CHOCOHOLICS

ENGLISH

Translated Dutch article from May 2008
(Nov. 2014)

... about sex-linked recessive chocolate from Carefoot

A majestic Orpington rooster (bantam) in Carefoot's colour: chocolate on the cover of Fancy Fowl (.com). All Orp and Wyandotte photos: Grant Brereton.

As in more colour varieties its possible that the visible colours can have a different genetical background. We knew chocolate till recently (2008) as the colour of the White Crested Polands but this 'chocolate' is genetical different from Carefoot's chocolate which suddenly popped up in a flock of black Orpington bantams. Colour- and other mutations happen spontanously everywhere in the world and are in most cases disposed as wrong colour and therefore not according to the standard colours. But if you have 'the eye' and some knowledge of colours, you can continue with such a mutation and that's exactly what Carefoot did.
This mutation did not only happen in his birds, in the US there is someboy who also has now and then 'wrong' blacks, the only thing you have to do is: recognize it.
The above title is the title of an article in Fancy Fowl from April 2008 written by Rob Boyd who 'revitalized' the only left chocolate hen from the discoverer of the chocolate-gene Dr. Carefoot. Following the story how Rob, Grant and Richard from the UK restored the population starting 2004. And they too see the value for the fancy of this 'new' colour. I added extra information about chocolate or better call it bronze, about inheritance etc. First Rob's story...

Discovery of bronze (choc)

It was sometime in the late 80s-early 90s Dr. Clive Carefoot, a mathematician in origin, started to focus on inheritance and published his first articles. One of the articles was about a dark brown hen he found between his large black Orpington bantams. He started to test breed her and discovered the colour behaved strange compared to the other black diluters dun colour and blue. In 1995 he published about this pure breeding colour in British Poultry Science and 'Carefoot-choc' was a fact. Next to this self colour he created a line of 'chocolate & lemon' Wyandottes in which he replaced black for dark brown choc (dual pen breeding for roosters). From this line only two roosters were born and the colour got extinct.

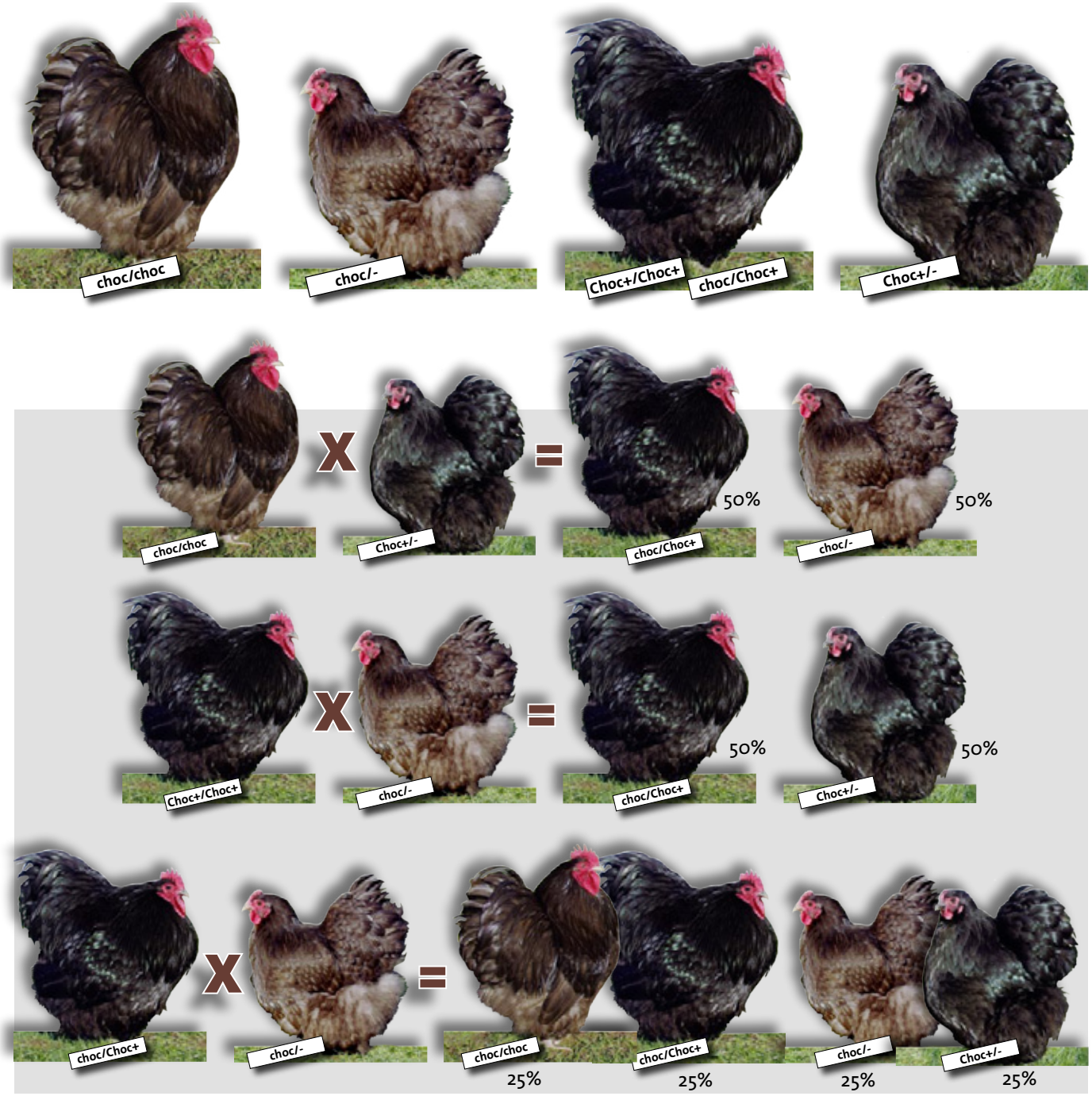
Continuation of bronze (choc)

