



The Pigeon Genetics Newsletter

News, Views, and Comments.

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Section # (1) Beginner

Genetics of Color of Gimpel pigeons

The gimpel pigeon is a strong representative among the color pigeons due to its deep rich color. Since it is primarily a color pigeon, color of almost all portions is important, even the toe nails. The first impression of a Gimpel should be a bird with deep rich color, proper gimpel (colour arrangement) called pattern , and a highly polished sheen when required.

A Gimpel bird must have its head, neck, belly, under body and under tail wedge covered by bronze and the rest of the plumage (wing, rump and tail) are to be the base color and should be free from bronze, except the base of the flights. This line of demarcation is called “gimpel pattern”

The above photos of Gimpel pigeons from left to right, first three from Siesta Lofts and last one from Filiph Beslić.

Based on the base color, shield pattern, color intensity and/or pied marking, there are mainly six color varieties and many sub-color varieties present in the breed. Below are some photos of the color varieties in the breed.



Copper bluewing



Gold bluewing



Copper blackwing



Gold blackwing



Copper whitewing



Gold whitewing



Copper whitewing barred



Gold whitewing barr



Copper bluewing barred



Copper bluewing check

Pied marked Varieties

Pied marked varieties such as white flights, white tail, priest marked and monk marked are present in the breed and they are rare, especially the white tail and monk marked varieties. Below are some photos as examples.



Copper blackwing-white flights



Copper blackwing-priest marked



Gold blackwing-priest marked



Gold blackwing-white flights



Gold bluewing-white flights



Gold bluewing check-white flights

Gimpel Bronze

Gimpel pigeons have been test bred by a number of people and found that there are two distinct non allelic autosomal mutations expressed together to produce birds with base color overlaid by a bronze colour on the blue areas , of the head, neck, belly, under body and under tail. The first one is symbolized Ka1 is partially dominant to wild type. The second mutation is believed to be a distinct bronze from the first one with the symbol ka2, as the small caps of the symbol indicates, it is recessive to the presumptive ancestral or wild type allele. The dominant one express on neck, belly, under body and under tail, whereas the recessive one expresses on head.

The bronze mutations present in all color varieties of Gimpel is the same. Gimpel bonze is not a unique characteristics to the gimpel pigeons, it is also present in Nuremberg Lark, Swiss Berner Lark, South German Coal Lark, etc. Out crossing Gimpel with wild type produces offspring with bronze colored belly and usually lack bronze on head and under body, similar to South German Coal Lark or Coburg Lark. Below are some examples for Gimpel crosses.



Left a F1 with bronze belly out of blackwing mated to Homer by Axel Sell and right a couple of Steve Shaw's gimpel coloured parlor Project birds (F2s out of brother-sister mating)



A couple of Gimpel-Lal band crosses



A young cock bred by Axel Sell

The above bird is a gold whitewing(ashred base) carrying blue after the juvenile moult with full gimpel bronze, bred from a Gold whitewing barred cock mated to gold bluewing white barred hen, she was also hemizygous for whitewing (we will be discussing this mutation later on). Note the head, it is a plain headed, that is/was also present in the standard.

The above example can be taken as proof for both varieties (whitewings and bluewings) possessing the same mutations for bronze colouration. I have also seen photos of Gimpel - Nuremberg Lark F1 crosses with full bronze that someone posted in one of the facebook groups where I am a member . Unfortunately I can't find the photo now.



A gimpel bluewing coloured West of England trumbler(American version) with poor head colour posted in an FB group by Becky Lewis. The bird lacking ka2 or it could be a poor expression of the mutation.

Multi-trait Punnett Square for Dihybrid crosses(Ka1 & ka2)

Not just Ka1 and ka2, of course each gimpel variety consists of many mutations present and all of them are essential to get the desired coloration. However, it is important to show the inheritance of gimpel bronze alone and it may be useful to people who are introducing the mutations in to other breeds.

