

The Lemon mutation in Pigeons (*Columba livia*) shares same chromosome location as Dilute-White in Ring-necked Doves (*Streptopelia "risoria"*).

by Robert J. Mangile

On page 82 of his book, "Origins and Excursions in Pigeon Genetics", Dr. Willard F. Hollander (1983) stated, "Sooner or later an extreme-dilute mutation should pop up in the pigeon, like the white of ring-dove." In 1997 Jack Barkel, of South Africa, found a new color in pigeons that he labeled "Lemon". However, the plumage coloration of Barkel's Lemons was variable shades of tan, depending on the pattern and other mutants involved - not the assumed color of a lemon. In May 2002 some of Barkel's Lemons were imported into the United States and stock was distributed to several pigeon fanciers.

By April 2005 I had received one lemon check hen and a few Figuritas from Jerry Sternadel. It was about that time when testing done by Larry Davis demonstrated that the gene that produced the Barkel's Lemon plumage was an allele to the sex-linked gene dilution (d) and was given the genetic symbol " d^{ex} " for "extreme-dilute". (See a comprehensive article on Lemon by Larry Davis and Ron Huntley at <http://www.angelfire.com/ga/huntleyloft/lemon.html>.) One question that needed answering: was the new extreme-dilution gene in Barkel's Lemons the corresponding counterpart of the ring-necked dove's sex-linked dilute-white (d^w)? I was determined to find an answer to that question.

Discussion

Figuritas are among the smallest pigeon breeds and by the end of 2008 I had transferred the lemon coloration to small Figurita-like stock, (Fig.1). During 2009 and 2010, matings #119 and #120, involving lemon Figurita cocks to dilute-white ring-necked dove hens, produced a combined total of forty-two (42) eggs. (Table: 1). Of the twelve that hatched, ten died within a week or less. The two squabs that survived matured into near white male hybrids with orange-red



Figure 1. Lemon bar Figurita size cock.

eyes, (Fig.2). All newly hatched squabs had very short down (naked), pink eyes, totally flesh-colored bills and feet, and looked like albino hatchlings.



Figure 2. An adult lemon x white hybrid cock.



Figure 3. Four newly hatched squabs – as follows: (A)-lemon pigeon X dilute-white dove hybrid, (B)-dilute-white dove, (C)-lemon pigeon X dilute-blond dove hybrid, (D)-lemon pigeon.



Figure 4. Lemon X blond hybrid.

In 2012, matings #121 and #122 produced a combined total of twelve eggs. (Table: 1). Of the four that hatched, three died before fledge (at one day, 14 days and 18 days). The last squab from #122 was not being fed properly and appeared to be failing at 15 days of age. Its condition improved with assisted hand feeding with a syringe, (Fig.4). It seemed exceptionally tame but I ultimately realized it was blind. (I'm still hand feeding at four months of age with hope it will learn to eat on its own.) All squabs from #121 and #122 had intermediate down length and displayed a bill ring similar to blond dove squabs, (Fig 3). The mature eye color is an orange-red similar to blond doves, the bill tip is dark, (Fig.4), the

plumage is darker than a blond dove – showing a gray back - and the wattle is not powdery white, as in adult pigeons, but similar to ring-necked doves.

Table 1. Four pigeon X dove hybrid matings.

<u>Pair No. 119</u> , lemon check cock (1516B) X dilute-white hen (100L)
32 eggs were produced - 19 infertile, 3 died as embryos, 10 hatched (9 died by day 7, 1 matured to white male)
<u>Pair No. 120</u> , lemon bar cock (1551B) X dilute-white hen (6)
10 eggs were produced - 5 infertile, 2 died as embryos, 3 hatched (2 died by day 2, 1 matured to white male)
<u>Pair No. 121</u> , lemon check cock (1581A) X rosy-blond hen (14)
6 eggs were produced -1 infertile, 3 died as embryos, 2 hatched (both died at 14 days with blond plumage)
<u>Pair No. 122</u> , lemon bar cock (1581C) X blond hen (25)
5 eggs were produced – 1 infertile), 2 died as embryos, 2 hatched (1 died by day 2, 1 matured = <u>blind</u> blond male)

All four matings were bred in individual cages. Of the 53 eggs from these four matings only 16 hatched. The surviving two extreme-dilute hybrids from pair 119 and 120 displayed "black" in their abdomens until about 15 days of age, as did two others that died at one week old of age. Blackened abdomens were not noticed in the blond hybrids from pair 121 and 122. Some newly hatched squabs were not fed and died by the second day.

