



A pair of brimstone canaries (*Serinus sulphuratus*), close relatives of the true green canary.

# Canary Culture: Concepts in Genetics

PART 3

by Tony Buccci  
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## Wild Canary

The wild canary (*Serinus canarius*) was first discovered in the early 1400s inhabiting the Canary Islands, Madeira and the Azores. The wild canary is olive green in color with several black and brown stripes on its back. There is a greenish-yellow strip on his forehead, with the regions above and under the eye, on the sides of the head and on the neck also a greenish yellow. The chief difference between the male and female is that on the breast and abdomen of the female grayish-white color takes the place of the greenish yellow of the male.

The green canary is still being bred by fanciers who know the value of the original color and vigor. Since the 1400s, many mutations have occurred and have been preserved by canary breeders. Most mutations are in the form of new colors. However, some mutations are evident in the form of feather shape and feather arrangement. Color mutations are divided into two groups, the Melanins and the Lipochromes.

## The Melanin Canaries

Melanin canaries are dark in appearance. The pigment which colors their feathers is called "melanin." These canaries are not popular as pets, compared to the light colored canaries,

because of their drab appearance. But, to the fanciers, melanin canaries are challenging and beautiful. They are more prolific, vigorous, and longer lived. A few years ago I imported several kinds of canaries from Europe. I lost many lipochrome varieties during the quarantine period but the melanin varieties all survived.

The classic melanin group is divided into the following four varieties:

1. Black-grown (green),
2. Agate (green dilute),
3. Brown (cinnamon),
4. Isabel (cinnamon dilute).

The terms in parentheses are old names and still used in some canary circles.

An interesting observation about melanin mutations is that each progressive mutation is lighter in color. The black-brown (green) is the darkest of them all, and each progressive color appears to be diluted. In appearance, the Isabel is the lightest of them all.

The darkest (black-brown) canary is genetically dominant over all other lighter colors. Next, agate is dominant over brown and Isabel. The last example is the brown being dominant over Isabel. We can visualize each progressive mutation as a set of steps. Each time we step down we find the color which is recessive to the previous step. (See Figure 1.)

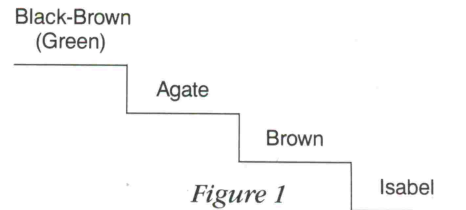


Figure 1

## Sex-linked Inheritance

My last article ended with an explanation of dominant and recessive traits. It became evident green color is dominant over the brown color. The mechanics of the Punet Square (Figure 2), were explained in the previous article, and can be used to formulate the concept of sex-linked inheritance. The hereditary factors which are responsible for the transmission of the melanic colors are attached to the "X" sex chromosomes. The same factors are not found on the "Y" chromosome.

(Note: Birds differ from mammals. Male mammals carry XY sex chromosome and female mammals carry XX sex chromosomes.)

		HEN	
		Xb	Y
COCK	XG	(cock) XG Xb	(hen) XG Y
	XG	(cock) XG Xb	(hen) XG Y

Figure 2

The Punet Square (Figure 2) is a graphic representation of the sex-linked inheritance. It explains the following:

Mating a green cock to a brown hen will produce: green males, carriers of brown (*heterozygotes*); and green hens (*homozygotes*).

One of the best examples of the sex-linked inheritance is expressed by mating a green male canary carrier of brown to a green hen. (See Figure 3).

		HEN	
		XG	Y
COCK	XG	(cock) XG XG	(hen) XG Y
	Xb	(cock) XG Xb	(hen) Xb Y

Figure 3

In this mating, we can observe both parents are phenotypically green, and yet they will produce one offspring which is brown in color. The brown offspring is a hen; therefore, it is a definite clue that brown is sex-linked

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recessive. With the above mating, we can never produce a brown male. I may add that this is one of the worst matings the breeder might choose to use. The reason is in order to determine which of the males is the carrier (*heterozygote*), we must test-breed them both. In a case where you wish to sell these males, they must be sold as possible carriers of brown. Note the characteristic of sex-linked inheritance is such that the hen is always a *homozygote* (or pure to the color she inherited).

A better mating with positive results can be achieved by mating a green carrier of brown to a brown hen. (See Figure 4). With this mating, we can produce one brown male, one green carrier of brown, one brown hen, and one green hen.

		HEN	
		Xb	Y
COCK	XG	(cock) XG Xb	(hen) XG Y
	Xb	(cock) Xb Xb	(hen) Xb Y

Figure 4

One mating we have not discussed is mating of a male brown to a green hen. (See Figure 5.) In this mating, the hens will be brown and the males will be carriers of brown.

		HEN	
		XG	Y
COCK	Xb	(cock) XG Xb	(hen) Xb Y
	Xb	(cock) XG Xb	(hen) Xb Y

Figure 5

The last mating is a brown male to a brown hen. (See Figure 6.) All of the offspring will be brown.

In each of these matings, we can predict the color and sex of each offspring. The brown was used to demonstrate the sex-linked inheritance.

		HEN	
		Xb	Y
COCK	Xb	(cock) Xb Xb	(hen) Xb Y
	Xb	(cock) Xb Xb	(hen) Xb Y

Figure 6

For information about contacting any of these member clubs, please call that club's closest state coordinator. There is a state coordinator listing with phone numbers elsewhere in this publication.



If pairings with other colors are to be used, we simply change the letter accompanying each "X" chromosome. Keep in mind that a capital letter indicates "dominant," and a small letter indicates "recessive." See the example in Figure 7 which shows the mating of a male agate to an Isabel hen. The result of this mating is two male agate carriers of Isabel and two agate hens. Did you notice this mating is the same as the mating in Figure 2 except with different colors?

		HEN	
		Xi	Y
COCK	XA	(cock) XA Xi	(hen) XA Y
	XA	(cock) XA Xi	(hen) XA Y

Figure 7

### The Lipochrome Canaries

Lipochrome canaries are light in appearance. The agent that colors their feathers is called "lipochrome." The lipochrome group is divided into the following varieties: 1) yellow, 2) white dominant, 3) white recessive, 4) red orange, 5) mosaic (dimorphic), 6) ivory, 7) rose ivory.

Ivory and rose ivory are the only lipochrome varieties which are sex-linked in character, and are recessive to all other lipochrome varieties. For example, if a yellow male is mated to an ivory hen (see Figure 8), we can see the results of the sex-linked inheritance at work.

		HEN	
		Xi	Y
COCK	XY	(cock) XY Xi	(hen) XY Y
	XY	(cock) XY Xi	(hen) XY Y

Figure 8

I would like to suggest you study the workings of the Punet Square thoroughly. If necessary, read Part 2 of this series of articles where a detailed explanation of the Punet Square was given. Once you understand the Punet Square, a glance at it will reveal the results of the mating in question.

For homework, complete all of the possible matings for agate-Isabel and yellow-ivory, using the Punet Square method. ●

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