When we out cross gimpel, all F1 offspring will be heterozygous Ka1 and ka2,

since *ka2* is recessive to its wild type allele, it does not express at all, thus the youngsters will show bronze only on the belly (rarely some F1s show no bronze at all). When mating two such dihybrids, The F2 generation produces youngsters with different amounts of bronze; that is from no bronze at all to full gimpel bronze. Below is a Punnett square showing the probability to get each genotype in the second generation.

♂ \ ♀	$Ka1\ ka2$	$Ka1\ +$	$+ \ ka2$	$+ \ +$
$Ka1\ ka2$	$Ka1//Ka1$ $ka2//ka2$	$Ka1//Ka1$ $ka2//+$	$Ka1//+$ $ka2//ka2$	$Ka1//+$ $ka2//+$
$Ka1\ +$	$Ka1//Ka1$ $+ //ka2$	$Ka1//Ka1$ $+ //+$	$Ka1//+$ $+ //ka2$	$Ka1//+$ $+ //+$
$+ \ ka2$	$+ //Ka1$ $ka2//ka2$	$+ //Ka1$ $ka2//+$	$+ //+$ $ka2//ka2$	$+ //+$ $ka2//+$
$+ \ +$	$+ //Ka1$ $+ //ka2$	$+ //Ka1$ $+ //+$	$+ //+$ $+ //ka2$	$+ //+$ $+ //+$

According to this table, chance to get a full gimpel bronze phenotype in the second generation is very low, only one out of 16, but usually that is not the case in the breeding pen. When I discussed this with a few breeders who tried to transfer the bronze factors in to other breeds, they had different opinions and from their results I had the impression that maybe some genetically impure gimpels could also show full bronze phenotype, interesting nevertheless.

I have seen a number of F2 gimpel crosses, most of them were bronze on just belly, some with full gimpel bronze and some without gimpel bronze at all, but none with gimpel bronze only on the head (that is homozygous *ka2*) Of course the probability for getting offspring with just homozygous *ka2* (without *Ka1* at all) out of the dihybrid crosses is very low, but it should be possible if *ka2* is indeed a different bronze. Just wondering if *ka2* can express alone without *Ka1* at all, how can we consider it as a distinct bronze unless it can express

without the presence of Ka1! Have any of you ever produced one in the F2 or any further generation., if yes, please send us some photos, we would like to publish it in the future issue and of course it will clarify the doubt.

Dark and light Gimpel

As we exemplified above, Gimpel comes in both dark(copper) and light(gold) shades. Of course the copper gimpels are wild type at the sex-linked dilute locus. According to the standard the "Blue" area of a dark Gimpel should be deep brilliant copper-bronze in color. It should be evenly and deeply coloured with no dullness or fading on the belly. It should have a highly iridescent sheen, the more fire the better. This sheen should be copper to pink in colour throughout". The colouration is required also in the copper whitewings, but difficult to get. In whitewings, the dark bronze is somewhat darker and is more of a brownish red shade.

Gold , also know as light bronze , are pale versions of the gimpel bronze. According to the standard, the blue area of a light bronze gimpel should be of a golden yellow in colour and evenly coloured, neither a lighter or a darker tone is preferred.

Wing color of Gimpels

1 Bluewings

Bluewing Gimpels come with barless, bar and checker. According to the standard "Wing shield, back, rump and tail are to be an even shade of blue, the more pure the blue the better, but neither a light or dark blue is preferred. Flight tips are to be dark, tail has a black band". The photos exemplified are not standard phenotypes. Darkening factors like dirty and smoky are present in the bluewings, that will help to maintain the desired colouration. Sooty is not part of the genome, as it will ruin the coloration. I was told that sooty can be present in the bluewing checks, however, according to the standard, checkered birds should have clearly defined and evenly spaced checks. We know that sooty is extremely variable, and it is better to keep sooty away as heavily expressed sooty can darken the shield,

thus it can be a problem to get clearly defined and evenly spaced checks. Additionally, grease quills are also present, and part of all the color varieties of Gimpel pigeon.