Dr. Carefoot became ill and was no longer capable to continue the chocolate Orpingtons. At the end he only had a rooster and a hen. Rob Boyd got in 2004 the last one who was left, the hen, which was 4 or 5 years old. With good feed and care Rob and his friends Grant Brereton and Richard Davies could make the hen start laying eggs again and she was paired to a black Orpington rooster. From this cross seven eggs were collected but none of the eggs was loaded. As very last attempt Rob cut the feahters of both butts and this helped. Fifteen eggs were full and the men were overjoyed.

Left: choc on Wyandotte, top photo a chocolate partridge rooster, below a choc laced pullet. All bred from a cross to Orpington, so not ready at alll.

CHOC INHERITANCE

Photos: Grant Brereton



Choc inheritance

Chocolate from Carefoot is sex-linked (male needs two doses to show it and the hen one because choc is on the sex chromosome, you can compare it with gold/silver and cuckoo). Choc is recessive so black is dominant to choc.

Examples how Carefoot's choc inherits

The abbreviation for chocolate (genetic name), bronze (hobby name) is 'choc' written with a small 'c' because its recessive to C which is black in this case because choc is a diluter of black, red stays unaltered. Black as counterpart from choc is 'Choc+', which means: no-choc. The + is a long time ago agreement when it concerns a colour or feature of Red Jungle Fowl, which has no choc so Choc+ which is black is wildtype or 'default'.

choc/choc	only a rooster can carry two doses, he looks chocolate/bronze.
choc/-	only a hen can have one dose, she looks chocolate/bronze.
choc/Choc+	only a rooster can be this, he looks black and carries choc.
Choc+/Choc+	when talking about choc, a rooster who is black and doesn't carry choc
Choc+/-	when talking about choc, a hen which doesn't have the choc gene, she is black.

A choc Orp girl (choc/-) and a black Orp boy (Choc+/choc)...

Patience

They knew they shouldn't expect choc birds from the first cross because they used a black rooster. The first fifteen chicks were therefore black. They appeared to be seven boys and eight girls. The plan was to cross one of the boys to their choc mother but unfortunately the choc hen died when her chicks were still too young.

The only solution was to cross brother x sister of which 25% choc birds could be expected. Grant expected that only the females would be choc from this cross because choc is sex linked recessive. And this is exactly the difference between choc and dun colour which is described on White Crested Polands at first, which is incomplete dominant and has the same action on both sexes.

with my best Black Orpington male and I collected seven eggs. To our dismay, none of these eggs were fertile, so out of desperation, I trimmed the feathers around their vents even further and this seemed to do the trick. As luck would have it, the fifteen eggs that followed were all fertile and we jumped for joy!

