

The Pigeon Genetics Newsletter

Founded by Dr. Willard F. Hollander

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Hello everybody!

I would guess that all of us in the northern hemisphere are glad to see the end of this hot summer. I sure am.

In this month's newsletter we're taking a look at the **Almond phenotype** and the multiple gene mutations involved with its expression, particularly the primary gene mutation, **Stipple**, which is responsible for the variegation in the plumage, and some of the various phenotypes besides Almond that are associated with it.

Layne Gardner sent me so many great photos it was very difficult to decide which ones to include.

Thanks to Gary Young for the follow-up to his article from last month, and thanks to Layne for sending me some great photographs for the newsletter.

- Ash Hammett
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English Short-faced Tumbler

photo by Layne Gardner

If we're really interested in learning about genetics, proper *terminology* is important.

If we aren't using the correct vocabulary to discuss the subject, then it's more difficult to understand each other.

This results in confusion, and confusion leads to disagreements.

Many problems arise largely from the traditional names historically used by pigeon fanciers to describe what they considered "breed specific" traits that are in fact the same genetic mutation(s).

Or the opposite problem, using a single term to identify similar phenotypes that are in fact the result of completely unrelated genetic factors.

Both are equally confusing and equally bad.

There are multiple examples of this problem that directly relate to any articulate discussion of the **Almond** phenotype.

The first, and worst, misperception involving "Almond" is the term itself.

There is no single "Almond" gene.

The specific *single mutation* that is responsible for the variegated or "stippling" effect is properly referred to as **Stipple**. Stipple is a sex-linked, dominant genetic mutation. Any pigeon that carries this mutation, or any of its alleles, will express its phenotypic effects and can be correctly referred to as a "Stipper".

A lot of fanciers use the term "Almond" very loosely to describe any Stipper phenotype, and many breeders use the term "Almond" to reference the gene mutation. While that doesn't necessarily mean they don't understand the properties and function of the mutation properly, using the incorrect term to reference the actual Stipple (St) gene mutation has created a lot of confusion.

At the very beginning of modern genetic research on pigeons, the term "Almond" *was* used, by Hollander and others, to identify the gene mutation because that is what fanciers had always called it.

However, once it was understood that the phenotypic "Almond" was ***not a single factor mutation***, but a ***combination*** of mutations, researchers realized that a better term was needed to describe the actual single mutation that was responsible for the "stippling" effect.

"Gesprenkelt" is the German word for *variegation*. The Danish words "stipper" and "stankede" translate to mean *speckled*. The comparable English word is *stipple*.

Unsurprisingly, it was decided the best English term for the single mutant should be "Stipple", and it was given the genetic symbol "St".

The **Stipple** locus resides on the sex (Z) chromosome(s). There are numerous *alleles* at this locus, which we'll briefly address.

There is a sex-linked **reversion** factor associated with Stipple that is unique to the mutation.

As Stippers age, they express more and more of their base color and pattern; the mutation is less "functional" as the pigeon ages. This is called reversion.

A heterozygous Stipper cock carries the broken gene, the Stipple mutant gene, **on one** of his two sex (Z) chromosomes, but carries **two** base color genes, one **on each** of his two "Z" chromosomes.

If the base colors are not the same, the reversion results in some unusual phenotypes because the Stipple mutant remains more influential **on its own chromosome's base color**.

This functional factor is irrelevant when discussing a female bird, because hens only have one sex chromosome, so as the reversion progresses, her single base color is the base color expressed over time.

In both sexes any **autosomal** color mutations may be expressed to some extent as the reversion continues with each molt.

STIPPLE *definition:*

Oxford Dictionary:

english - stipple (verb)

to stipple; to paint or draw something using **small marks**. a **stippled** effect.

Webster's Dictionary:

in biology - (noun) - stippled, stippling; **the appearance of spots. a spotted condition.**

Axel Sell:

St - Stipple, formerly often named Almond.

Sex linked dominant mutation.

Almond and "Multicolored", Sprenkels and Stippers, two or more colors on a feather, in combination with Spread called "Sprenkel", homozygous cocks near to white and often bladder-eyed.

One important fact to know is that the Stipple mutant is a **semi-lethal** or **sub-lethal** mutant gene. Either term is acceptable and both have the same definition.

What that means is that when the Stipple gene mutation is present in the homozygous state (only possible in a male pigeon) the bird will either not live to fledge or it will have health problems.

Homozygous Stipple cocks usually have serious eye problems and other health issues if they do live long enough to develop them.

A couple of the Stipple alleles have the same health problems and a couple of the alleles have no health problems at all.

There are reports of homozygous Stipple cocks that breeders claimed had no health issues.

