# Quaker Parrot Color Genetics

**Complete Guide for Parrot Shop Owners**

Based on the Genetic Calculator by Martin Rasek (gencalc.com) — Version 1.3

This guide explains all possible Quaker Parrot color mutations, how they are inherited, and practical breeding combinations for your parrot shop. Each mutation section includes inheritance rules and breeding tips.

## Inheritance Types

Quaker Parrot mutations follow different inheritance patterns. Understanding these is key to predicting offspring colors.

**RE — Autosomal Recessive** **SE — Sex-linked Recessive** **DO — Autosomal Dominant**

**IN — Autosomal Incomplete Dominant** **CD — Co-dominant**

### Autosomal Recessive (re)

Both parents must carry the gene. The trait skips generations — birds can be 'splits' (carriers) without showing it.

**Key Rule:** Both copies of the gene must be the mutation for the bird to show it.

### Sex-linked Recessive (se)

The gene is on the Z chromosome. Females (ZW) show it with just one copy. Males (ZZ) need two copies.

**Key Rule:** Split males can pass the trait without showing it. Females show it immediately if they get the gene from dad.

### Autosomal Dominant (do)

Only one copy needed to show the trait. Single factor and double factor look the same but breed differently.

**Key Rule:** A visual bird always has at least one copy. Breeding visual x normal always gives ~50% visual.

### Autosomal Incomplete Dominant (in)

Like dominant but single factor shows an intermediate appearance between mutant and normal.

**Key Rule:** Double factor = full expression, single factor = intermediate, normal = wild type.

### Co-dominant (cd)

Two different mutations combine to create a blend appearance. Neither is dominant over the other.

**Key Rule:** A bird with two different mutation alleles shows a blend of both.

## All Color Mutations

Quaker Parrots can have mutations in the following gene groups. Each gene group works independently.

#### Grey / Recombinant Grey (G) — Autosomal Dominant

One copy produces a grey bird. Double factor (G/G) and single factor (G/g+) look the same but inherit differently.

**Alleles:** G (grey) and g+ (wild type/green)

| Cross | Offspring Result |
|---|---|
| **G/G x G/G** | 100% grey (double factor) |
| **G/g+ x G/g+** | 25% grey (df), 50% grey (sf), 25% green (normal) |
| **G/g+ x g+/g+** | 50% grey (sf), 50% green (normal) |
| **g+/g+ x g+/g+** | 100% green (normal) |

> **Breeding Tip:** Grey is dominant so even one copy shows visually. To avoid accidentally producing grey babies, both parents should be green (g+/g+).

#### Dark (D) — Autosomal Incomplete Dominant

Double factor (D/D) shows full dark expression. Single factor (D/D+) shows an intermediate/darker green.

**Alleles:** D (dark) and D+ (wild type)

| Cross | Offspring Result |
|---|---|
| **D/D x D/D** | 100% dark (df) |
| **D/D+ x D/D+** | 25% dark (df), 50% dark (sf), 25% normal |
| **D/D+ x D+/D+** | 50% dark (sf), 50% normal |

> **Breeding Tip:** Dark is incomplete dominant — single factor birds look darker green, double factor birds are noticeably darker.

### Blue / Turquoise / Aqua (bl) — Co-dominant (Multiple Alleles)

Three alleles at the blue locus. Blue is the recessive form (bl/bl). Turquoise (bl_tq) and Aqua (bl_aq) are parblue mutations. They are co-dominant with each other.

**Alleles:** bl (blue), bl_tq (turquoise), bl_aq (aqua)

| Cross | Offspring Result |
|---|---|
| **bl/bl x bl/bl** | 100% blue |
| **bl/bl_tq x bl/bl_tq** | 25% blue, 50% blue-turquoise, 25% turquoise |
| **bl/bl x bl_tq/bl_tq** | 100% blue-turquoise |
| **bl_tq/bl_aq x bl_tq/bl_aq** | 25% turquoise, 50% turquoise-aqua, 25% aqua |

> **Breeding Tip:** Quaker Parrots are naturally green (blue = bl/bl). To get blue babies, both parents must carry blue. Blue x Blue = 100% blue.