2 Blackwings

Unlike the name indicates blackwings are not spread, but usually check patterned with all the three known darkening factors (dirty, smoky and sooty) and of course grease quills. Iridescence is a structural colour that seems to act as a recessive to wild type , also present in the blackwings. The three darkening factors plus Iridescence are on blue check to get the shiny solid black colouration. According to some people who have worked with blackwings , suspect that the sooty present in the blackwings is somewhat different to the typical sooty.



Above left is a gold bluewing white barred and at right is an offspring(gold blue dark check, incomplete Toy stencil) of her sired by a gold blackwing cock. The breeding result shows that the sire was a dark ccheck patterned.

Copper blackwings and copper bluewings show a horn coloured beak with dark tip and dark horn coloured nails. The color of beak and nails is balanced by the combined expression of dirty and smoky. Some blue series gimpels show very dark beak and nails, that is because they are lacking smoky factor. Some show very light beak and nails, in this case Dirty is missing. Light beak is not a fault in the breed, but not preferred. In gold varieties of blue and blackwings generally the beak tip is lighter than coppers, that is of course because of the pale factor.



Left is a head view of a copper blackwing with typical horn coloured beak and right is a Young blackwing gimpel with light beak and blue tail instead of black tail indicates dirty not present.

3 Whitewings

Whitewings are Ash red series, and as with bluewings, they come in barless, barred and checker pattern. They are free from dirty and sooty, but smoky is part of the genome, that is what gives them the desired flesh coloured beak and nails. They have grease quills as well as the light color of the wing is caused by the “whitewing” mutation. It is a sex-linked recessive and present also in some other breeds like Saxon and Thuringer Moon pigeons, and in some of the Swiss breeds. In those breeds the birds are selected for bronze only on neck, thus the

rest of the plumage is lighter(except pattern), this indicates that the mutation expresses on all plumage except the reddish pigmented area.



A heterozygous whitewing out of a whitewing cock and a bluewing hen. You can see the dark beak caused by dirty that the youngster inherited from the bluewing parent.

Since each of the varieties possess different mutations, crossing different wing colours (blue, black and whitewing) birds can result in poor coloured birds without any further use. Even mixing of Copper with gold of the same wings colour is not recommended by the experts as it can ruin the intensity of the bronze, at least that is what I was told.

White barred Gimpels

Copper and Gold bluewing Gimpels come in white barred as well. There are two different types of white bars in the breed. One is with dominant opal, and the other is with Toy Stencil complex , developed in Germany by Klaus Gedhard.

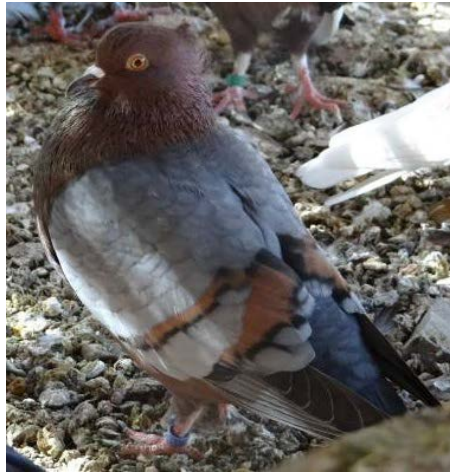


Different poses of a gold bluewing dominant opal, photos from Graeme Boyd.

As you can see in the photo its flights and tail band is much lighter compared to the other bluewing varieties. Bluewings require dark flights and tail band according to the standard, but that is not that easy with the opals, perhaps standard is/was different for the opal varieties?



Above a Copper and a Gold bluewing white barred Gimpel, first one photographed by Mick Bassett and the second one owned by Filip Beslić, both are from Klaus lineage.