Comments and Conclusions

In pigeon cocks heterozygous for lemon and dilute (d^{ex}/d) the plumage is noticeably lighter or brighter than in homozygous dilute (d/d) cocks. And dove fanciers have observed that male blond doves that are heterozygous for dilute-white and dilute-blond (d^w/d^B) are of a lighter plumage than males homozygous for blond (d^B/d^B). But in (d^{ex}/d^w) hybrids the lemon gene (d^{ex}) seems to produce a "darker", rather than lighter, plumage. And the (d^{ex}/d^B) hybrids show a darker, bluish blond plumage – not lighter as noticed in (d^B/d^w) male doves. In pigeons lemon-brown ($d^{ex}b$) plumage is noticeably darker than lemon-blue.

The small amount of data from these four hybrid matings indicate that the extreme-dilute gene found in Barkel's Lemons is a mirrored mutation of the gene that produces dilute-white in ring-necked doves. Lemon pigeon-white dove hybrid males (d^{ex}/d^w) are nearly all white with a trace of tan overcast in areas of their plumage. In lemon pigeon X blond dove matings the young hybrids that survived long enough to produce feathers displayed blond plumage, indicating allelism (d^{ex}/d^B) and that lemon is recessive to blond. In blue (wildtype) pigeon X blond dove matings the male offspring have "slaty" plumage ($+//d^B$). In a hybrid mating (#110) outside this report two slaty blue hybrid males were produced from a black Figurita cock X dilute-white dove hen. No photographs were taken of these birds but an example of slaty blue hybrid male, given to me by a friend, can be seen in Figure 5.



Figure 5. A slaty blue pigeon-dove hybrid cock given to me by a friend.

On page 292 of the [American Naturalist, Vol. LXXXIV, July-August 1950](#) "Hybrids of Pigeons by Ring Dove" by Leon J. Cole and Willard F. Hollander they had this to say. "It was early discovered that if a "dilute" pigeon were used with either blond or white dove, the hybrids were all blond (= dilute), quite distinct from the slaty "type hybrids". Apparently therefore blond and dilute are essentially the same genetically."

Addressing the cause of the early embryonic death and high mortality of nestlings in crosses of domestic pigeons, *Columba livia*, and Ring-necked doves, *Streptopelia "risoria"*, Cole and

Hollander, pages 286-287 had this to say. "A study of the immunogenetic features in this cross was reported by Irwin and Cole (1936). The erythrocyte antigens of the hybrids include those of both parental species, though some variation was noted in the pigeon antigens represented. Also there was a new antigenic property or "hybrid substance," which was interpreted as an effect of complementary action of genes governing antigenic properties, (Analogous effects have been noted in other species hybrids.)"

And in December 2004, Dr. Wilmer Miller wrote the following on his web site page "Pigeon/Dove Hybrids"

[http://www.ringneckdove.com/Wilmer's WebPage/pigeon_dove_hybrids.htm](http://www.ringneckdove.com/Wilmer's%20WebPage/pigeon_dove_hybrids.htm)

"The red cell antigens have been studied by several investigators. Primarily, Professor M. R. Irwin [my major professor] utilized the hybrids produced by Dr. L. J. Cole to show a mysterious "hybrid substance" related to that found in pearlneck/ringneck, senegal/ringneck, and other species hybrids also investigated by Irwin. This was a great puzzle to geneticists of that time (1930's-40's), since the hybrid substance was inherited as a dominant but not present in either parental species. I was able to show that it is much like a (serological) interaction product well known for other more ordinary characters. Further, I showed that it resulted from the CC' red cell species-specific antigenic complex of the cross of the triangular spotted pigeon with the domestic pigeon. For more complex details see my CV references. " # # #