We knew we wouldn't get any chocolate chicks in the first cross because we were breeding to a Black male and as we expected, the fifteen chicks that hatched looked like Black Orpington chicks. It was then a case of waiting for what turned out to be seven cockerels and eight pullets to mature. The plan was to breed one of these cockerels back to the chocolate female, but unfortunately she died whilst her offspring were quite young. When they finally matured, our only option was to carry out a brother / sister cross and we thought we would get 25% chocolates emerging, which was right, however Grant suspected they would all be female, because chocolate is a "Sex linked" recessive gene. This is where, in two ways it differentiates from "Dun" which is classed as a "Co-dominant gene."

We hatched over a hundred chicks from the brother to sister mating and we produced twenty chocolates – all of which were female. We were slightly dismayed at this but knew we had to keep on, and that our time would come. At the same time, we also used one or two of the chocolate carrying males to cross with Partridge Wyandottes in order to attempt a line of "Chocolate and Lemon" Wyandottes.

THE KNOW HOW...

Knowledge is power with poultry and we knew we had to breed one of the original chocolate carrying Orpington sons (Black in appearance) to some of their chocolate daughters so that we could produce some chocolate males. We could have used the brothers of the newly produced chocolate pullets, but we knew there was only a 50% chance of them carrying chocolate, and hence this would have risked 100% Black offspring once again. As you can appreciate, breeding a chocolate pullet to a Black male without chocolate would have been exactly as the first cross and we didn't want to go backwards.

In spring 2007, our chocolate pullets were finally ready to be penned with their fathers, and that combination produced 50% chocolates this time, the remainder were Black. However, we knew half of the chocolates would be Male and I reared them until fully grown at home in Southampton. Our only showcase with the chocolate Orpingtons has been the National in 2007, where we exhibited a total of twenty one birds - this included four trios.

Some people don't like the chocolate colour, and my answer to that is "everyone is entitled to their opinion". I have to admit, they did look a little dark at the National and people could be forgiven for thinking they were Blacks. However, natural daylight would have revealed their true identity. I was particularly pleased to be congratulated by Orpington Master, Roger Clark at the National – it was a great compliment to receive on their first outing. I only hope I can do them justice, and keep on improving chocolate Orpingtons. Maybe standardisation beckons, who knows? For now, my main goal is to produce as many quality specimens as possible and keep true to type.

SPREADING THE WEALTH

I believe that life is very short and we should make the most of it. This is why we have sold some chocolates and although not cheap - it is if you consider the amount of time, money and effort we have put in. I also believe that the chocolate gene should be spread around and experimented with. Some may disagree, but in honesty, that really doesn't worry me. I have bred pure lines of poultry for over a decade and I will continue to do so. I believe it's ok to experiment as long as we keep the pure lines "pure".

We have now created some "Chocolate and Lemon" looking birds – we hope to develop them with good Wyandotte Type as a tribute to Dr Carefoot who sadly passed away in 2007. We have also made crosses in an attempt to produce a "Chocolate laced" variety of Wyandotte. In our experience, the chocolate gene does very little to Red (or lack of it – Silver) pigment and we believe chocolate could replace the black parts on almost any colour / pattern involving any degree of black, on any fowl.

Some folk have gasped in amazement at how we managed to produce chocolate Orpingtons with chocolate coloured legs and beaks etc. However, we must hold our hands up and admit it's nothing we did – the chocolate gene changes all black parts of a fowl to chocolate.

If you have an interest in chocolates, please phone or text me on 07917 337080.

Rob Boyd

A rudimentary Chocolate Wyandotte (Note the Matt Tone)

Chocolate Male

12 - FANCY FOWL APRIL 08

Choc on Wyandotte hen. This hen was not deep dark black but dull black. See Genetics of Chickencolours page 77 what this is. Below a choc Orpington rooster.