If that ever actually occurs, it is **extremely** rare.

It is more likely that these male pigeons are not in fact homozygous Stipple, but actually Stipple and one of its more benign alleles.

ALMOND is a **phenotype**, a **combination** of several gene mutations.

The textbook **genotype** of **Almond** coloration is:

Intense, **wild-type Blue** base color

Heterozygous or homozygous **T-pattern**

Heterozygous (*hemizygous* for hens) **Stipple**

Heterozygous **Recessive Red**

Heterozygous or homozygous **Kite Bronze**

Color darkening modifiers such as dirty, sooty, and smoky will enhance the expression of the ground color, and if you can get some iridescence on the body that also looks really cool.

Almond is a specific stipper phenotype; **one of several**.

You can breed Stipper pigeons in all kinds of combinations and none of them are "inferior" to the Almond phenotype, they just aren't "Almond".



Jacobin

photo by Layne Gardner

Stipple and its alleles

As was stated above, the Stipple mutation is located on the sex chromosome(s). Stipple is a dominant mutation, which means a pigeon only needs one copy of the mutation in its genotype for the mutant to be expressed to some degree in the plumage.

There are at least six generally recognized genetic mutations at this chromosomal **locus**. When multiple genetic mutations occur at the same locus on the chromosome, they are termed **alleles**.

Only one of these genes can be present at that locus on the sex chromosome. So a cock can carry **any two** of these genes, while a hen can carry **only one** of them, **including** the unbroken wild-type gene at that location on the chromosome. The generally recognized genetic possibilities for this particular locus are listed below, including the normal wild-type gene.

+ - wild-type

St - stipple

St^F - faded

St^Q - qualmond

St^{Sa} - sandy

St^H - hickory

St^f - frosty



Faded (St^f)

photos by Layne Gardner

Texan Pioneers. Homozygous faded cock on the left, hemizygous faded hen on the right.



A Stipper Horseman Pouter that I raised a while back. I chose to include this photo because I am certain of his genotype. This photo is typical of what a yearling "Stipper blue check" looks like. He's just hetero stipple on blue check. He does not carry a bronzer. He is not spread. He is not an "Almond", nor is he a "poor quality Almond". He is a "Stippled Blue Check". A "Stipper".

In short, not all Stippers are "Almonds", but all "Almonds" are Stippers.



English Trumpeter

photo by Layne Gardner

The interaction between Stipple and Bronze

One of the earliest known genetic studies of the “Almond” phenotype (Wriedt and Christie) was undertaken around 1925.

Apparently they were mainly interested in the inheritance of “sprinkling” (stippers) and examined stipper Danish Tumblers descended from English Almond Tumblers.

Wriedt and Christie reportedly were not particularly interested in the “almond” coloring, and described *the interaction of the “stipper” mutation with kites and recessive red* as though it were “nothing special” or noteworthy.

If that is true, it was a grave oversight in evaluating *the function* of the “Stipple” factor *as a single mutant in and of itself*.

Different “bronzes” interact with the Stipple mutation in different ways.

The various *phenotypes* that pigeon fanciers refer to as “bronze” are for the most part not very well understood. There are any number of factors that can cause a Blue/Black pigeon to show some reddish coloring in its plumage, and many fanciers and breeders are quick to assume any blue t-pattern pigeon that has any reddish pigment anywhere in its feathers is a “Kite” bronze.

This is not accurate.

Kite Bronze (K) is a specific, dominant mutation that has a subtle “bronzing” effect on the plumage which is generally most noticeable on the inner vanes of the primary flight feathers. Some pigeons may show some reddish color in the wing shields. Many “Almond bred” Kites are also split for Recessive Red, which can slightly increase the reddish pigment present in an adult Kite.

So we have yet another terminology problem. The term “Kite” has been misused by fanciers for so long that many pigeon breeders don’t know what it looks like anymore.

At any rate, Kite Bronze is generally considered to be the best “bronze” to use to achieve rich ground color in the Almond phenotype.

Over the years, I’ve heard some pigeon fanciers remark that “Kite is tied to Almond”.

If that is supposed to mean that Kite is “tied” figuratively to good bronzing in the Almond phenotype, or that one could produce a Kite from a mating between an Almond pigeon and say, a Blue t-pattern, then that’s a true statement; it’s just another terminology problem.

But if that statement is meant to describe an inheritance factor, then it is patently false.

The Stipple mutation’s locus is found on the sex chromosome(s).

The “Kite Bronze” that has been extracted from English Short-faced Tumblers is an *autosomal* color modifying mutation.

It is biologically impossible for an autosomal gene to be genetically “tied” to a gene that is located on the sex chromosome.

