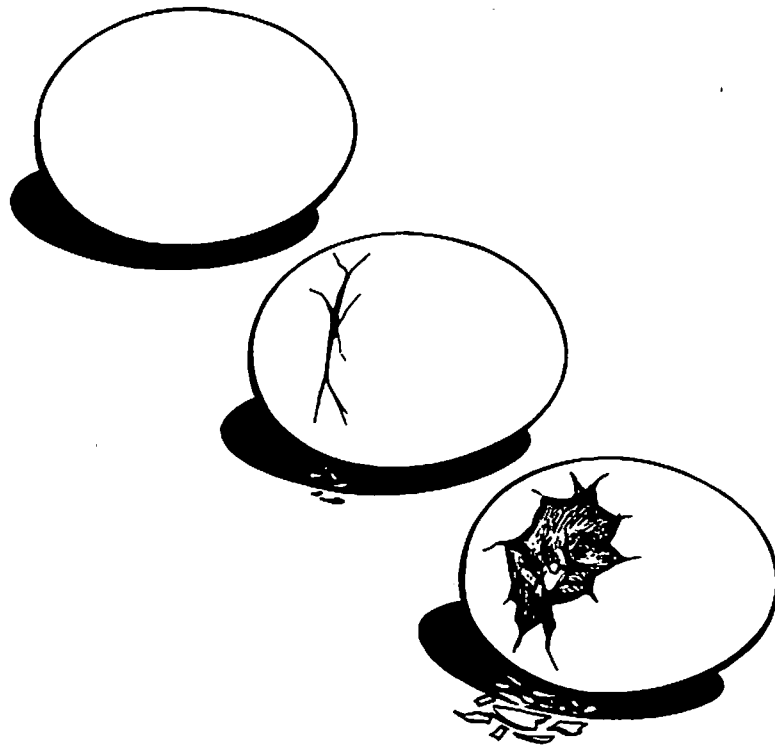


Incubating Chicken Eggs



Incubating eggs artificially is an old art dating back to several thousand years ago when the Chinese and Egyptians developed artificial methods. Theirs were crude compared with current mammoth incubators which hold from a few thousand up to 100,000 or more eggs in which the temperature, humidity, ventilation, and turning are controlled automatically.

Watching the embryo develop inside an egg is one of nature's miracles.

Poultry Science Unit 3

Cooperative Extension Service Kansas State University Manhattan

Hatching Eggs

Securing Fertile Eggs

A hen mated with a rooster produces fertile eggs when the male's sperm unites with the ovum of the hen. Contact your local hatchery or county Extension agent for sources of fertile eggs.

Care of Hatching Eggs Before Incubation

The chick's structural development begins soon after fertilization. The hen lays the egg approximately 24 to 26 hours after conception. The cells continue to divide as the egg travels down the oviduct of the hen. After the egg is laid, cell division ceases whenever the temperature of the egg's contents drops below 80°F. Store hatching eggs at temperatures between 55 to 60°F. and a relative humidity of 80 to 90 percent. For best results, incubate eggs within seven days after they are laid.

Selecting Hatching Eggs

Not all eggs laid are suitable for hatching. Selecting eggs carefully is important for two reasons: the physical characteristics of the egg may influence hatchability and many defects in eggs are inheritable. Factors to consider when selecting eggs for hatching are size, shell quality, shape, and cleanliness.

Size. Best hatchability is obtained from eggs weighing between 23 and 27 ounces per dozen. Double-yolked eggs rarely hatch.

Shell quality. Eggs with thin or porous shells lose moisture too rapidly during incubation and are apt to be broken during turning.

Shape. Within reasonable limits, egg shape does not affect hatchability. Do not select extremely round, slender, or misshapen eggs.

Cleanliness. Dirty eggs hatch poorly and may introduce disease into the incubator.

Operating the Incubator

Developing a fertile egg successfully depends not only on a plentiful supply of all food nutrients essential for growth, but also on the environment of the egg during incubation. Give careful consideration to proper temperature, humidity, ventilation, and turning. The recommendations apply specifically to the type of incubator illustrated in "Construction of a Small Display Incubator," 4-H 138b. In most cases they also will apply to all types of small still-air (no fan) incubators.

Records

Three times daily record the temperature, turning of the eggs, adjusting the thermostat, and interesting observations during the incubation period. Take the readings before you open the incubator to turn the eggs.

See page 8 for a suggested form.

Testing the Incubator

The incubator should not be in direct sunlight and not subject to drafts and extremes of temperature.

Pretest the incubator. Operate it for at least 24 hours with only water in the moisture pan. This allows you to adjust the temperature controls properly. Regulate the temperature by turning the adjustment screw which extends through the back of the incubator.