There were bred over a hundred chicks from the brother x sister crosses and the result was twenty choc females. Rob, Grant and Richard had a bit problems being patient, everything went too slow because they wanted choc males. Meanwhile they crossed the choc carrying rooster to a partridge Wyandotte to re-create chocolate and lemon.

Knowledge

Knowledge is power in colour breeding and they knew a choc carrier but black looking rooster had to be crossed to a choc hen to get choc roosters. In 2007 the choc hens were crossed to their black looking fathers to check whether they carried one dose of choc. They got 50% choc offspring. Because there were born also choc males, the birds were raised till maturity by Rob. On the National in 2007 the first 21 choc Orpingtons were shown of which four trios.

Nice colour?

Some people didn't like choc/bronze. This was the same in the time Carefoot showed his choc Orpingtons to the British Standard committee which didn't 'like' the colour. Talking about old fashioned, conservative and subjetive. Carefoot was very disappointed of such narrow minded thinking and never ever showed the chocs again and kept them to himself. But tastes differ, change and everybody can say what s/he thinks, we are 10 years later (this article is originally written in 2008). Also in the UK an amount of breeders changed their minds and liked the colour. Some choc Orpingtons are very dark brown and in an exhibition hall with not much light the chocs are difficult to distinguish from backs. Of course there was comment again from the dinosaurs. In daylight or under normal (good) light conditions the warm darkbrown colour is very well to see. Rob got compliments from the Orpington professor in the UK, Roger Clark about the quality of the animals. Rob planned to continue with this colour and to maintain the good type.

Wyanotte pullet in chocolate partridge. Small photo: choc cross.

The Light

Fortunately Rob and his friends thought that such a special colour should not stay restricted to their backyards. Some birds were sold to interesed breeders on the National who wanted to continue this colour and experiment with it. Some are against colour experiments but Rob thinks different about this and understands there are mor creative breeders. Experiment as much as you wish but keep the lines pure. Chickens can be used as paint and you can mix them to get new colours and patterns. This is also done with blue, dun colour, lavender when it concerns black dilutions you can incorporate in a new colour pattern. When the conservative mentality always existed there were never been other colours than partridge and duckwing and self black, white and that's it. Lavender partridge or blue laced gold would never existed and the rest of all the beautiful colours we have today.

Chocolate and Lemon

Rob continues this colour on the Wyandottes as an ode to Dr. Carefoot who passed away December 2007. Especially type needs considerable attention but also the colour pattern. The first steps are made for choc laced gold. The experience of these men tells that all parts which are black on the chicken can be made chocolate, also the beak and legs. Choc has not much influence on gold (red) and its counterpart silver. Black is diluted in variable degrees depending on the amount of black present and the feather structure and choc fits on every breed.

Gratitude

Many thanks to my friend Grant Brereton who gave permission to share his knowledge to interested Dutch breeders and perhaps also judges. For this translation you can try to find the original article on Fancyfowl.com located in the UK.

Making photographs of these shades is very difficult and depending on the light circumstances in which the colour is different all the time. In evening sun the colour is much warmer compared to artificial light. Also the quality of digital cameras may vary and the whole palet of shades of bronze is complete.

DARKBROWN DUN

... about autosomal dominant look-a-like of sex linked recessive chocolate from Carefoot...

White Crested Polands from Kees de Nekker. Photos: Sigrid.

Darkbrown dun inheritance

Darkbrown dun colour is also called chocolate in the fancy. Officially its not correct because chocolate has been claimed by Dr. Carefoot in 1995. There is no connection between the fancy and science and therefore the fancy doesn't have to bother about colour names and whether they reflect the genetic background of a colour anyway. To avoid confusion I use the word darkbrown dun because its correct and genetically its heterozygous dun colour which is longer. This darkbrown dun colour was first showed on White Crested Polands in the USA and got its name there.

What is dun colour?

Dun colour is located on the same gene as dominant white and therefore its called an allele of dominant white. It also mentioned in the recipe of dominant white. Dun colour makes black dark brown and its shade is a bit less warm compared to recessive sex linked choc. This observation can be subjective because the feather structure and also the amount of black (e-allele) determine the shade, just as seen on the dull black Wyandotte with choc a few pages back. Actually if you don't know where you are looking at, choc and darkbrown dun look the same, therefore its important to know the difference. Carefoot's choc is in the Netherlands (from Orp), test breedings are busy and I found choc also found in Seramas of which I thought it was dun colour and perhaps both are present.

