Incubation of Pekin ducks by single loading with the cuticle on

Incubation is simply a means of copying reproduction as it occurs in the natural environment. Nature is the benchmark, so it is necessary to imitate it as closely as possible.

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There are actually several alternatives to artificial incubation – with or without cuticle, multiple or single stage loading – and each technique has its own advantages and disadvantages.

For the incubation of breeder Pekins, parent or grandparent, Grimaud Frères Sélection has chosen the method of single stage loading keeping the cuticle of the egg on. In this article, we will discuss the various important stages in this method.

During the incubation period, two phases are observed. The first is known as the endothermic phase and the second the exothermic phase. Within both these cycles, there are critical points which must be correctly managed if the desired quality is to be obtained.

In modern incubation, in addition to the biological parameters, energy consumption is an important criterion for the economic performance of the hatchery.

The important stages in embryonic development, with reference to embryo-genesis, are as follows.

Endothermic phase

● **Placing in incubation:** the incubation time is relative to egg weight, which is directly correlated to laying stage, storage time and strain. For these different reasons, it is advisable to use a template, providing the necessary reference points. This template will include the laying stage, storage time and strain. The time of loading into incubation will depend on the desired hatching time. An adjustment in either direction may be made according to the duration of transportation and delivery.

● **Development of the circulatory system from 0 to 6 days:** It is a delicate phase in the incubation process. During these six days, the egg is vulnerable and requires stability in term of all the various parameters, (temperature, humidity, ventilation, CO_2 and turning).

At this stage the egg does not need much oxygen. For this reason, the inlet and outlet trapdoor must remain closed for 3-4 days. As well as providing a certain level of sealing, closing the trap doors will stabilise the temperature and humidity parameters. The rise in CO_2 will also be more effective, and will enable viable development of the circulatory system. Turning is also essential during this phase, initially in order to spread the yolk, and later to prevent the embryo from sticking to the inner membrane.

● **Endothermic embryonic growth from 7-15 days**: embryonic development leads to higher oxygen consumption, making it necessary to increase the ventilation parameters (opening the inlet and outlet trap doors). The temperature and humidity parameters, on the other hand, must be decreased, since the embryo starts producing its own

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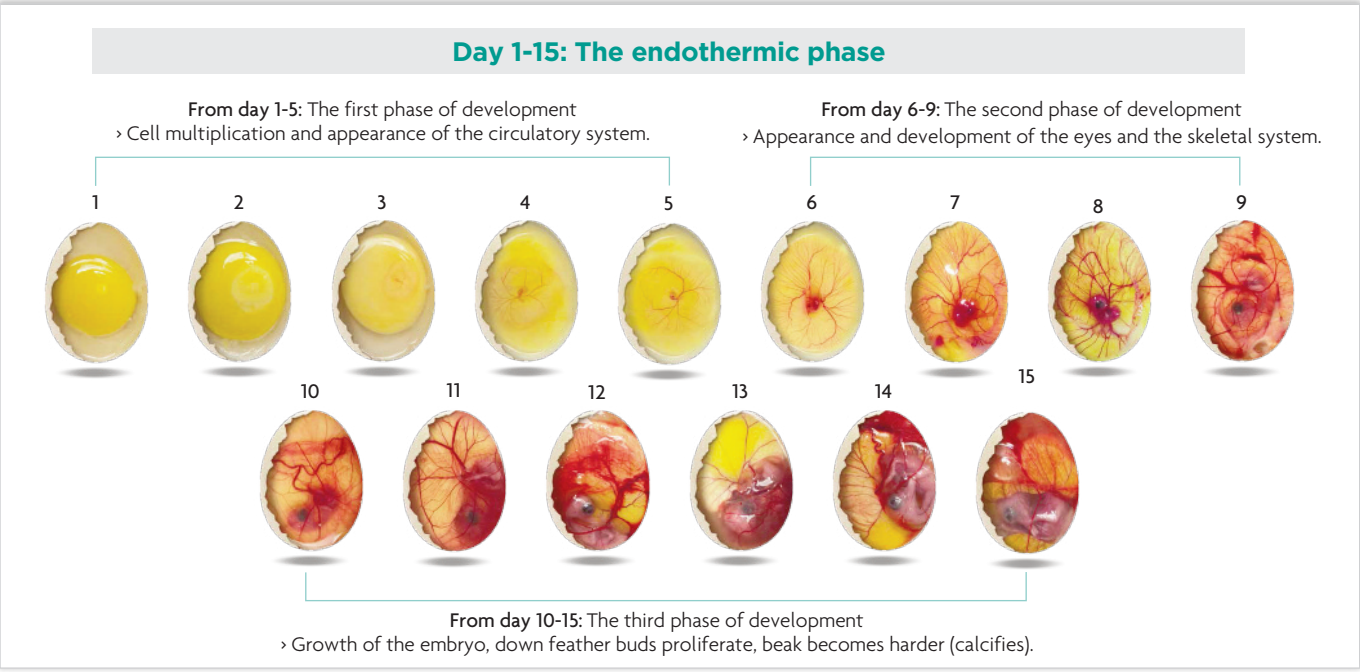

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calories, which will evolve throughout its growth.

During this phase, the candling of hatching eggs is performed. This involves removing unfertilised eggs or dead embryos. It is important to do this under controlled environmental conditions (no air currents, room temperature of around 24°C).

This task is necessary for two reasons: to provide feedback to the farm and to maintain health conditions. Rapid return of fertility information is important for the farm, which will make the necessary adjustments.