### Cinnamon (cin) — Sex-linked Recessive

Located on the Z chromosome. Females (ZW) express it with one copy. Males (ZZ) need two copies to be visual.

**Alleles:** cin (cinnamon) and + (wild type)

| Cross | Offspring Result |
|---|---|
| **cin/cin (M) x +/Y (F)** | 100% split to cinnamon males, 100% cinnamon females |
| **cin/+ (M) x +/Y (F)** | 50% normal females, 50% split males |
| **+/+ (M) x +/Y (F)** | 100% normal |

> **Breeding Tip:** Split males can pass cinnamon to offspring without showing it. Always test breed or know your splits.

### INO / Pallid (ino/pd) — Sex-linked Recessive (Multiple Alleles)

INO and Pallid are co-dominant alleles on the sex chromosome. INO birds lack pigment (yellow/white). Pallid is a lighter version.

**Alleles:** ino (INO), pd (pallid), + (wild type)

| Cross | Offspring Result |
|---|---|
| **ino/ino x ino/Y** | 100% INO |
| **ino/pd x ino/Y** | Mix of INO and INO-pallid |
| **ino/+ (M) x +/Y (F)** | 50% INO females, 50% split males |
| **+/+ x +/Y** | 100% normal |

> **Breeding Tip:** INO is very popular. A split male x normal female gives 50% INO daughters and 50% split sons.

### Opaline (op) — Sex-linked Recessive

Opaline changes the wing pattern — body color replaces the wing bar pattern. Located on the Z chromosome.

**Alleles:** op (opaline) and + (wild type)

| Cross | Offspring Result |
|---|---|
| **op/op (M) x +/Y (F)** | 100% split to opaline males, 100% opaline females |

| | |
|---|---|
| **op/+ (M) x +/Y (F)** | 50% opaline females, 50% split males |
| **+/+ (M) x +/Y (F)** | 100% normal |

> **Breeding Tip:** Opaline is best bred with INO to produce the highly valued INO-Opaline combination.

### NSL INO (Non-Sex-Linked INO) (a) — Autosomal Recessive

Unlike sex-linked INO, NSL INO is on an autosomal chromosome. Both parents must carry the gene for expression.

**Alleles:** a (NSL INO) and a+ (wild type)

| Cross | Offspring Result |
|---|---|
| **a/a x a/a** | 100% NSL INO |
| **a/a+ x a/a+** | 25% NSL INO, 50% split, 25% normal |
| **a/a+ x a+/a+** | 50% split, 50% normal |

> **Breeding Tip:** Both parents must be carriers (split) for NSL INO to appear. Visual NSL INO x Visual NSL INO = 100% NSL INO.

### Fallow (fa) — Autosomal Recessive

Fallow birds have pink eyes and a warm, golden body color. Like NSL INO, it requires both parents to carry the gene.

**Alleles:** fa (fallow) and fa+ (wild type)

| Cross | Offspring Result |
|---|---|
| **fa/fa x fa/fa** | 100% fallow |
| **fa/fa+ x fa/fa+** | 25% fallow, 50% split, 25% normal |
| **fa/fa+ x fa+/fa+** | 50% split, 50% normal |

> **Breeding Tip:** Fallow is visually distinctive with pink eyes. Once you have visual fallows, breeding is straightforward.

### Dark-Eyed Clear (DEC) (cr) — Autosomal Recessive

DEC birds have a solid yellow body with no eye color (dark eyes). They lack all body pigment.

**Alleles:** cr (DEC) and cr+ (wild type)

| Cross | Offspring Result |
|---|---|
| **cr/cr x cr/cr** | 100% DEC |
| **cr/cr+ x cr/cr+** | 25% DEC, 50% split, 25% normal |
| **cr/cr+ x cr+/cr+** | 50% split, 50% normal |

> **Breeding Tip:** DEC is visually obvious — solid yellow body. Best bred with other recessive traits for variety.