Autosomal: the same on both sexes, the opposite of sex linked. Dominant: the opposite of recessive.

Khaki, homozygous dun colour. Small photo the male. Shades vary due to feather quality but less in shade compared to blue.

More about Seramas dun and choc later. First more on the chocolate and khaki White Crested Poland bantams. All started in the US and those birds swam to Europe. Heterozygous dun colour is called chocolate in the fancy (I^D/i+). The birds have one dose dun colour and one dose black which is therefore diluted to dark brown.

There are four possibilities when we talk about dun colour:

Dun/Dun	looks light beige which is called khaki, genetical comparable to splash
Dun/Black	darkbrown dun, hobby name chocolate
Black/Black	no dun colour

Dun colour/Dominant white cross White Crested x Padua, hen.

... and to complicate things:
Dun/Dominant white = grizzle grey with here and there dark brown feathers, ground colour lighter than khaki, ground colour can be white as well. Under colour varies from dark to light khaki coloured till white. All these variations can be seen on one chicken, depending on the the breed. If there is red/gold in the bird it can break through because one dose of dominant white can't prevent red/gold very well only dilute it a bit.
Dominant white/Dominant white = dirty white with here and there a black feather and if there's red/gold this breaks through. Can't be compared to thoroughbred dominant white.

Sex linked inheritance

First some more explanation on sex linked inheritance and autosomal inheritance and the difference between darkbrown dun and chocolate/bronze. Roosters have a sex chromosome which has two positions vacant for information, hens have only one position. Suppose you give the male sex chromosome this: >< shape, the hen's one is cut in the middle and therefore >, the other side (<) isn't there to contain information.

Heterozygous dun colour, hobby name: chocolate or better dark-brown dun, here a nice hen with mottled. Mottled is recessive so you have to inbreed once to get mottled dun coloured offspring. Sometimes mottled is in one dose visible (thumbs, head, belly) but you have to search for it.

Sperm cel and egg cel contain half of the genetical information of whats in the normal cells. Hereditary information, DNA can be looked up on wiki. For the gametes DNA splits in two parts in the length. So the rooster gives half of his information and the hen as well, and because she misses < on her sex chromosome, this is written like /- she give also 'nothing'. Some write a W instead of -, I think this is confusing since W is white legs and a small w is yellow legs.
So information which is located on the sex chromosome can be split on a rooster but not on a hen, the rooster can give either A or A and the hen A or -. Information on all other chromosomes can be split in two and given to offspring. So both rooster and hen give either A or A if they are A/A themselves. When A is not on the sex chromosome, the trait is called autosomal. When A is located on the sex chromosome the trait is called sex linked.
There are many websites today (compared to 2008) where you can find the chromosomes of chickens and which traits are on which chromosome number.

Except Carefoot's chocolate also cuckoo/barred is sex linked. The rooster can have two doses cuckoo/barred and becomes very light (double temporary pigment stop during feather growth). One dose of cuckoo/barred is one time on/off, two doses is on/off off.
Also gold (s+) and silver (S, s-allele) work like this, therefore a rooster can be both gold and silver at the same time and a hen is gold or silver because she has only one position for either one depending on what here father gives her. This trait is used for autosexing breeds, or actually both cuckoo/barred and silver or gold.

Back to darkbrown dun colour. Actually this asks as well for a scheme how it inherits like the scheme of Carefoot's chocolate. Fortunately its way more simple because dun colour can't hide on a chicken because its dominant. On the next page the scheme of dun colour.

