Pekin duck eggs – single stage incubation

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Multi-stage incubation is characterised by eggs of different developmental ages being incubated within the same cabinet. At Cherry Valley they are exposed to a uniform temperature, a single humidity setting, constant aeration of the cabinet (that is introduction of fresh air) and turning once an hour.

All of the eggs will experience these conditions despite their differing requirements, particularly in temperature maintenance, at various times during the incubation period.

Eggs at the start of incubation generate no metabolic heat but this steadily increases during the second half of incubation. In multi-stage incubation the metabolic heat of older eggs warms adjacent fresher eggs, thereby minimising temperature differences within the cabinet and so this system relies on eggs of different ages being distributed evenly within the cabinet.

Although hatchability can be commercially acceptable using multi-stage systems it has some disadvantages. Firstly, all eggs irrespective of flock age, storage period or size are in the same cabinet and experience the same incubation environment, which may not be optimal for hatchability or duckling quality. Another problem is the point that the machines are always in operation (as one set of eggs is removed it is typically replaced with a second) and so it is hard to maintain the highest state of hygiene and biosecurity.

Increased biosecurity

Single stage incubation has the potential to overcome these problems. This system, often called 'all-in all-out', involves setting all of the eggs in an incubator at the start of incubation and emptying the cabinet at transfer. This means that after each set the cabinet can be thoroughly cleaned and disinfected and so dramatically increasing the biosecurity of the incubation process. Single stage incubation also varies from multi-stage systems in the way that the incubation environment is set up.

Maintenance of temperature is very different from multi-stage incubation. In single stage incubation the temperature of the machine has to be set to match that required by the eggs. Therefore, the temperature tends to be set relatively high (perhaps 0.6-0.8°F above the typical level for multi-stage incubation) for the first couple of days before dropping to the temperature typically used for multi-stage incubation.

This gets the early embryo off to a good start. From around the middle of incubation the temperature set point is gradually reduced by increments of 0.1-0.2°F every one to two days to ensure that the machine responds to the increasing metabolic heat output from the eggs. This ensures that the egg temperature does not rise to a level that can cause loss of hatchability and duckling quality. This means that the temperature set point has to follow a programme that can see the temperature of the air in the cabinet drop by perhaps 2.5°F from setting to transfer. If the temperature does not change during development then from the middle of incubation the egg temperature will increase steadily and the embryos will experience heat stress that will affect their survival through to hatch.

As with temperature the humidity setting of the single stage incubator can be changed through incubation. Often the wet bulb is at a high level at the start of incubation (high % relative humidity) and is lowered towards the end of incubation to achieve a correct weight loss from the eggs. This is particularly important for single stage programmes that run with the machine closed to fresh air during the first half of incubation. The high humidity caused by this situation reduces the rate of weight loss that needs to be counteracted during the second half of incubation. The exact humidity settings for an incubator depend on the local conditions and eggs and the best way to determine whether the setting used is appropriate is to weigh eggs during incubation. Single stage setting allows eggs from different source flocks to experience a different humidity, which should optimise their weight loss. If it is possible to fill a single stage incubator with eggs from the same flock then the humidity can be matched to optimise weight loss.

Introducing fresh air into the cabinet provides oxygen for the embryos, dilutes the carbon dioxide that they produce and the humidity lost from the eggs. It also provides a constant background cooling effect beneficial to maintaining the correct egg temperature. In single stage incubation the rate of aeration can be changed according to the stage of incubation. At the start of incubation aeration can be very limited or even stopped without any detrimental effect.

After the middle of incubation the damper needs to be progressively opened to allow in more air in line with the oxygen and cooling requirements of the eggs. Excessive aeration should be avoided because this destabilises the incubation environment and there is a loss of warm, humid air that the machine has to replace. Ideally, the amount of air moving through the machine should be ascertained at various fixed damper settings so that the damper flap can be set at a level appropriate to the requirements of the eggs at any time.

Importance of egg turning

Single stage incubation also allows for the rate of egg turning to be changed according to egg age. Holding the eggs in a horizontal position during the few days before transfer allows for better airflow over the eggs and reduces egg temperature. Egg turning is very important during the first half of development, which prevents this practise being applied in multi-stage machines.

Single stage incubation continues into the hatcher, which have always been operated in this manner. Ideally, the decrease in temperature set point continues and the humidity can be increased during the pipping phase of hatching. The value of being able to wash and disinfect hatchers between hatches has long been recognised.

Matching the incubation environment to the eggs within the cabinet has been shown to improve hatchability and duckling quality.

Reducing variation between eggs (for instance having eggs from only one breeder flock in the same cabinet) allows for the incubation environment to be modified maximising production of the best quality birds. However, it is often the case that the initial programme used in single stage incubation need to be modified in order to maximise results.

This involves a degree of trial and error, but the results are well worth the effort. ■