Dark Factors

The term dark factor refers to the genetic mutation that changes the basic color found in budgerigars from a normal light shade of green or blue to a darker shade of green or blue. A genetic mutation is defined as any variation from the normal wild-type light green budgie. Each mutation is determined by a pair of genes, one half of a pair inherited from each parent. For each pair of genes there are three distinct possibilities. One is where both genes of a pair represent the original wild-type characteristic. Two, is where both genes of a pair represent the mutation. In each of these first two possibilities the pair of genes are said to be homozygous, meaning the same. The third possibility is where one gene of a pair represents the original wild-type characteristic and the other gene represents the mutation. Where the pair of genes represents two distinct characteristics the pair is said to be heterozygous, meaning different. In this third scenario the characteristic which is visible is the dominant characteristic and the characteristic which remains hidden is the recessive characteristic. Each of these pairs of genes is illustrated through a specific nomenclature, usually an alphabet letter. A capital letter is used to designate the dominant characteristic, the corresponding small letter the recessive characteristic. For example, the genetic nomenclature used to illustrate the mutation responsible for blue color is “bb”. The normal wild-type green being the dominant characteristic is “BB”. Its heterozygous form, i.e. green/blue, is “Bb”. The dark factor, “DD”, presents a slightly different scenario. While dominant over its wild-type light green counter part, “dd”, it is only partially dominant or semi-dominant. In its heterozygous form the dark green, “Dd”, is a medium shade of color, darker than the wild-type light green but not as dark as the darker olive green, “DD”. When combined with the factor for blue, “bb”, the light green, BB dd, becomes skyblue, “bb dd”, dark green, BB Dd, becomes cobalt, “bb Dd”, and olive green, BB DD, becomes mauve, “bb DD”. The following matings illustrates the relationship between light, medium, and dark shades resulting from the dark factor.

light (dd) X light (dd) =

100% light (dd)

dark (DD) x dark (DD) =

100% dark (DD)

light (dd) X dark (DD) =

100% medium (Dd)

light (dd) x medium (Dd) =

50% light (dd) and 50% medium (Dd)

medium (Dd) x dark (DD) =

50% medium (Dd) and 50% dark (DD)

medium (Dd) x medium (Dd) =

25% light (dd), 50% medium (Dd), and 25% dark (DD)

Dark Factored Greens

The following illustrate effect of the dark factor on the normal wild-type light green. For purposes of this article it is assumed that all the birds are pure green.

light green (BB,dd) X light green (BB,dd) =

100% light green (BB,dd)

olive green (BB,DD) x olive green (BB,DD) =

100% olive green (BB,DD)

light green (BB,dd) X olive (BB,DD) =

100% dark green (BB,Dd)

light green (BB,dd) x dark green (BB,Dd) =

50% light green (BB,dd) and 50% dark green (BB,Dd) dark green (BB,Dd) x olive green (BB,DD) =

50% dark green (BB,Dd) and 50% olive green (BB,DD)

dark green (BB,Dd) x dark green (BB,Dd) =

25% light green (BB,dd), 50% dark green (BB,Dd), and 25% olive green (BB,DD)

Dark Factored Bues

The following matings illustrate the effect of the dark factor when combined with the factor for blue. Once again the assumption is that the color is a pure blue.

skyblue (bb,dd) X skyblue (bb,dd) =

100% skyblue (bb,dd)

mauve (bb,DD) x mauve (bb,DD) =

100% mauve (bb,DD)

skyblue (bb,dd) X mauve (bb,DD) =

100% cobalt (bb,Dd)

skyblue (bb,dd) x cobalt (bb,Dd) =

50% skyblue (bb,dd) and 50% cobalt (bb,Dd)

cobalt (bb,Dd) x mauve (bb,DD) =

50% cobalt (bb,Dd) and 50% mauve (bb,DD) cobalt (bb,Dd) x cobalt (bb,Dd) =

25% skyblue (bb,dd), 50% cobalt (bb,Dd), and 25% mauve (bb,DD)

The Violet Factor

The violet is a dominant mutation (VV) that intensifies color, darkening the color of the bird with which it is associated. This is particularly evident in blue series birds transforming skyblue into violet skyblue (bb,dd,Vv), a color almost indistinguishable from normal cobalt, and normal cobalt into visual violet (bb,Dd,Vv), the only color recognized for exhibition purposes. The violet factor seems to have less effect on mauve. The color of the violet mauve (bb,DD,Vv) is only slightly enhanced. The following matings illustrate the production of visual violets.

skyblue (dd,vv) x violet (Dd,Vv) =

25% violet (Dd,Vv), 25% skyblue (dd,vv), 25% skyblue violet (dd,Vv), and 25% cobalt (Dd,vv)

cobalt (Dd,vv) x violet (Dd,Vv) =

25% violet (Dd,Vv), 25% cobalt (Dd,vv), 12.5% violet skyblue (dd,Vv). 12.5% skyblue (dd,vv),