Temperature

Natural movements of air currents distribute heat and ventilate a still-air incubator. Maintain the temperature at 102 to 103°F. The bulb of the thermometer should be level with, but not touching, the tops of the eggs.

With the kind of controls commonly used in small incubators, you will observe some fluctuation in temperatures. Do not be alarmed. The temperature can vary from 99 to 104°F. with no harmful effects, if the temperature does not remain at these extremes for long.

Overheating is much more critical than underheating. Prolonged overheating will accelerate growth and lower the percent of hatchability. Operating a still-air incubator at 104 to 105°F. for the entire incubation will kill nearly all the embryos. Underheating slows down embryonic growth.

Humidity

Avoid excessive drying of the egg because it causes the chick to stick to the shell: adequate moisture is mandatory. Yet, too much moisture in the incubator prevents normal evaporation and decreases hatching. The problem usually is too much ventilation and not enough moisture in a small still-air incubator.

To determine the moisture content of the air, make a cloth wick, wet it, and place one end over the base of a thermometer. Wait five minutes, then check the reading of the thermometer. It should

read between 85 to 90°F. This is called the wet bulb reading and is determined by the rate water evaporates in the incubator. Maintain a wet bulb reading between 85 and 90°F. (50 to 65 percent relative humidity) at all times.

During the last three days, while the chicks are hatching, the wet bulb reading should be nearer 90°F. Put water in a cookie pan on the bottom of the incubator to provide moisture. Increase the humidity by putting a sponge in the water pan, by sprinkling eggs with warm water, and by reducing ventilation. Check the water level daily.

Two other methods to determine moisture loss are candling the eggs and weighing the eggs.

Candling

As incubation progresses, the air cell of the egg becomes larger and deeper because of the moisture lost by the egg.

You can candle the eggs to determine moisture lost. To candle, hold the egg in front of a strong light in a darkened room. The light rays penetrate the egg and make it possible to observe the egg's contents.

You can construct a simple, cheap egg candler from an oatmeal box, tin can, or similar object. Cut a one-inch hole in the side of the box or can. Obtain an extension cord and mount a 60-watt bulb inside the candler.

To candle the egg, hold the large end in front of the light, rotate it gently, observe the contents, and record the depth of the air cell.

Number each egg set. At the 7th, 14th, and 18th days of incubation, candle eggs and compare the air cells with your first depth.

Do not keep the eggs out of the incubator for more than three to five minutes. Removing the eggs from the incubator for turning and observing does not harm the eggs if they are not allowed to cool excessively. Excessive cooling slows down the chick's development. The degree of delay depends on the degree of cooling.

Enter your results on page 6.

Determining Fertility

By candling, you can determine the fertility of incubating eggs after four or five days of incubation. What you will be able to see will depend upon your knowledge of the egg's structure and whether the egg is fertile.

As you hold a fertile egg in front of the candling light, you will see a small dark spot in the cen-

ter of the egg with a network of blood vessels branching out from it. This is the developing embryo. If the egg is infertile, the egg contents will appear clear or devoid of any evidence of development. Eggs showing "rings or streaks of blood" contain embryos that have died early in the incubation period.

Weighing

Another way to determine moisture lost is to weigh each egg at the 7th, 14th, and 18th day of incubation. By simple calculations you can determine the percentage of the original weight lost. This loss mainly represents moisture. An egg should lose about 10 percent of its original weight for the best results.

Ventilation

To develop properly as a living organism, the embryo requires an ample supply of oxygen. Also, poisonous carbon dioxide must be removed for the embryo to survive.

The incubator illustrated in Unit 2 has small holes in the walls for ventilation. The holes at each end of the incubator, between the level of the eggs and water pan, are inlets. Two outlets are provided near the top of the incubator. Restrict both outlets by pasting tape over half of the hole.

When the first chick has hatched and emerges completely, remove the tape from both outlets to increase the air flow.

Turning the Eggs

For normal growth, turn the eggs at least three times each day. This prevents the embryo from sticking to the shell membrane. An odd number of turns per day is important because an even number of turns allows the eggs to remain in the same position for a long time each night. You do not need to turn the eggs after the 14th day of incubation.

Mark the date on each egg to record when the egg was set and indicate that the egg has been turned.

You may use an egg carton to hold the eggs. Results usually are better if you place the eggs directly on the wire tray. Under no circumstances should the small end be higher than the large end. Change the position of the eggs in the incubator as they are turned to eliminate the effects of possible temperature variations inside the incubator.



