

First grade eggs – it's not just about shell quality

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The production of first grade, high quality eggs is crucial to the profitability of laying hens. Whilst a great deal of attention has focused on mineral nutrition to ensure shell strength and appearance, there are other considerations from a nutritional point of view that can influence the production of first grade eggs that are desirable to the consumer.

Size and colour

So what is a first grade egg? The egg must have a certain appearance, with a smooth, strong, regular shell. Obtaining eggs of a suitable size to match market requirements (especially for supermarket retailers) is important, as under- or over-sized eggs will be rejected. In addition, consumers have more 'local' demands, with some desiring very strongly pigmented yolks.

This can be dictated by hen nutrition and the application of specialist feed ingredients, such as enzymes, especially regarding the efficiency of transfer of colour from pigments supplied in feed, either via naturally pigmented material such as corn, or those added separately to the diet.

Matching the egg's characteristics to consumer's expectations is important to ensure profitability for the egg producer and will define 'first grade' eggs for that specific market.

Feeding an appropriate and balanced diet to high producing laying hens is the basis for all successful egg production, however there are other dietary factors, not always readily

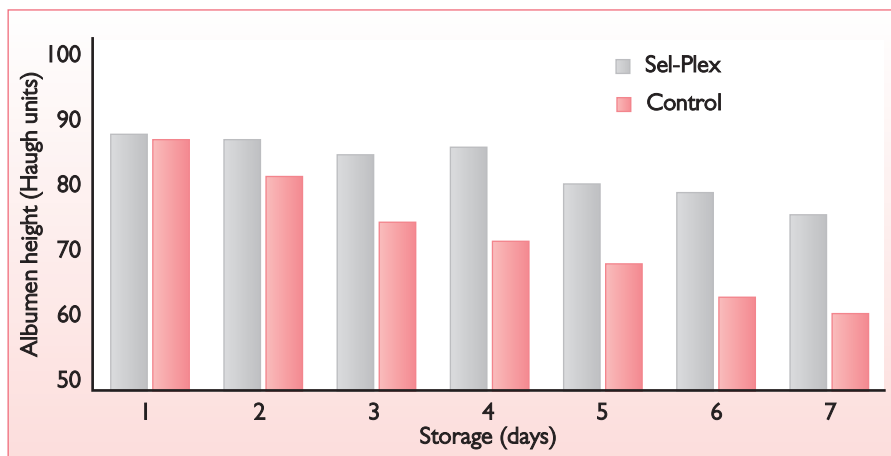


Fig. 1. Influence of organic selenium in eggs on egg quality preservation (measured by Haugh units) during seven day storage (Wakebe, personal communication).

appreciated, which can influence the quality of the eggs.

These quality characteristics may not always be visible in terms of external appearance of the egg, but still has a major bearing on the consumer's opinion of egg quality.

The internal quality of the egg is a characteristic that is specifically noted by consumers, as they directly observe this when using the eggs. When a cook breaks an egg, they observe not only the yolk colour, but also how well defined the white and yolk is, i.e. whether the egg appears to be 'wet' with little structure or if it holds together well, with a firm albumen, and whether the yolk breaks, etc.

They may also note the comparative levels of yolk and white – with a higher amount of yolk being desirable in most cases.

Improving diet digestibility and limiting potential digestive upsets in laying hens will increase production of these characteristics

in the egg. There are well established, commercial feed ingredients that are known to optimise the internal digestive environment in poultry that can influence egg laying.

Trials with feeding a mannan-oligosaccharide product (Bio-Mos, Alltech Inc, USA) have shown that, due to the activity of this ingredient in stabilising the microflora in the gut of hens, more nutrients are available for egg production, leading to significantly higher yolk levels (Table 1).

Commercial trials with Bio-Mos have also shown greater persistency of lay in high performing flocks.

