Poultry housing and management in developing countries

Incubation and hatching

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On village farms, fertile eggs are hatched mainly using broody hens. On semi-commercial and commercial farms, they are hatched artificially in incubators.

Hatching fertile eggs using broody hens

One of the important characteristics of village hens is their capacity for broodiness. The large majority of improved-breed birds have lost this capacity. When broody birds are approached, they make a typical brooding noise and fluff up their feathers. Broody hens prefer to sit on eggs in a dark environment that is protected from predators, and they need a supply of feed and water. When one or more cockerels are present in the flock and have been observed mating regularly with females for a week or more, the eggs will normally be fertile (CTA, 2007).

Quality of fertile eggs

Hatching eggs (stored at 16 to 17 °C) need to have good shell quality. Storing eggs at higher temperatures promotes the development of the embryo. In many developing countries it is difficult for village farmers or breeding centres to store eggs under ideal conditions. Under high temperature conditions, the eggs are likely to “sweat”, allowing bacteria to penetrate the shell. Relative humidity should be maintained at approximately 75 percent in the fertile egg holding room. Higher humidity encourages mould growth on eggs.

Pre-warming of fertile eggs

Eggs need to be warmed to room temperature for approximately eight to 12 hours before they are set in the incubator. The purpose of pre-warming is to minimize temperature shock to the embryo and condensation on the shell. It also reduces the variation in hatch time. Good air circulation is essential for an even pre-warming of eggs.

The incubator room

Optimum results can be expected if the temperature in the incubator room is maintained at about 25 °C. However, the tropical climate in many developing countries makes it difficult to maintain good incubator room conditions.

Incubators

In small hatcheries in developing countries, incubators are often small, still-air machines with a capacity of 12 to 240 eggs. The relative humidity must be 55 to 60 percent at set, and increased to 75 percent after day 18. In small incubators, this is normally achieved by placing an extra container of water in the incubator.

The eggs are set in a horizontal position and are turned manually. The source of heat is usually a thermostatically controlled heating element or light bulb or kerosene lamp. Humidity is supplied by water in a container either above or below the eggs, and ventilation is controlled by small air vents. Circulating-air incubators have an electrically driven fan to maintain constant temperature and ventilation of the eggs.

In large-scale operations in developing countries, incubator setting capacity ranges from approximately 10 000 to 100 000 eggs. The equipment used to incubate and hatch chicks is all precisely controlled (Cobb-Vantress, 2008). Optimum temperatures for setters are 37.1 to 38.6 °C, at a relative humidity of 60 to 70 percent. The hatching eggs are set vertically, with the blunt end uppermost in the setter, and are turned mechanically through 90° every hour.
until about three days prior to hatching. The eggs are then transferred to a hatcher, where they are placed on hatching trays on their sides, with the long axis horizontal, to allow the chick to move freely out of the shell at hatching. Hatcher temperatures are usually slightly lower than those in the setter, to reduce the risk of overheating, and are typically 37 to 38 °C, while relative humidity is usually raised to about 75 to 80 percent. Hatchability should be in the range of 80 to 90 percent for imported hybrid strains, but varies with the breed and the age of the breeder flock.

Egg candling
Candling of chicken eggs on the seventh and eighteenth days of incubation is recommended for small poultry producers and commercial farms. Egg candling (using a torch or bright light in a dark area) detects cracked and infertile eggs and those containing dead embryos or bacterial or fungal rots; these eggs can then be removed from the incubator. Cracked and rotten eggs must not be allowed to remain in the incubator as they can explode and result in infection of the hatching chicks.

Fumigation of incubators
The effectiveness of formaldehyde gas in killing bacterial organisms is based on the concentration of the gas, the exposure time, the temperature and the humidity of the incubator. The chemicals potassium permanganate and formalin are mixed together to release formaldehyde gas. This procedure has proved to be the most effective method of destroying bacterial organisms in the hatchery.