Copper bluewing red barred (incomplete toy stencil), belongs to Bertus Pretorius.

Birds with undesirable bronze expression

1 Floating or Shield bronze.

Young gimpels in the nest plumage often show bronze coloured shield in the nest, and most of them moult out the bronze after the juvenile moult, but not all. Some breeders call it “floating bronze”. Adult birds should have no bronze on the wings (except base of the flights), tail and rump and is considered a fault.



A gold blackwing baby in the juvenile plumage with bronze on the shield, that

turned out to be a cock and looks perfect after the juvenile moult, bred by Siesta lofts.



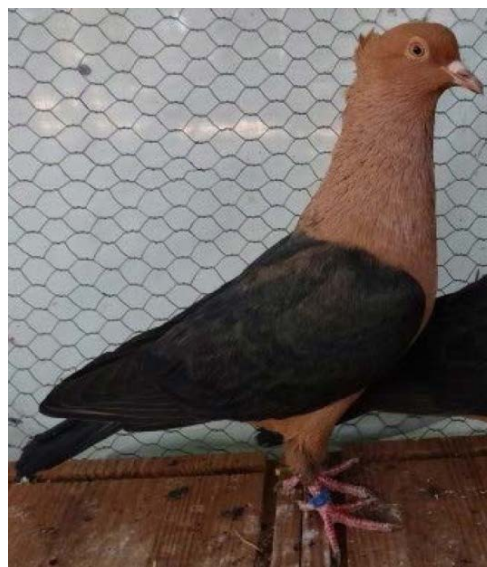
A copper blackwing and a copper bluwing with bronze on shield, bred by Bertus Pretorius.



A couple of gold blackwings left-before and right after the moult .



A couple of blackwings left before and right after the moult.



A gold blackwing after the moult with some floating colour on the shield.

Page 17

As you can see, the bronze on the shield may or may not moult out, most moult out completely, some show minor amounts of bronze after the moult, whereas some retain most of it. We don't know much about the genetic side of this bronze as to what is responsible for this.

2 Excess or reserve colour.

Some Gimpels show excess coloration, it is different from floating bronze and will never moult out. Birds with excess color are not showable, but hens with excess colour are excellent breeding stock, thus in that way they are desirable. Same as floating bronze, we don't know the genetic side of this factor. According to some well experienced Gimpel breeders, breeding two birds with excess color will mess up the young completely and mating a cock with decent quality to an excess colored hen usually produces better quality daughters and sons not as bad as the sire. Cocks with excess color are rarely used in the breeding program. Most of it makes little sense from a genetic point of view, but breeding show quality Gimpels certainly requires practical experience along with theoretical knowledge!



A copper blackwing with excess color, bred by Bertus Pretorius.



First top view, second and third upside down of a whitewing and a blackwing
-Photos from Bertus Pretorius.

Tail shot of three hens with excess color, Have a look at what is displayed in their tail and inner webs, that will give you an idea of excess color on the tail , and should not confused excess colour of floating bronze, they are different.



A Gimpel copper blackwing hen with excess colour, belongs to Bertus Pretorius.

Brown series Gimpel pigeons

Brown Gimpels did exist in the 60s 70s and 80s in the USA, and the colouration is also mentioned in the Standard book of the NPA; however, now-a-days they are extremely rare or don't exist at all. Bertus Pretorius, from the

Page 19

South Africa started developing brown gimpel in 2000, he had some good results with Copper (intense) birds, but in Gold (pale) the result was not good. He still has a separate loft with about 30 brown gimpels, lets hope to see brown gimpels from him in the future.



A couple of pale brown gimpel project birds from Bertus Pretorius loft



An excellent Gold brownwing photographed by Dick Ans Hamer.

If the bird is genetically identical to gold blackwings except the base locus (where brown mutation present), it should not be that difficult to recreate the colouration.

