Dr. Maysem Hassan ali
First stage
Poultry mangement

Incubation and Hatching

Incubation is the **act** depending on:

1. Based on heating source: Hot air incubator and Hot water incubator

2. Based on fuel used Gas operated incubator and Oil operated incubator

Location

The chick hatcheries are modern buildings that provide separate rooms for each hatchery operations, but each room has its individual requirements. The hatchery area should be a separate unit with its own entrance and exit, unassociated with those of the poultry farm. The hatchery should be situated at least 1000 ft from poultry houses to prevent horizontal transmission of disease-producing organisms from the chicken houses to the hatchery.

Size of the hatchery

The size of the hatchery is based on the egg capacity of the setters and hatchers, number of eggs that can be set each week and number of chicks hatched each week. Also, necessary space to be allotted for future expansion.

Principles Of Incubation

Five major functions are involved in the incubation and hatching of poultry eggs. They are:

1-Temperature

2- Humidity
3- Ventilation (Oxygen and Carbon dioxide level and air velocity)

4- Position of eggs

5- Turning of eggs

1.Temperature

Temperature is the most critical environmental concern during incubation because the developing embryo can only withstand small fluctuations during the period. Embryo starts developing when the temperature exceeds the Physiological Zero. **Physiological zero** is the temperature below which embryonic growth is arrested and above which it is

reinitiated. The physiological zero for chicken eggs is about **75oF (24oC).** The optimum temperature for chicken egg in the setter (for first 18 days) ranges from **99.50 to 99.75 o F** and in the hatcher (last 3 days) is **98.50F**.

2.Humidity

Incubation humidity determines the rate of moisture loss from eggs during incubation. In general, the humidity is recorded as relative humidity by comparing the temperatures recorded by wet-bulb and dry-bulbthermometers.

Recommended incubation relative humidity for the first 18 days ranging between **55 and 60%** (in setter) and for the last 3 days ranging between **65 and 75%**. Higher humidity during hatching period is given to avoid dehydration of chicks.

3.Ventilation

Ventilation is important in incubators and hatchers because fresh oxygenated air is needed for the respiration (oxygen intake and carbon dioxide given off) of developing embryos from egg setting until chick removal from the incubator.

The oxygen needs are small during the first few days compared to the latter stages of development. Oxygen content of the air at sea level is about 21%. Generally the oxygen content of the air in the setter remains at about 21%. For every 1% drop in oxygen there is 5% reduction in hatchability. Carbon dioxide is a natural by-product of metabolic processes during embryonic development and is released through the shell. **The tolerance level of CO2 for the first 4 days in the setter is 0.3%. CO2 levels above 0.5% in the setter reduce hatchability and completely lethal at 5.0%.** Since the normal oxygen and CO2 concentrations present in air seem to represent an optimum gaseous environment for incubating eggs, no special provision to control these gases is necessary other than to maintain adequate circulation of fresh air at the proper temperature and humidity.

4. Position of egg:

Artificially incubating eggs should be held with their large ends up. It is natural for the head of the chick to develop in the large end of the egg near the air cell, and for the developing embryo to orient itself so that the head is uppermost. When the eggs are incubated with the small end up, about 60% of the embryos will develop with the head near the small end. Thus, when the chick is ready to hatch, its beak cannot break into the air cell to initiate pulmonary respiration. Eggs positioned horizontally will incubate and hatch normally as long as they are turned frequently. Under normal circumstances eggs are set with large end up for the first 18 days (in setter) and in horizontal position for the last 3 days (in hatcher).

5.Turning of egg:

Birds, including chickens and quail, turn their eggs during nest incubation. Nature provides nesting birds with the instinct of turning eggs during incubation. Similarly eggs to be turned at **least 8 times a day**. Turning of eggs during incubation prevents the **developing embryo adhering to the extra-embryonic membranes and reduces the possibility of embryo mortality**. In large commercial incubators the eggs are turned automatically each hour i.e. 24 times a day. Most eggs are turned to a position of 45o from vertical, and then reversed in the opposite direction to 45o from vertical. Rotation less than 45o are not adequate to achieve high hatchability. **Turning is not required in Hatcher.**

Factors	**Setter**	**Hatcher**
Temperature	99.50 to 99.75 o F	98.5 o F
Relative Humidity	55-60 %	65-70 %
Position	Large end up	Horizontal
Turning	Manual - 8 times Automatic - 24 times	No turning

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Selection of hatching eggs

Not all eggs laid by a breeding flock are set. Eggs that are cracked, dirty or misshapen are usually not used for hatching. Very small or very large eggs do not hatch as well as eggs in the middle size range. Eggs with thin or very porous shells are not likely to hatch well because of excessive losses of water during incubation.

Reducing contamination of hatching eggs

Poor hatching egg sanitation can be a major cause of lower hatchability and poor chick quality. There is no such thing as a sterile eggshell. More bacteria are picked up on the shell when the egg passes through the cloaca where urine and intestinal contents also pass. The bacterial load found on an eggshell at the time of lay ranges from 300 to 500 organisms. After oviposition, every surface the egg comes in contact with can further inoculate the shell surface. After an egg is laid it begins to cool. During the cooling process the egg contents begin to shrink and producing negative pressure. This is one of the more opportune times for bacteria on the shell surface to penetrate the eggshell. Egg has many natural defense mechanisms to reduce bacterial penetration. The shell itself provides some protection. The cuticle on the surface of the eggshell is the best natural barrier to penetration. The inner and outer shell membranes provide additional barriers. The albumen provides a somewhat effective control over contamination. The albumen has a high pH in which most bacteria cannot survive. The chalazae contain an enzyme, *lysozyme,* which has antibacterial properties. Many breeder people choose some methods to reduce the microbial load over the eggshell. Sanding, buffing, and wiping the hatching eggs are not good methods of sanitation. Sanding and buffing will remove at least part of the cuticle resulting in eggs that are more susceptible to penetration. Fumigation with formaldehyde gas is an effective method of sanitizing hatching eggs. Solutions containing quaternary ammonium compounds, formalin, hydrogen peroxide or phenols may be moderately effective in reducing the microbial load over hatching eggs. DO NOT wash eggs unless necessary. If it is necessary to wash eggs always use a damp cloth with water warmer than the egg. This causes the egg to sweat the dirt out of the pores. Never use water cooler than the egg. Also, do not soak the eggs in water

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Advantages

1-Securing hatching eggs. 2-Traying hatching eggs

3-Fumigation 4-Cold Storage 5-Warm eggs prior to setting

6-Loading of eggs 7- Candling 8-Transfer of eggs

9-Pulling the hatch 10-Hardening 11-Grading 12-Sexing

13-Vaccination14-Chick delivery15-Washing and cleaning.

Steps Involved In Commercial Hatchery Operations:

Receiving cleaned hatching eggs

⇓

Fumigation of eggs for sanitation
(3x concentration for 20 minutes)
(3x means 60g KMnO4 and 120 ml formalin for 100 cu.ft.)

⇓

Storage in egg holding room
(65^{0}F temperature and 75% R.H.)

⇓

Pre-incubation warming at Room temperature
(4 to 6 hours)

⇓

Loading eggs in the setter
(For first 18 days)

⇓

Candling of eggs for removing infertile eggs

⇓

Transfer to the hatcher
(last 3 days)

⇓

Pulling out the chicks
(at 90% dry condition)

⇓

Sexing
(only for layer chicks) (Vent sexing / feather sexing)

⇓

Grading

⇓

Vaccination
Marek's

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