As for the health aspect, any dead embryo not removed during incubation represents a cross-contamination risk should it split. However, retaining the cuticle significantly reduces this risk. It is advisable during candling to group the fertile eggs together in the racks and trolleys to maintain uniformity of parameters.

Depending on the accuracy and speed at which feedback required by the farm is sent, an optical fibre can be used to candle the eggs individually.

Exothermic phase

Throughout this phase, the parameters referred to above will evolve. In terms of temperature, taking account of the embryo's heat production, it is advisable to decrease it slightly as incubation progresses.

The same applies to humidity, thus encouraging water weight loss, necessary for the emergence of the duckling.

With single loading, this weight loss is not linear, as is the case with multiple stage loading, and must be controlled. In order to do this, simply weigh a few reference racks on a weekly basis until transfer. This weight loss should be around 13%.

At this stage, the CO_2 level rises significantly, and it is for this reason in particular that the opening of the inlet and outlet trapdoors should be increased.

The idea of retaining the cuticle stems from environmental considerations in line with the 'Natural Concept' charter developed by Grimaud Frères Sélection.

In fact, to remove this cuticle, it is necessary to use high concentrations of chlorine. Something which clearly goes against the spirit of the charter. The use of this substance can have consequences for people, the environment and equipment. With retention of the cuticle, it is therefore essential to control the health aspect by working as far as possible upstream from the egg production cycle; in this case, on the farm. The cuticle is also a natural health barrier, offering protection from potential contamination.

In the process of incubation with retention of the cuticle, it is essential to spray eggs with water.

This is intended not only to remove the excess calories produced by the embryo, but also to help break down the structure of the shell, which will subsequently facilitate the emergence of the duckling. This is performed daily from the beginning of the exothermic phase.

During this operation, the egg is liable to microbial invasion, conveyed by the water. It is therefore necessary to use biologically safe water with a pH between 6 and 7.

In addition to these properties, the hardness of the water is also important. Chemically hard water leaves a calcium deposit on the shell which can lead to blocking of the pores. This results in poor gaseous exchange leading to suffocation of the embryo.

At the end of this cycle – just before what is referred to as the hatching phase – the duckling begins its hatching work by breaking through the inner shell membrane into the air chamber. This is the first stage in establishment of pulmonary respiration and retraction of the yolk sac into the visceral cavity.

Duckling hatching process

Transfer from the incubator to the hatcher is now possible. It is therefore necessary to stop spraying eggs with water just before the first pippings. This transfer is generally made when the level of pipped eggs is close to 80%.

The first day in the hatcher is important. A significant increase in the CO_2 level is required, in order to accelerate blood circulation and stimulate the duckling in this energy-sapping work. It is important to open the hatches afterwards to release this CO_2.

Homogeneous spraying performed previously during the exothermic phase will provide the conditions required to reduce the hatching window, which is a guarantee of duckling quality.

Once internal pipping has been completed, the duckling begins to lift the shell at a single point. It continues its work while turning around in the air space. Once it has turned around, it lifts the shell and can begin to extricate itself.

Regular and rigorous monitoring of these two days spent in the hatcher is vitally important.

The hatchery manager must have a sharp eye and must make the necessary corrections by adjusting the parameters of temperature, humidity and ventilation which are essential for obtaining a quality duckling.

The humidity peak observed during the hatching phase is natural and essential. In waterfowl species, it reaches very high levels of around 90-92% relative humidity. This is a good indicator of hatching quality.

The emergence of the ducklings brings with it all sorts of work (counting, sorting, sexing, boxing and dispatch). The Pekin species must be expertly sexed if quality is not to be affected. The skeleton of the duckling is very fragile, and must be handled with dexterity. For this reason, sexing by touching is recommended, so as not to break or dislocate the animal's hips. This often happens if using the classic method of sexing by everting the cloaca. In the case of relatively long transportation, it is recommended to start the ducklings a few days earlier.

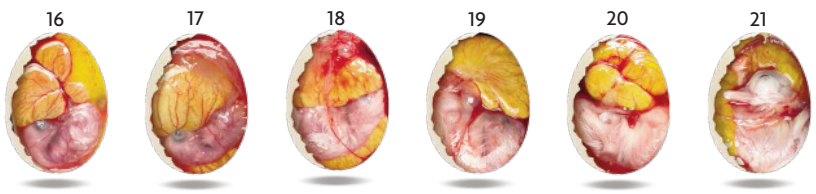
The Pekin is a fast-growing species. It is therefore important to manage this starting duration so that you do not have overly large ducklings. If this is the case, it will be necessary to adjust how the animals are packaged, reducing the number per box.

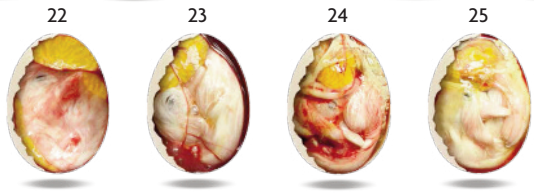
Conclusion

Incubation is a task requiring experience and observation. The task must be performed with consideration for the animal's biology. Any lack of vigilance during the process may lead to a loss of performance and therefore an economic loss. Good management of parent stock incubation is decisive in enabling a batch to fully express its genetic potential during the egg production phase. ■

Day 16-28: The exothermic phase

From day 16-21: The fourth phase of development › Embryo growth is rapid and yolk sac absorption increases. Internal body organ development is evident.





From day 22-25: The fifth phase of development › Yolk sac absorption is very rapid, head turns into position under the right wing.

From day 26-28: The sixth phase of development › Pipping starts, duckling completely cuts shell with the egg-tooth in a counter clockwise direction (around 24 hours). Duckling emerges.