So, for the avoidance of doubt, Kite Bronze, or any other “bronze”, cannot be genetically “tied” to the Stipple gene.

Stipple and any “bronze” are always inherited independently of each other.



Modena

photo by Layne Gardner

Magnani is another term used in reference to the Stipper phenotypes, usually the Modenas.

Magnani Modenas are exhibited at pigeon shows in every possible combination of Stipple and whatever color mods happen to be present in the bird's genotype, and rightly so. That's why Modena breeders don't call them "Almonds", because many of them definitely are not.

They're ***all*** Stippers, though.

The same genetic mutation found in other breeds is responsible for the stippling effect.



Old Dutch Capuchine

photo by Layne Gardner

Stipple can be combined with any of the three base colors and dilution factors, and bred in combination with any of the other color modifiers or pattern genes.

However, we should only use the actual term "Almond" to describe a Blue t-pattern, Kite bronze, het Recessive Red, Stipper pigeon.



Oriental Roller

photo by Layne Gardner



German Beauty Homer

photo by Layne Gardner

Ember (e^E) reversion photos from Gary Young

As a nice coda to his article from September, Gary Young sent in these photos of a Catalonian flying pigeon, "*colomb de vol*".

These pics are a great example of the progression of **Ember** through the first molt from juvenile plumage (very similar to recessive red) into the partial *reversion* to the base color that is expressed in the adult coloration.



The Spiral Notebook

- ac - achondroplasia (lethal)
- al - albino
- am - amputated
- at - ataxic
- b - brown
- B^A - ash-red
- Bh - baldhead pied
- c - barless
- C^L - light checker
- C - checker
- C^D - dark checker
- C^T - T-pattern
- ca - cataract
- cl - clumsy
- cr - crest
- cy - crazy
- d - dilute
- d^{ex} - extreme dilute
- d^p - pale
- da - Dunkles Auge (dark eyes)
- dr - drumming
- Drz - drizzle
- ds - Davis syndrome
- dsc - deutsch scraggly
- e - recessive red
- e^E - ember
- er - erratic
- F - frayed
- fb - feed-blind (lining blindness)

breed: animals *within a species* having a distinctive appearance or behavior developed by deliberate (*artificial*) selection.

allele: one of two or more alternative forms of a gene that arise by mutation and are found at the *same* locus on the *same* chromosome.

fg - fringe
 fr - frillneck
 fs - Frill stencil
 fz - frizzy
 G - grizzle
 G^T - tiger-grizzle
 G^W - white grizzle
 Gp - gimpel pattern ----->
 gr - grouse
 H - hosen or grouse legged
 ic - ice
 In - indigo
 Ir - Iridescent
 K - kite bronze
 Ku - short beak
 L - silky
 ma - mahogany
 mi - microphthalmia
 my - milky
 Nn - Naked neck
 na - Naked
 n - no oil gland
 ofr - Chinese Owl frill
 o - recessive opal
 o^{ch} - cherry
 Od - dominant opal (99.9% lethal as homozygote)
 p - porcupine
 pd - pink-eyed-dilute
 py - polydactyly
 ro - rolling, tumbling
 r - reduced
 r^{Ru} - rubella

Gimpel - or Archangel bronze 1 (Quinn's Kite Archangel)

Ka1 - dominant

Bronze or copper mainly restricted to the body, usually the expression of copper on the head is minimal or nil

Gimpel - or Archangel bronze 2

ka2 - recessive

Spreading of copper or bronze over the head

- ros - rose, beak crest
- S - spread
- Sb - sideburns
- sc - scraggly
- skpy - Show-King polydactyly
- sl - slipper
- so - sooty
- St - stipple
- St^F - faded ----->
- St^Q - qualmond
- St^{Sa} - sandy
- St^H - hickory
- St^f - frosty
- sm - smoky
- t - extra outer toes
- t^H - Hasz' lethal
- tr - pearl iris
- Ts - Toy stencil ----->
- U^G - under grizzle
- V - dirty
- w - outer-toe web
- Wr - warbling
- wo - wobbly
- wl - web-lethal
- z^{wh} - recessive white
- z - gazzi
- z^{Pc} - penciled

Faded

A benign allele to the Stipple mutation that can be bred as a sustainable sexually dimorphic phenotype in any breed of domestic pigeon.

Homozygous cocks are white with some flecking, typical of a Stipper phenotype.

Hemizygous hens will express the sex-linked base color and any additional autosomal modifiers in a slightly "faded" or washed-out phenotype.

Toy Stencil

(Toy Stencil complex) Ts partial dominant

Responsible for white pattern

Probably the result of three traits acting together:

(Ts1, Ts2, ts3)

-Axel Sell