RECIPE DARKBROWN DUN & KHAKI

X

=

25% males
25% females

25% males
25% females

X

=

25% males
25% females

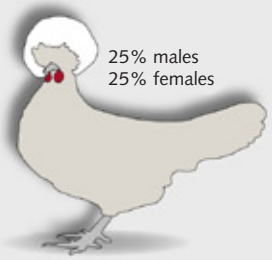
12,5% males
12,5% females

12,5% males
12,5% females

X

=

25% males
25% females



25% males
25% females

Dun colour is autosomal, therefore it inherits the same on hens and roosters.

i+/i+ = black
I^D/i+ = darkbrown dun
I^D/I^D = khaki

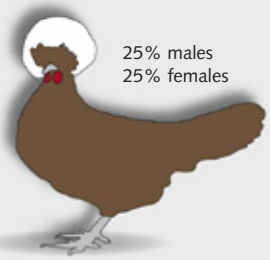
X

=

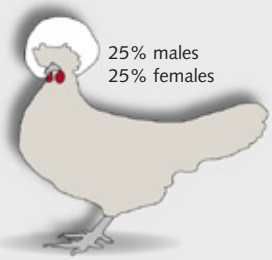
50% males
50% females

X

=



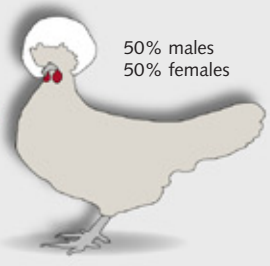
25% males
25% females



25% males
25% females

X

=



50% males
50% females

Gold and/or silver below darkbrown dun and khaki

Whether a chicken is gold or silver or both always plays a role below a self colour which covers all feathers.
Best is silver and no autosomal red to avoid a brown reddish shade. Not everybody pays attention to this. Or it doesn't matter because there is enough pigment to cover it (as in blacks) or no pigment leakage in white birds. In white birds cream or yellow is not appreciated, therefore the most clean whites are based on silver and have no autosomal red. Actually this is the same for blacks and especially diluted blacks. Some photos on this page how red and gold look below khaki and blue.

This khaki male looks impure for silver/gold (S/s+). In his saddle you see gold but less in hackle. It varies what's below a White Crested black bird hides before dun colour hit. This phenomenon can be seen in blues as well, which have a brown-golden shade. The rooster in the middle shows 'shoulder-red' which comes through khaki.

Black of a black chicken covers red and silver pigment. In khaki, chocolate and blue less. Leakage can be seen in males' hackle and saddle and in hens in neck and under the chin. If there is also autosomal red present this will enhance gold even more or makes silver yellowish.

Examples of gold/red under blue. Blue is a black diluter just like dun colour. Left: White crested blue hen with gold under her chin and right blue Brahma in moult, the feathers of the rooster are worn.

Father and daughter choc Serama. Daughter has also Cha.

Left: choc/bronze Serama rooster, right chocolate White Crested Poland hen. Is this the same colour?

Some more on what's below a colour. Next to blue and white also cuckoo/barred can be considered as a black chicken with an on/off colour switch. When a black chicken with cuckoo is gold based, you won't succeed to get a crisp black/grey/white coloured chicken. The bird will look brownish or dark brown when it carries a lot of autosomal red as well. New feathers have more pigment, its not yet diluted by UV-radiation. If you want a good black bird you can use a cuckoo hen (she is either gold or silver, not both) who was outside all Summer because if there is gold or autosomal red it will show. Autosomal red makes blacks brownish. Some dark black pullets and cockerels can look dark brown in their first year (first adult feathers), later they will change these dark brown feathers for black after 2nd moult. Don't get confused by this to think you have suddenly a chocolate bird.

Choc/bronze again...

As written before, you just have to notice dark brown in your birds and wheather its darkbrown dun or choc/bronze or a one year old black. When you are a chicken colour freak you pay extra attention and you can experiment when you notice something odd.

Chocolate Serama

There were born two chocolate-coloured Serama roosters from 'darkbrown dun looking' hens. That's what I thought. Dad was in both cases a black with silver leakage and some autosomal red and a dark wing triangle. Pure self black Serama (males!) did not exist in the Netherlands in 2008 (still not in 2014), there were/are only black hens. The roosters start to leak silver/gold just like black Silkie roosters when they grow older. Those birds are not E, nor ER until...

Which chocolate were the Serama?

So I tested one of the choc/bronze? roosters on a khaki and a black hen.