Nutritional factors

Certain nutritional factors can influence the internal appearance and structural characteristics of eggs, including the levels of antioxidants in the feed. Antioxidants are essential for membrane integrity in all tissues, and maintain the strength of the yolk membrane, preventing breakage during cooking.

Experiments conducted with laying hens examining the influence of feeding certain forms of antioxidants, such as organic selenium, have shown better transfer of this key nutrient into the egg (Table 2).

Hens receiving the organic form (Sel-Plex, Alltech Inc, USA) had significantly higher lev-

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Table 1. Effect of mannan-oligosaccharides on composition of eggs (Peric et al, 2009).

Diet	Fresh egg weight (g)	Boiled egg weight (g)	% shell on boiled egg	% egg white on peeled egg	% egg yolk on peeled egg
Control	65.80	62.90	17.72	63.31 ^a	36.59 ^a
Bio-Mos	64.20	62.15	15.47	62.27 ^b	37.73 ^b
P value	0.36	0.68	0.06	0.05	0.018

^{a,b}Means within column with no common superscript differ significantly (P<0.05)

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els of selenium (Se) expressed in their eggs at both three and six weeks of receiving the supplemented diet. Other trials have shown that the best transfer was seen for higher inclusion levels of organic Se in diets, such as 0.3ppm or more.

These eggs will have much higher levels of antioxidant protection for internal structures, promoting both yolk membrane strength and albumen height.

The antioxidants transferred into eggs are associated with improvements in shelf life. Trials on the storage of eggs and their changes in internal quality characteristics have shown that Haugh unit (albumen height) is particularly affected over time.

As a result, older eggs can be considered to have poorer internal quality for the consumer, and may be downgraded.

Taking Haugh unit as a convenient measure of relative internal quality, experiments were conducted using eggs stored over a seven day period to examine the influence of higher antioxidant/Se levels (Fig. 1).

The results showed that the eggs from hens fed organic Se sources had consistently higher Haugh units (albumen height) over storage time. The eggs were stored for seven days, and, as time progressed, the maintenance of internal quality could clearly be seen for the organic Se eggs, whereas quality declined markedly in the control group. These results indicated that, in addition

Parameter	Control	Selenite (inorganic)	Sel-Plex (organic)
Consumption (mg selenium/hen/day)	5	34	36
Egg content three weeks (mg selenium/egg)	2.6 ^c	9.9 ^b	13.0 ^a
Egg content six weeks (mg selenium/egg)	3.3 ^c	10.9 ^b	13.5 ^a

Means not sharing a letter differ significantly (P<0.05)

Table 2. Effect of selenium form on transfer into eggs from hens fed inorganic or organic selenium supplemented feed (Cantor et al., 1996).

tion to the higher Se content in eggs from hens fed organic forms of Se, such a feeding strategy can maintain egg quality over storage time to a higher level than seen in eggs from non-supplemented hens. As the generation of first grade eggs is important to production profitability, maintenance of the internal quality and shelf life of these eggs is a key consideration, and feeding organic Se to laying hens can help to maximise the sales of these products.

First grade eggs essential

The production of first grade, high quality eggs is essential in the modern laying hen industry. Retailers have strict requirements regarding appearance, size, freshness and internal quality, as these form the major considerations in purchasing decisions made by consumers.

Although a great deal of attention has focused on external egg quality parameters, internal quality is equally as important from a consumer's point of view, especially where it relates to appearance and handling during food preparation.

Using specialist feed ingredients to promote digestion and nutrient uptake, such as enzymes or Bio-Mos, will ensure the construction of high grade eggs within the oviduct. Providing highly bio-available sources of key antioxidant minerals, rather than cheap inorganic forms, is important in maximising transfer into eggs.

From the experiments above, it is clear that feeding laying hens to maximise their own utilisation and transfer of nutrients for egg formation, as well as ensuring transfer of key quality-linked minerals such as Se into eggs, are useful strategies to ensure first grade egg production as well as promoting longer shelf life. ■