upon an unusual phenotype and began selectively breeding from it to eventually achieve what we know today as a recessive red. It was soon understood that it was an autosomal gene (not sex-linked), and that it was recessive to wild type and was given the symbol (e). Since that time, we have noted and named another mutation at the sox-10 locus. That mutation is 'Ember', it is also recessive to wild type BUT slightly dominant over the original mutation and thus has a symbol (e^Em). These birds appear as rather normal recessive reds in the nest but moult out to express their base colour pigment while retaining the red in the flights and tail band as well as the coarse spread 'C' patterns on the wing shields, (checks and bars).

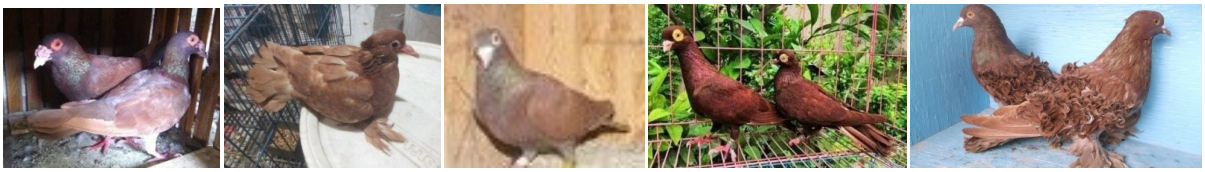
Arguably the best expressions of recessive red have been in the Red Carneau breed. This red is almost as deep and rich as that seen on a Rhode Island Red hen. Getting the red to extend deep down into each feather and evenly over the entire bird is not an easy task, and the formula is still not well known.

Carneau - **Levi** ....

Tumbler - **Rob Grogan**

Below are photos of a number of breeds where recessive red has been introduced over the years, and in fact most all breeds now have this colour mutation.

(1) **AK Lofts**, (2)**Anwarul Kabir** , (3) **Ryan Harvey**, (4) **Malik Hamza** , (5) **Alfred Neese**.



In almost every breed some recessive reds also sport white mottling on the shields. We have talked about this many times. It is thought to be caused by an enabler gene that when combined with recessive red causes a moult to white effect to take place mainly on the shields from a rose wing to a white side phenotype. The (partial dominant)baldhead gene (as seen in most Roller breeds), is not believed to be compatible with recessive red and thus always moults to a white mottle wing. The (dominant) baldhead gene however is compatible with recessive red. These have been seen in the Trumpeter breeds. The saturated T - pattern blue/Black base hidden by (e) seems to contribute to moult to white.

The full compliment Toy Stencil genes also produces a whitened shield that on recessive reds looks a bit similar to white wing or white side but retains some coloured lacing of the Saturated T-Pattern hidden..


Photo/Breeder - **Mohammad Alfouderi**.

Most recessive reds have basal whitening naturally. The colour simply does not extend all the way down into each feather especially on the flights and tail feathers. This is a very similar effect to the genes 'Undergrizzle', and 'flash'. It is also mistaken as being the same as the "Agate" phenotype , by unknowledgeable Almond breeders. Here is **Clint Robertson's** Gold (pale factor recessive red) with the whitened basal feathers referred to as 'sugar tail' in Fantails. The second photo is that of undergrizzle plus naturally whitened basal feathers of a recessive red. Breeder - **Piotr Buzynski .**

The "RED" pigments vary and one sex-linked version is the well known ASH-Red. This is also known as a Dominant Red. It is a mutation at the sex-linked major colour locus and has nothing to do directly with recessive red. The blue/Black base of the recessive red when mated to an ash/Red produces some ash/Red offspring that will have dull blue /gray flights and tail band instead of the normal ash colour.

Ash/Red T-Pattern - **Russow Zaman**.

Ash/Red Print Grizzle - **Shoibal Sabbir**.

Bronze is said to be an enhancer but it depends upon which bronze. There are many types of bronze and they are still not well understood. Some tend to effect feathers basally , while others appear to cover over base pigment which makes them good candidates to help recessive red to look deeper red and to be more epistatic (covering more completely).. Some bronze traits cause recessive red to look "brassy" rather than a deep red even tone.

Let's take a closer look at these RED pigment mutations:

Brander

(1) typical Brander called "lepa lal" in Bangladesh.-- (2) by **Dick Ans Hamer** typical Brander.

Below Brander (Brander to wild type) lacking (e) and Brander with recessive red (e) - **Gibson**.

Below a series of Branders bred by **Voiajori Colorati** - Bulgaria

Breeder Octavian Sarafolean - Branders with undergrizzle.

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Pryzemyslaw Araszewicz Brander .

Photo Sooty Brander bred by **Md Kamal Hossain**.


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The one main feature here in all of these specimens is that the Tail band and flight ends are not affected by Brander. The OUTER most portions of each feather are the most effected so that the darker the base, the better the red will cover. That is why I stated many times that Brander expresses as an "overcoat". Kite bronze on the other han d expresses as an 'undercoating' so that you have to part the feathers to find it. Some breeders have found this a hard pill to swallow as they have been looking at hetero recessive red birds and seeing that as a Kite bronze expression when it is not!
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Recessive reds bred from Brander **Voiajori Colorati** - Romania.