## Common Breeding Combinations

Here are practical breeding examples your shop can use as a starting point.

### Green x Green

**Sire (Male):** Normal Green Male (g+/g+, D+/D+, bl/bl, +/+, +/+, +/+, a+/a+, fa+/fa+, cr+/cr+)

**Dam (Female):** Normal Green Female (g+/g+, D+/D+, bl/bl, +/Y, +/Y, +/Y, a+/a+, fa+/fa+, cr+/cr+)

**Result:** 100% Green offspring (both male and female). Safe combination for producing standard babies.

### Grey SF x Green

**Sire (Male):** Grey Single Factor Male

**Dam (Female):** Normal Green Female

**Result:** 50% Grey (SF), 50% Green. Predictable — easy to plan your breeding program.

### Split Cinnamon Male x Normal Female

**Sire (Male):** Split to Cinnamon Male

**Dam (Female):** Normal Green Female

**Result:** 50% Cinnamon Females, 50% Split Cinnamon Males. Great way to produce cinnamon daughters!

### Split NSL INO x Split NSL INO

**Sire (Male):** Split NSL INO Male

**Dam (Female):** Split NSL INO Female

**Result:** 25% NSL INO, 50% Split, 25% Normal. Classic split x split breeding — 1 in 4 chance of INO.

### Blue x Blue

**Sire (Male):** Blue Male

**Dam (Female):** Blue Female

**Result:** 100% Blue. Once you have blue birds, all offspring will be blue.

### INO Male x Normal Female

**Sire (Male):** Split to INO Male (ino/+)

**Dam (Female):** Normal Female (+/Y)

**Result:** 50% INO Females, 50% Split INO Males. Best strategy for producing INO daughters.

## Important Notes for Breeding

⚠ **Remember:** Birds can be *splits* — carrying a mutation without showing it. A green (normal-looking) bird can carry INO, NSL INO, Fallow, DEC, or Grey genes. Always know your splits!

### Key Concepts

| Term | Meaning |
|---|---|
| **Visual** | The bird shows the mutation (has the genes for expression) |
| **Split** | The bird carries the mutation but doesn't show it (carrier) |
| **Single Factor (sf)** | One copy of a dominant/incomplete dominant mutation |
| **Double Factor (df)** | Two copies of a dominant/incomplete dominant mutation |
| **ZW vs ZZ** | Females are ZW (one Z chromosome), Males are ZZ (two Z chromosomes) |
| **Sex-linked** | Gene on the Z chromosome — inheritance differs by sex |

### Blue-Chromosome Linkage

Blue and Dark mutations are linked on the same chromosome. Birds can be:

- **Type 1 (T1):** Both mutations on the same chromosome
- **Type 2 (T2):** Mutations on separate chromosomes

This affects inheritance when a bird is single-factor for both Dark and Blue.

### Recombinant Frequencies

When multiple sex-linked mutations are present, recombination can occur:

- INO and Cinnamon loci: ~3% recombination
- Opaline and INO loci: ~30% recombination
- Blue and Dark loci: ~14% recombination

## Quick Reference — What To Expect

| Goal | Recommended Cross | Expected Outcome |
|---|---|---|
| Produce INO daughters | Split INO male x Normal female | 50% INO females, 50% split males |
| Produce Cinnamon daughters | Split Cinnamon male x Normal female | 50% Cinnamon females, 50% split males |
| Produce Blue babies | Blue male x Blue female | 100% Blue |
| Produce NSL INO | Split NSL INO male x Split NSL INO female | 25% NSL INO |
| Produce Grey babies | Grey SF male x Green female | 50% Grey (SF), 50% Green |
| Safe breeding (no surprises) | Normal male x Normal female | 100% Green |