Factors that Influence Hatchability

Certain factors influence hatchability. In all three experiments, you should number the eggs before setting. The appropriate tables are on pages 6 through 10 to record results in each experiment.

Turning

Place a setting of eggs in the incubator. Turn half of the eggs three times per day for the first 14 days. Do not turn the others.

Egg Position

Incubate half of a setting of eggs with the small end higher than the large end throughout the incubation period.

Eggs During Hatching

On the 18th day, remove eggs from the incubator and place crinoline or cheesecloth over the wire tray. Replace the eggs. After the 18th day, do not open the incubator unless necessary. Should it be necessary to add water, add warm water (110°F.).

Remove the chicks after they have dried off. If everything has operated properly, the chicks should be dried and fluffed out by 21½ days after the eggs were set.

Shell Porosity

Set two dozen normal eggs and two dozen eggs sealed by dipping in mineral oil.

Why Eggs Fail to Hatch

One or several factors may be involved when eggs fail to hatch.

- Incubation temperature is too high or too low.
- Humidity is too low during incubation. When the relative humidity is below 60 percent, the chicks may start to emerge from the shell on the regular hatch date, but then become stuck in the shell, unable to get out.
- Eggs have not been turned properly.
- Eggs were held too long or were under improper conditions before incubation.

Incubation periods for different species of birds are:

Chickens: 21 days
 Turkeys: 28 days
 Ducks: 28 days
 Quail (Bobwhite):
 22 days
 Pea fowl: 26-28 days

Geese: 30 days
 Pheasants: 25 days
 Pigeons: 18 days
 Quail (Coturnix):
 18 days



Determining Moisture Loss

METHOD 1

Name _____
 Address _____
 Name of Club _____
 Name of Community Leader _____
 Name of Project Leader _____

Egg Number	Remarks*		
	7 days	14 days	20 days
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			

* Indicate how air cell depth of individual egg compares with normal air cell.

Determining Moisture Loss

METHOD 2

Egg Number	Weight at Time of Setting	Weight at 18th day	Amount of Weight Loss	Percent Moisture Loss
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

Answer the following questions:

- What was the average percentage lost during this period? _____
- What was the maximum and minimum percentage lost in individual eggs? _____
- Explain these variations.

Determining Fertility and Hatchability

No. Eggs Set	Date	Fertility		Hatchability	
		No. Fertile	% Fertile	No. Hatched	% Hatched

Explain your results.

Effect of Turning on Hatchability*

No. Eggs Set	Number Hatched		% Hatchability	
	Turned	Not Turned	Turned	Not Turned

* Based on fertile eggs only.

Explain your results.

Effect of Egg Position on Hatchability*

No. Eggs Set	Number Hatched		% Hatchability	
	Normal	Abnormal	Normal	Abnormal

* Based on fertile eggs only.

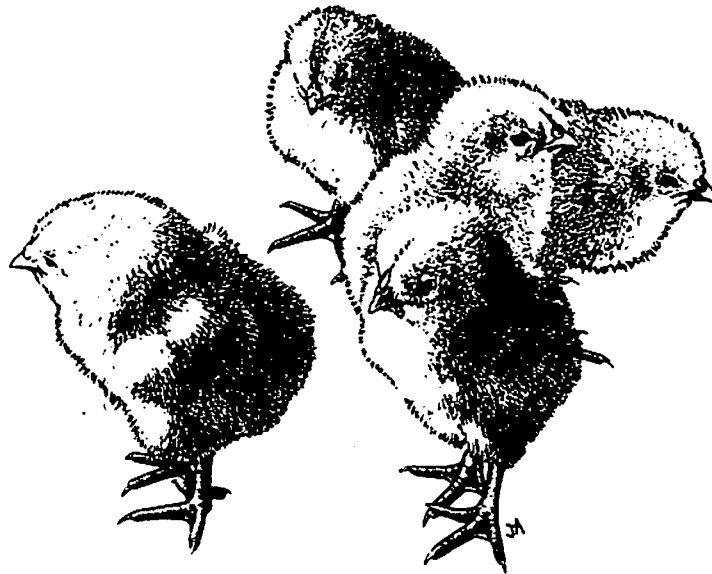
Explain your results.

Effect of Shell Porosity on Hatchability*

No. Eggs Set	Number Hatched		% Hatchability	
	Normal	Sealed	Normal	Sealed

* Based on fertile eggs only.

Explain your results.



Albert W. Adams
Professor
Animal Sciences and Industry

Marion E. Jackson
Extension Economist
Poultry Marketing and Production



COOPERATIVE EXTENSION SERVICE, MANHATTAN, KANSAS

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