HATCHED CHICKS
The chicks hatch after 21 days of brooding or incubation. If the eggs have been hatched by a hen, she will immediately take care of the chicks, but will typically remain on the nest until the majority of the eggs have hatched. If the chicks have been hatched in an incubator, they are ready to be taken out of the hatcher when most of them are dry and fluffed up. Chicks will easily dehydrate if left in the hatcher for too long. They have yolk reserves for about three days, but survival rates are increased if they are provided with food and water within 24 hours of hatching. Chicks are normally removed from the hatchers within 24 hours of the first chick hatching. The chicks should be held in an environment that prevents overheating or chilling. Temperatures should be in the range of 30 to 32 °C, and relative humidity in the range of 70 to 75 percent. Adequate ventilation is vital at all times, to provide the chicks with a constant and uniform supply of fresh air.

Vent and feather sexing
Sexing of day-old chickens is not normally practised on village farms, but is an essential procedure in commercial operations with modern hybrids, particularly for layers, where the male chick has no commercial value. Broilers are also often sexed, but the requirement here is less important. There are two fundamentally different approaches to sexing: one identifies the sex of the day-old chick by sex organ-related differences; and the other employs sex-linked genes (Barnett et al., 2001). In the first approach, sexing can be done in any population using one of two methods: i) vent sexing, which relies on visual identification of the sex organs using an endoscope inserted into the chick’s vent; and ii) cloacal
sexing, where the chick’s cloaca is everted and the vestigial copulatory organ can be seen in male chicks. Both of these procedures require extensive training. The second approach involves fixing appropriate sex-linked feathering rate or colour genes in the parental lines (see Poultry Development Review on Poultry genetics and breeding in developing countries). In the progeny from such matings, male chicks are either slow-feathering or white, and hatchery staff can readily distinguish them at hatch from their rapid-feathering or coloured-feathered female counterparts.

Culling chicks in the hatchery
Culling is conducted to reduce the potential for transferring disease within flocks, to provide a uniform hatch of chicks for production, and to reduce pain and suffering of sick and deformed chicks.

There are three methods for culling surplus or sick chicks (Barnett et al., 2001):

- Cervical dislocation: The neck of the day-old chick is held against a firm surface (e.g., the edge of a tabletop) and gentle pressure from both thumbs is applied to dislocate it. This method can be used on small farms.
- Gas stunning with carbon dioxide: The chicks are held in a container covered with a lid or plastic. They are initially stunned and then killed with longer exposure. A concentration of 55 percent carbon dioxide in air is required to kill the chicks with two minutes exposure time.
- High-speed macerators: Some larger hatcheries use these to kill unwanted chicks and any live chicks in eggs that have failed to hatch.

Removal of claws and spurs
In commercial operations, it is routine for male breeding birds to have the terminal segment of the inner toe removed, to prevent damage to female birds while mating. This is routinely done at the hatchery, although about 10 percent of chicks may have their claws removed on-farm. It is best to use a beak trimming machine to cut and cauterize the wound, although scissors can also be used. Males may also have their spurs removed, again preferably using a beak trimmer to cut and cauterize the wound (Barnett et al., 2001). Sharp scissors can be used, but the wound is not cauterized, and there is a risk of excessive bleeding. This procedure is necessary to prevent damage to birds when fighting. In village farms, the sharp points of the claws and spurs can be blunted with abrasive material.

Bird identification
A small percentage of breeding birds require individual identification. Methods used for small numbers of birds include either cutting the skin between the toes (the webbing) with scissors or a scalpel blade, or trimming the digits with sharp scissors or a beak trimming blade (Barnett et al., 2001). For larger numbers of birds number-embossed wing bands or leg bands are necessary. Wing bands are attached to the bird by passing the pin or sharp point through the web of the wing. Leg bands are fastened around the metatarsus above the foot.

Wing-bands can be applied at hatch, but leg-bands can not be applied before about 12 weeks of age, due to rapid increase in the diameter of the leg up until about this age.

REFERENCES


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