



Cooperative Extension Service
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Methods for Sexing Day-Old Chicks¹

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Introduction

The sexing of day-old chicks was unknown before 1925. Since then, enormous strides have been made in its progress. Today, there are four general methods of sexing newly hatched chicks: biochemical/histological, instrument, vent, and auto-sexing.

Biochemical/Histological Sexing

Biochemical/histological methods involve the identification of chromosomes by karyotyping, or the biochemical characterization by DNA analysis or other chemical methods. This may be the preferred method for very expensive individual birds, but it is otherwise uneconomical.

Instrument Sexing

Instrument sexing is done with an optical instrument (Keeler Instrument) somewhat similar to a proctoscope (used by doctors to inspect the rectum). An optical tube is inserted into the large intestine of chicks and the gonads observed directly through the intestinal wall. Male chicks have two testicles while females usually have only one ovary which is located on the left side. This method requires considerable training and can result in injury to more chicks than does the vent sexing method.

Instrument sexing is used primarily for sexing day-old chicks, but there is no reason it could not be used on other fowl as well. Due to their small size, however, it is unlikely this method can be used for sexing game chicks and small pet birds.

Vent Sexing

Vent sexing was originally developed by the Japanese and involves visual examination of the cloaca of the chick with the sex being distinguished according to minute anatomical differences. This method requires extensive training over several months for mastery, but is quite accurate and rapid once considerable experience is gained.

The Japanese introduced vent sexing to North American poultry producers in the 1930s, and it quickly became the most common method used by the U.S. poultry industry. Due to the cost, intensive training required, and potential for chick injury, it has been replaced by other methods where possible. However, vent sexing is still used extensively by breeding companies for non-auto-sexing lines, including parent and grandparent stocks. Because no auto-sexing characteristics have been identified in turkeys or most other domestic species, vent sexing must be used. However, waterfowl and ratites have larger, more easily distinguished phalli (primitive male sex organ) which makes vent sexing easier in those species.

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The best time for vent sexing is when the chicks are from 12 to 26 hours old. Chicks less than 12 hours old are more likely to suffer prolapses than older chicks. The vent of unfed chicks more than 36 hours old can be hard to open and the anatomical differences are harder to detect than in younger chicks.

Auto-Sexing

Auto-sexing is the use of an easily observable sex-linked characteristic to distinguish the sex of the chick. Because there is a rather limited number of sex-linked characteristics which can be used, and these are present in only a few breeds of chickens, it is necessary to utilize the carrier breeds or to introduce the sex-linked gene into the desired breed or strain.

It is important to note that in birds, the male has XX and the female has XY sex chromosomes. This is the opposite of mammals where the female is XX and the male is XY. In sex-linked crosses, the gene in question is carried on the X-chromosome.

Color-sexing

The Barred Plymouth Rock breed carries a gene for barring (B). This gene produces a white bar on an otherwise black feather. It is incompletely dominant over the non-barring gene (b). This allows for sexing of day-old Barred Plymouth Rock chicks. Sex of these chicks can be distinguished by the size and shape of a head spot at hatching. At day-old, males have a large white head spot. The head spot is much smaller and more narrow in females. In the adults, the male with two barring genes (BB) has feathers with broader white bars than those of the female (B_) and, consequently, is overall lighter in color. See Table 1.

The sex-linked trait of barring has been used for auto-sexing other crosses. When a non-barring male is crossed with a barring female, the resulting females will be non-barring like their father, while the resulting males will be barring like their mothers. See Table 1.

Table 1.

