Egg Quality

Egg quality is best divided into two components - shell quality and internal quality.

Shell Quality

The egg shell is the packaging for the product. Good shell quality is required to prevent breakage or other damage to the egg contents.

Shell quality is determined by calcium metabolism within the laying hen. There is a finite capacity to deposit calcium in shell formation, firstly because the egg is only in the shell gland for a limited time, and secondly because of the rate of calcium metabolism.

As the laying hen ages, the eggs produced are generally larger. It is because of this fact that egg shell strength becomes weaker as the hen ages. Research indicates that the percentage of shell decreases by about 0.07% per week of age. This is partly due larger internal contents reducing the overall shell percentage, but also due to the finite calcium deposit being deposited over larger internal contents, thus being marginally thinner.

Decreasing shell quality with hen age can be overcome to a large extent by phase feeding layers. Phase feeding requires the feeding of different specification rations at different times in the laying cycle. Generally feed specifications reduce as the hen ages which results in a slightly smaller egg thus increasing the shell percentage of the egg and increasing shell thickness. With phase feeding, the calcium percentage in the ration is also increased to assist with good shell formation. In a three phase feeding program the daily intake of calcium is increased by around 0.2g per day in phase two and by a further 0.3g per day in phase three.

To produce good egg shells, hens are expected to consume the required amount of feed of the correct nutrient specification. This means that factors which change this relationship may alter egg shell quality. Increased temperature over prolonged periods will reduce feed intake and lower shell quality. Water mineral quality, and incorrect feed specification, can also impact shell quality negatively.

Data from our Bond Brown breeding lines indicates that a weight of over 2800g is currently required to break the shell of an egg produced at forty weeks of age.

Internal Quality

Internal egg quality refers to the various contents of the egg. These contents are the yolk, the albumen and inclusions.

Inclusions, such as blood and meat spots are unappealing to the consumer. Inclusions are generally rare in the highly productive layers available to the commercial producer, and can be easily removed at the egg grading floor at the candling stage.

Yolk colour is feed dependent and consumer preferences differ around the world. In Australia, a colour range of 10 to 13 on the DSM colour fan is preferred.

Yolk pigmentation is primarily determined by the xanthophyll content of the diet. Xanthophyll generally comes from plant pigments in the feed, or from green pick in free range birds, but can also be added to the diet in natural or synthetic forms.

It is known that disease, particularly IB, can lower yolk colour, and it has been suggested that worm infestation may affect the uptake of pigment from the diet.

Yolk colour may become mottled if the egg is stored too long, and the membrane around the yolk may appear wrinkly as the yolk loses water (and therefore size) as the egg ages.

Albumen (or the white of the egg) is the most important part of the internal content and is the component that deteriorates as the egg is stored (ages). Deterioration occurs because the albumen breaks down and the egg loses water.

The consistency of the albumen is measured by its height midway between the yolk and the edge of the albumen. However, as albumen height varies with egg size (weight), Haugh developed a formula to compute a measurement of albumen consistency. This measurement, the Haugh unit (HU), is calculated as follows:

$$HU = 100\log (h-1.75G^{0.37} + 7.6)$$

where
HU = Haugh Unit
H = albumem height (mm-2)
G = egg weight (g)

The HU is now used universally to assess the internal quality of an egg.

The HU of eggs produced is known to decrease with hen age and storage conditions.

Under ideal conditions of nutrition, management and environment, young hens (20 weeks) would be expected to produce eggs with a HU around 100, while older hens (80 weeks) should be producing eggs with a HU of about 75. This equates to, and other researchers have confirmed, a decrease in HU of between 1.2 to 2.4 per month of age of the hen.

The Bond Brown layer is right on target producing an average HU of 90 at 40 weeks of age in non-environmental controlled shedding.

Egg handling and storage conditions have the biggest (and negative) impact on HU.

According to New Zealand research, the minimum acceptable HU at the time of reaching the consumer is 60.

Under Australian conditions it would not be unusual for an egg to lose 15 HU before reaching the grading/packing floor if kept at ambient temperatures. Because of this, the NSW Food Authority suggests a maximum of two days at ambient temperature before grading/packing, or preferably on farm storage at 8° C.

Recommended storage conditions generally range from 7-13° C and 50-60% humidity.

Even under ideal storage conditions it is expected that the HU will decline by about 0.7 per day (5 per week).

Australian Best Before dating on cartons is usually four weeks. Even under ideal storage conditions from egg laying, eggs from 80 week old birds would be at the minimum acceptable HU by this date.

It should be remembered that storage conditions at retailers are better than ambient, but not ideal.

Finally, eggs may obtain unacceptable odours or flavours if stored near contaminants, or if the hens are fed fish oil/meal or canola products in unacceptable levels in their diet.

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