In this case the second bird is expected to become even more white with age which makes this phenotype/genotype different than the Agates of the English Short Face Tumblers that are fledged solid red and then moult to mottle wing but do not change from there onward. Below

(1) **Rob Grogan** Breeder.

(2) Brander Agate breeder **Voiajori Colorati**.

When there is white being expressed in the feathers of youngsters before the first moult , they almost certainly have another grizzle or pied gene present. True agates are solid red in the nest and mottle out with the first moult. To date no one has ever produced a true agate from two solid almond bred recessive reds , nor have there ever been any solid reds produced from two true Agates. This confirms that they are genetically completely different!

The Pigeon Hobby needs to have more breeders testing these genetic traits. I realize that it takes a lot of money for feed and care as well as providing space for individual breeder pens etc. This is not to
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mention the hours needed for cleaning and feeding plus careful record keeping and banding etc. The Romanian Breeders mentioned in this issue have been doing exceptional work !

Two Branders blue/black base T-Pattern. Breeder **Voiajori Colorati**.

Below : Ash /Red hetero blue/black , het. (e) ribbon tail. (2) Ash/Red Ribbon Tail and (3) Blue/Black hetero Indigo and ribbon Tail. Photos and breeder - **Voiajori Colorati**. center bird - **Octavian**.

Below : (1) Stipple on Brander , (2) Stipple on Brander hetero recessive red (e). **Voiajori Colorati**.

Kite bronze is not actually 'red', but much more typically a bronze or tarnished yellow tone and is seen expressed primarily on the basal regions of each flight feather. In some cases it is seen in juvenile feathering when the feathers are soft and weakly coloured by the base pigment. Once the bird gets through its first moult, that bronze effect disappears as part of the original base pigment cells. This was a finding of Dr. Lester .P. Gibson. who by the way , celebrated his 95th. year not long ago. Most often breeders who attribute any reddish tints to saturated T-Pattern blue/Black adult specimens as "Kite" are actually seeing the effects of heterozygous recessive red and not Kite.



While the above photos 'may' include Kite bronze, they would never appear this deep red without being recessive red also!! The Kite bronze even in the homozygous state also does not express this far out toward the ends of the flights and rarely (IF EVER) does it express anywhere else on an adult bird unless a de-pigmenting gene is also present. Photos by **Octavian Sarofolean** .

Other bronze traits : **Catalin Radu** breeds these interesting birds with a specific bronze gene that seems to be (Ts1) but you will notice that the bronze also expresses in the tail feathers basally which is where we usually see Brander. I do not think Kite or Brander are involved here but this is one that will have to be studied extensively., it may be a combination of bronze traits.

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Toy Stencil : This is one that has been primarily studied and reported on by **Dr. Lester .P. Gibson**. It has three components , Ts1 , Ts 2 , and ts3. Ts1 alone will always produce dark red bronze in the "C" Pattern areas of the wing shields only, in both the heterozygous and the homozygous states. The whitening of these areas will only be possible if there is an addition of either homozygous Ts2 and/or ts3.

 (Ts1) bred by **Jith Peter**, and photo **Sajjad Pigeon Loft** (Ts1) 

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Distinct Bronze found in Lahores , Indian Fantails and maybe Jacobins : This bronze is seen as an 'undercoating' and looks like Kite but is commonly seen expressing with spread factor. Since recessive red was unheard of in Lahores until attempts to introduce it were made in America , it seems safe to say that the phenotype is not due to hetero (e). Photo **Rashed Pigeon Loft** .

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Unexplained RED phenotype: **Gulf Farm** Post , these birds are a deep red that in some specimens at least have proven to be Ash/Red genetically. What factors cause the deep rich red phenotype are not exactly known. They do not ever mottle out on the shield which commonly is the case with a recessive red baldhead. The baldhead gene may be dominant as opposed to partial dominant.

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Roger Hansen Lebanon Bronze (Kl) , photo of course by **Layne Gardner**

(Kl) has been tested by **Dr. Gibson** and others over the years. It seems likely that it is a combination of Toy stencil and frill stencil on an ash/Red base as it has been duplicated in several other breeds using those traits. The velvet (Saturated T-Pattern wing shield) is part of the deep red production.

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That is a look at the Red (phaeomelanin) that we find in recessive reds (e) , ash/Reds (Ba) , and a large family of Bronze traits that still are not well enough understood in order for us to say anything definite about their genetic relationships. It seems quite obvious that none of them are alleles. However someone may prove that wrong at least for a few of them? We do know that they help make any "RED" expression more vibrant. This can be helpful or a hindrance such as in the case of producing properly coloured Almonds.

We need all of you to do what the Breeders in Romania are doing , and that is taking each trait at a time and working with it until they get the results they want at the same time keeping records of everything they do so that they can eliminate any unexpected result.

Lastly , you may be saying - "then how do I tell exactly what it is I am looking at in all of these phenotypes?" While each bronze tends to affect a very specific region of feathers , some do overlap and it is difficult to be precisely accurate . There is always a wide range of variations depending upon the many other combinations possible plus the modifiers that can be involved in some but not in others. Even the most seasoned breeders make mistakes, so there is no easy answer. I hope the above photos and explanations have helped to give some clarification.

(Ts1) Argent Modenas - **Aj Pigeon Loft**.
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