Sex-linked barring:
B = barred; b = non-barréd ♂ = male; ♀ = female
a) crossing non-barréd male with barréd female:
bb^{σ} (non-barréd) X $B_^{\text{♀}}$ (barréd) ⇒ Bb^{σ} (barréd); $b_^{\text{♀}}$ (non-barréd)
b) in Barréd Plymouth Rocks:
B is incompletely dominant over b
BB^{σ} X $B_^{\text{♀}}$ ⇒ BB^{σ} (barréd, large white head spot) ⇒ $B_^{\text{♀}}$ (barréd, small white head spot)

Another characteristic that has been used in some commercial strains is the silver (S) and gold (s) color genes. Gold males are mated to silver females and in the resulting offspring the males are silver and the females are gold. Several other genes can either enhance or decrease the accuracy of color differentiation. See Table 2.

Table 2.

Sex-linked gold/silver:
S = silver; s = gold ♂ = male; ♀ = female
ss^{σ} (gold) X $S_^{\text{♀}}$ (silver) ⇒ Ss^{σ} (silver); $s_^{\text{♀}}$ (gold)

The silver and gold genes have been used as the basis for sex-determination of day-old chicks in both the egg and broiler industries. Some of the commercial strains of brown-egg layers have the silver/gold sexing characteristics. In broiler crosses, day-old female chicks are gold or buff-colored while the male chicks are light yellow or white. Poultry processors, however, prefer white feathered birds. When old enough to be processed, broiler females from this cross are gold and white, but the gold is in the outer portion of the feathers. The undercoat and quills are usually white so that there is minimal disadvantage in the processing plant. The male broilers are white, or almost white, at processing. See Table 2.

The gold/silver and barred/non-barred genes have been combined and used in some commercial brown-egg layers. A gold, non-barred Rhode Island Red male is crossed with a silver, Barred Plymouth Rock female. The females resulting from the cross are black/red and non-barred while the males are black and white barred. See Table 3.

Table 3.

Sex-linked gold/silver and barring (S,s and B,b):	
B = barred; b = non-barred	
S = silver; s = gold	
♂ = male; ♀ = female	
Rhode Island Red ♂ (gold, non-barred) ssbb♂	X Barred Plymouth Rock ♀ (silver, barred) S_B_♀
⇒ SsBb♂ (black and white barred)	
⇒ s_b_♀ (black-red, non-barred)	

The Rhode Island Red and New Hampshire breeds can be sexed by wing color at hatching, although the accuracy is reduced by normal color variations. Male chicks have a white spot in the down over the wing web. This spot is lost when the chick down is shed and replaced with second generation feathers.

Feather-sexing

The rapid/slow-feathering gene is the characteristic most commonly used by commercial breeders in the U.S. In this case, the sex of the chick is determined according to the length of the wing feathers (primaries and secondaries) at hatching. A rapid-feathering male is crossed with a slow-feathering female and in the resulting offspring the males are slow-feathering and the females rapid-feathering. Thus the males have relatively shorter wing feathers than the females. In the female, the covert feathers are

always shorter than the primary feathers. In the male, the covert feathers are always as long as, or longer, than the primary feathers. See Table 4.

Some training is required to develop competency in sexing based on wing feather length. However, the amount of training is considerably less than that required for vent sexing. Accuracy and speed are usually very good.

Table 4.

Rapid/Slow-feathering:	
K = slow; k = rapid	
♂ = male; ♀ = female	
kk♂ (rapid-feathering)	X K_♀ (slow-feathering)
⇒ Kk♂ (slow-feathering)	
⇒ k_♀ (rapid-feathering)	

The slow-feathering gene has been associated with undesirable characteristics such as delayed sexual maturity, lower egg production, and increased maintenance energy requirements. In broilers, the slow feathering male often has a less dense feather cover, greater susceptibility to skin injuries, and higher incidences of pin feathers at processing.

Summary

Sex determination in newly hatched chicks can be made by vent examination, instrument examination of the gonads, biochemical or histological techniques or auto-sexing (sex associated genetic markers). The most common methods are vent sexing and auto-sexing. Auto-sexing, where possible, is less expensive and more convenient than vent sexing. While both methods are equally accurate, there is less danger of injury to the chick with auto-sexing.