Spread Gimpel

There are self blacks and blacks with white flights present in the breed, unlike blackwing gimpels, these are spread. Spread completely masks Gimpel bronze and the birds appear as solid black, showing a complete epistatism over the bronze factor/s. They usually have rich iridescent luster. Spread on brown base may also mask the gimpel bronze completely.



A spread copper blackwing and a non spread brown gimpel(with darkening factors) project bird bred by Bertus Pretorius.

Spread ash red series birds show most of the gimpel bronze.



From left to right a dark spread ashwing during the moult and a spread ashwing after the moult belonging to Bertus Pretorius, last a spread ashwing from a fb group.

Recessive red Gimpel pigeon

Homozygous recessive red gimpel sometimes pops up in some families of gimpel pigeons, especially in the gold varieties, it is a sign that both of the parents carry recessive red. Heterozygous recessive red gives extra saturation for the gimpel bronze and the self birds are useful in the breeding pen.



A Couple of Gold whitewing barred, belonging to Bertus Pretorius.

According to him the one at the left is heterozygous for recessive red, and the other one not. Of course one can see the left one is more saturated and a bit darker than the other one and that is because of the heterozygous recessive red



First a couple of self gold youngsters belonging to Tabetha Kile, next self gold belongs to Bertus Pretorius, and the last one is a priest marked gold, also belongs to Bertus Pretorius.



A couple of Gold bluewing white bars after the moult with strange golden color and lacking the golden colour on tail. First one belongs to Axel Sell and second one belongs to Arpad Cseplo.

I have seen a few of this type, before and after the moult, posted by some breeders on Face book. Most if not all of them were pale and had darker tail band, and have not changed much with the moult. Some had darker beaks, so not likely recessive reds with poor expression. Does not look like floating/shield bronze either. Perhaps heterozygous recessive red plus something else. Anyone know in detail about this phenotype?



A self red Gimpel and a white gimpel, photos from Bertus Pretorius.



A copper whitewing checker photographed by Dick Ans Hamer and A gold whitewing checker belongs to Bertus Pretorius.

Grease quills

Grease quills are yellowish wax coloured, hard and longer than normal quills and are visible in the rump and tail area. The trait seems to improve colour and quality of the feather, in fact it is present in many breeds with shiny feathers. Mode of inheritance of the trait in pigeons is dominant.



A nice photo showing Grease quills by Michael Spadoni.

Page 24

I suppose it is not from a gimpel, but from another breed. This one maybe from a homozygous grease quill bird, heterozygous birds usually show smaller, and less in number than homozygotes and usually lack the yellowish wax colouration. The trait is necessary in all the colour varieties of Gimpel pigeons, and it is easily observable on whitewings and hard to see on blackwings.

Iridescence of Gimpel blackwings

The color of feathers is produced by either pigments or microscopic structures or sometimes both together (for example a blue pigeon is actually black pigmented, but their microscopic structure reflects blue, so the bird appears as blue instead of black in our eyes). Based on the glossiness, feathers may be classified as matt, glossy and iridescent. Matt feathers don't have any glow, and as the name indicates glossy feathers glow and iridescent feather produces purple or green sheen. The iridescence of feathers in pigeons is structural, and varies depending on the angle of viewing. According to Quinn, iridescence is produced by the slight twisting of the feather barbules, however, there is no proof given and it might be a supposition based on what is proven to be the reason for glossiness in case of human hair, as such factors have been shown to affect glossiness in human hair. Whereas according to research reports on iridescence of feathers of some other bird species published by some Universities, iridescent colour is associated with single-layer melanin deposition, while matt black colour is associated with a dense, uniform melanin deposition. In birds, the mechanisms that create these colours are diverse, but most if not all are based on ordered arrays of melanin granules within a keratin substrate in barbules.



From left to right a pigeon with matt black plumage, next an other bird species with glossy plumage (glossy plumage present in some breeds of pigeons as well) and last one is a Luster pigeon with iridescent plumage.