12.5% violet mauve (DD,Vv), and 12.5% mauve (DD,vv)

violet skyblue (dd,Vv) x cobalt (Dd,vv) =

25% violet (Dd,Vv), 25% cobalt (Dd,vv), 25% skyblue violet (ddVv), and 25% skyblue (dd,vv)

violet (Dd,Vv) x mauve (DD,vv) =

25% violet mauve (DD,Vv), 25% mauve (DD,vv), 25% violet (Dd,Vv), and 25% cobalt (Dd,vv)

violet (Dd,Vv) x violet (Dd,Vv) =

12.5% violet mauve (DD,VV), 25% violet mauve (DD,Vv), 12.5% mauve (DD,vv),

12.5% violet (Dd,VV), 25% violet (Dd,Vv), snd 12.5% cobalt (Dd,vv)

Dark Green/Blue Type I and Type II

The normal green budgie is dominant to the blue series bird. Light green mated to skyblue results in all light green offspring split for blue or light green/blue. When the dark factor is added to the mix an interesting phenomenon occurs. Due to the linkage between the dark and blue factors two very different types of dark green/blues are produced. Linkage takes place when genes are located on the same chromosome. In most instances we tend to view factors or pairs of genes independent of one another. However, genes are grouped together on chromosomes. In budgies there are thirteen pairs of chromosomes passed from parent to offspring. One-half of a pair inherited from each parent. All of the various genes which comprise the budgies genotype are grouped on these thirteen chromosomes. Genes which are grouped together are said to be linked to one another. The most common forms of gene linkage in budgies are those associated with the chromosome which determines a bird's gender. These factors are referred to as sex-linked factors. The dark factor (DD) and blue factor (bb) are examples of genes linked together on a chromosome other then the sex chromosome and therefore passed together as such from parent to offspring. The following tables illustrate how these factors relate to one another. Each of the pairs is illustrated as being linked together, i.e. "BD" or "bd". The two types of dark green/blues produced are referred to as dark green/blue type I (BD,bd) and dark green/blue type II (Bd,bD). In theory the dark green/blue type I (BD,bd) produces olive green and skyblue but no light green or mauve, while the dark green/blue type II (Bd,bD) produces light green and mauve but no olive green or skyblue.

light green (Bd,Bd) x cobalt (bD,bd)=

50% dark green/blue type II (Bd,bD) and 50% light green/blue (Bd,bd)

light green (Bd,Bd) x mauve (bD,bD)=

100% dark green/blue type II (Bd,bD)

dark green (BD,Bd) x skyblue (bd,bd)=

50% light green/blue (Bd,bd) and 50% dark green/blue type I (BD,bd)

dark green (BD,Bd) x cobalt (bD,bd)=

25% olive green/blue (BD,bD), 25% dark green/blue type II (Bd,bD),

25% dark green/blue type I (BD,bd), and 25% light green/blue (Bd,bd) dark green/blue (BD,Bd) x mauve (bD,bD)=

50% olive green/blue (BD,bD) and 50% dark green/blue type II (Bd,bD)

olive green (BD,BD) x skyblue (bd,bd)=

100% dark green/blue type I (BD,bd)

olive green (BD,BD) x cobalt (bD,bd)=

50% olive green/blue (BD,bD) and 50% dark green/blue type I (BD,bd)

olive green (BD,BD) x mauve (bD,bD)=

100% olive green/blue type I (BD,bD)

dark green/blue type I (BD,bd) x skyblue (bd,bd)=

50% dark green/blue type I (BD,bd) and 50% skyblue (bd,bd)

dark green/blue type I (BD,bd) x cobalt (bD,bd)=

25% olive green/blue (BD,bD), 25% dark green/blue type I (BD,bd)

25% cobalt (bd,bD), and 25% skyblue (bd,bd)

dark green/blue type I (BD,bd) x mauve (bD,bD)=

50% olive green/blue (BD,bD) and 50% cobalt (bD,bd)

dark green/blue type II (Bd,bD) x skyblue (bd,bd)=

50% light green/blue (Bd,bd) and 50% cobalt (bd,bD) dark green/blue type II (Bd,bD) x cobalt (bd,bD)=

25% light green/blue (Bd,bd), 25% dark green/blue type II (BdbD),

25% cobalt (bD,bd), and 25% mauve (bDbD)

dark green/blue type II (Bd,bD) x mauve (bD,bD)=

50% dark green/blue type II (Bd,bD) and 50% mauve (bD,bD)

dark green/blue type I (BD,bd) x dark green/blue type I (BD,bd)=

25% olive green (BD,BD), 50% dark green type I (BD,Bd),

and 25% skyblue (bd,bd)

dark green/blue type II (Bd,bD) x dark green/blue type II (Bd,bD)=

25% light green (Bd,Bd), 50% dark green/blue type II (Bd,bD),

And 25% mauve (bD,bD)

dark green/blue type I (BD,bd) x dark green/blue type II (Bd,bD)=

25% light green/blue (Bd,bd), 25% cobalt (bD,bd),

25% dark green (BD,Bd), and 25% olive green/blue (BD,bD)

<u>Crossoever</u>

While the preceding illustrations for dark green/blue type I (BD,bd) and dark green/blue type II (Bd,bD) are generally accurate, they do not take into consideration a genetic anomaly called crossover. During chromosomal crossover the chromosomes exchange DNA effectively recombining the genes. Due to crossover it is possible for dark green/blue type I to produce a small percentage of light greens and mauves. Likewise, dark green/blue type II are able to produce a small percentage of skyblues and olives.

Punnet Square

A Punnet square is a tool used to chart the transfer of genes from parents to offspring. Since each parent has the potential of passing on one of two genes to its offspring there are four possible outcomes for each factor involved.