Surprise! From this cross there are six black sons born and eight choc coloured daughters (in all varieties, silkied, mottled, silver partridge choc, smooth silver in hackle, both mottled etc). Till now (May 2008) and a lot of eggs to go, the same trick has to be done as Rob and his friends did to get a choc/bronze rooster. Not one choc/bronze cockerel was born from this cross to khaki-coloured (not dull black choc though) and black. This means the hens were both 'black' and the khaki hen not choc but darkbrown dun colour otherwise there were born more dark brown boys. Today 2013 I understand there is another 'brown' in Serama which I don't understand, it not choc nor dun colour and I'm testing it because I found unrelated Serama with this weird light brown colour.

Only black sons.

From all daughters only one without mottled. Father is impure for mottled (you can see this in hackle), (one of the) mother(s) probably too.

She looks at him and thinks 'what is wrong with him such a red head' and he thinks 'is this a chicken?'.

Another choc-experiment

One of the choc looking Serama roosters is with the black and khaki looking Serama hen and the other was used to create choc Silkie bantams.
I asked for a black Silkie bantam hen and got the ugliest from all and the Serama rooster thought the same and the Silkie hen didn't like the Serama rooster either. The photos show how they felt about eachother. They didn't want to know the other one the first week, they avoided eachother and neglect was allover. It was like an episode of a soap. Finally two eggs were laid

Update 2014

From this cross choc/bronze Silkie bantams now present in The Netherlands descend. The large choc/bronze Silkies come from a cross to Orpington bantam. In the book Silkies and Silkie bantams more photos of both bantam and large. Conclusion: it took a while but this mating worked out well. Meanwhile Cochin bantams were made too in choc and used to create Silkies. The colour choc is very popular in lots of breeds!

Chickens can be arrogant as well, they neglect eachother despite they are both chickens although they might think the other is something else.

The next day and following weeks the Silkie hen doesn't want the choc rooster. He tries to jump on her but she refuses, he doesn't dance for her although he does for Serama hens.

Silver chocolate laced Serama cockerel. Which chocolate? Wild varieties possible incl. 'special effects'

Future of chocolate and chocolate

(Mind: written in 2008). This year (2008) the first chocolate Orpingtons will come to the Netherlands to use in other breeds. This means we are in two or three years, we are stuck with the two genetically different but same colour looking chocolates in the Fancy: dark brown dun colour which is called chocolate in the fancy and Carefoot's chocolate which is called chocolate genetically. Hoe these colours will look on different breeds when the choc's are transplanted, is the question. As mentioned before, the 'kind' of black dilution, whether dun choc or recessive sex linked choc will play a role, next to feather structure (hard, soft, in between or silkied).
Because its is time (2008) to accept the colour chocolate and khaki on White Crested Polish, there must be written a standard description for dark brown dun chocolate and khaki. Both chocolates (dun and recessive sex linked) can be put in one bucket because the standard descriptions only tell about phenotype, how a colour looks and NOT its genetical back ground.

Proposed colour descriptions

Khaki

Colour of male and female
Feathers and shafts in all parts solid, one coloured, bright beige grey. Under colour: grey, cream white.

Serious faults
Different coloured feathers, mis-coloured patches (except for influence from UV-radiation, we like the birds to be outside) gold, red, mealiness or totally black or dark brown feathers.

Faults
Partly mis-coloured feathers, too light or too dark feather colour.

Khaki is a dilution of black. All colour varieties with back can be made in khaki, just like is done in blue varieties.

Chocolate

Colour of male and female
Feathers and shafts in all parts solid, one coloured pure chocolate brown. Under colour: light grey brown. Legs and beak can be dusky.

Serious faults
Different coloured feathers, mis-coloured patches (except for influence from UV-radiation, we like the birds to be outside) gold, red, mealiness or totally black feathers.

Faults
Partly mis-coloured feathers, too light or too dark feather colour.

Chocolate is a dilution of black. All colour varieties with back can be made in chocolate, just like is done in blue varieties.

Possible colour varieties

Colour of male and female
- Birchen
- Mottled
- Mille fleur
- Porcelain (double diluted with lav)
- Duckwing (silver and orange shoulder)
- Columbians
- Pencilled
- Laced
- Double laced
- Spangled
- Cuckoo/barred
- Wheaten
- Lakenvelder/Vorwerk pattern
- Partridge
- Choc/khaki tailed
- Wild colour (German melanised)
- Salmon
- Brassy back
- Furnace