In pigeons, the trait inherits as more or less recessive, and it has been affected by some factors including base colour, grease quills etc. Below are some photos of Gimpel blackwings showing iridescent sheen.



First one by Siesta Lofts, and the next three by Bertus Pretorius.



A couple of Mosaic Gimpels, first one belongs to SRK Shawon, and the other one posted by Bertus Pretorius.

Below is a table with different colour varieties of Gimpel pigeons and their genetic makeup. We have not included pied varieties in the table, pied varieties such as priest marked, white flights (6 to 10 white flights), white tail and monk marked are also present and they come with these colour varieties except

whitewings. In South Africa and US, they prefer clean beak for the whitewings. But recently I have noticed that, some of the copper gimpel whitewings from the Leipzig show(2016) posted on face book had horn coloured beak, that confued me a lot, they must be either dirty plus smokey or lacking both, as smokey alone on ashred produce clean beak. So, it is bit hard to make things so cut and dry, and the table is not final. Of course your opinions are welcome.

Phenotype	Genotype													
	Sex-linked loci					Autosomal loci								
	Base		Dilution		White -wing	Pattern				Darkners			Iridesce -nce	Grease Quills
	Blue	Ash -Red	Intense	Pale		Barless	Bar	Checker	T-pattern/ Dark check	Dirty	Sooty or so- ty look-alike	Smokey		
Copper white -wing		✓	✓		✓	✓						✓		✓
Gold white -wing		✓		✓	✓	✓						✓		✓
Copper white -wing barred		✓	✓		✓		✓					✓		✓
Gold white -wing barred		✓		✓	✓		✓					✓		✓
Copper white -wing check		✓	✓		✓			✓				✓		✓
Gold white -wing check		✓		✓	✓			✓				✓		✓
Copper blue -wing	✓		✓			✓				✓		✓		✓
Gold blue -wing	✓			✓		✓				✓		✓		✓
Copper blue -wing barred	✓		✓				✓			✓		✓		✓
Gold blue -wing barred	✓			✓			✓			✓		✓		✓
Copper blue -wing check	✓		✓					✓		✓		✓		✓
Gold blue -wing check	✓			✓				✓		✓		✓		✓
Copper black -wing	✓		✓						✓	✓	✓	✓	✓	✓
Gold black -wing	✓			✓					✓	✓	✓	✓	✓	✓

Last but not least, you may remember that in the equation for the classic almond colouration that we gave in the July 2015 issue , we used the capital letter "B" for the wild type present at the so called base/colour locus . Some people out there seem to disagree with that. We are not going to get into an argument over this,

Page 27

going on out there in a facebook group, however, some of our members may be curious as to why we used "B" for the wild type at the base locus instead of "+" which we usually use for the wild type present at any locus. Well, the main reason is that, there are many people in our members list starting to learn pigeon genetics, and they seem to have difficulty in identifying the so called base colours (ash red, blue or brown) of many stiffer combinations and some classic almonds are among them. For a beginner, it can be quite confusing and they may mistake a juvenile almond or a young almond hen as an ash red series bird, especially the almonds present in the ESFTs. If you are an expert, just turn your mind for a moment and view things from a beginner point of view, and then you will see what I am saying. I knew some people may argue about the symbol when I used it, but it was just so necessary to "point out" to the beginners that classic almonds are blue series (now some may argue there is no blue series and it is black series, but we can use either). I could use either(+//+) or "nothing or don't mention at all" for the base colour as either way is fine for wild type, but with the first method, people may be confused as to which locus I was referring and with the second way I could not point out that the base should be blue(black). You might have noticed that the University of Utah in the research report on "Epistatic and Combinatorial Effects of Pigmentary Gene Mutations in the Domestic Pigeon" used "B with a small + on top after B" as notation for wild type at the base locus. That is the accepted notation, just a "+" makes no sense.



Lower Bavarian cropper, photo from Mick Bassett.

