



Controlling Late Egg Weight in Broiler Breeders

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Summary

Controlling egg weight in broiler breeders late in the production cycle is an issue that many farm managers struggle with. As birds age, it can be difficult to keep egg size on target without producing excessively large eggs that weigh 2-3 g above the standard. However, with proper management techniques such as keeping track of on-farm egg weights and monitoring female uniformity and CV%, as well as maintaining the correct nutrient balance throughout the entire life of the flock, it is possible to maintain consistent egg size during post-peak production.

Understanding the correlation between egg production, female body weight and persistency versus egg size is key to managing concerns such as poor shell quality, that inevitably come with larger egg sizes and can negatively impact both hatchability and chick quality. By implementing the management strategies outlined in this article, it is possible to achieve and maintain excellent chick output, while allowing the breeder female to reach her full potential.

Introduction

One of the most difficult tasks of hatching egg producers is to achieve a minimum egg size of 50g at point of lay, while effectively controlling egg size to within 0.5g of target post 45 weeks. There is a strong relationship between egg size and chick weight and chicks should weight 66-67% of the total egg weight. Producing optimum egg weights in early production and controlling late egg size in older flocks will help to achieve good chick quality.

As birds age, a gradual increase in egg size is inevitable. However, with proper flock management, it is possible to prevent excessively large eggs (2-3 g above standard) in older birds. The purpose of this article is to explore the causes of excessively large eggs in older producing flocks and to identify practical solutions to avoid this issue and help express the full genetic potential of the breeding flock.

Description of the Problem

Because larger chicks come from larger eggs produced from older flocks, the term "large eggs" may be viewed as positive, being correlated with robustness and better performance. However, if egg size exceeds the threshold of 70g, it can be considered a problem by both farm and hatchery managers. Large eggs tend to have thinner shells and poorer shell quality and as a consequence a higher incidence of cracks and reject eggs. Hatchery managers may also notice an increase in contamination rate and the number of shell cracks due to larger eggs that do not properly fit into standard setter trays. Oversized eggs could force hatchery managers to use non-standard setter trays containing fewer eggs, and as a result hatchery capacity would be reduced and this could have a negative economic impact.

The breeder manager's responsibility is to maintain a balance between egg size, hatchability, livability and chick quality, which can sometimes seem extremely difficult. Often, the problem of excessive egg size can begin early in the bird's production cycle and can be difficult to resolve later on.

Weighing Eggs on the Farm

Daily egg weights should be recorded from 10% hen-day production onwards, with a minimum of 120-150 eggs being bulk weighed. These eggs should be taken from the second collection and gathered directly from the nest to avoid eggs that were laid the previous day. Double yolk, small and abnormal eggs should be rejected. The average daily egg weight is obtained by dividing the bulk weight (weight of eggs - weight of tray or trays) by the number of eggs weighed. This daily egg weight should then be plotted against the standard. It is important to note that the graph scale should be large enough to make the daily variation clearly visible. In flocks receiving the correct amount of feed, egg weight will follow the target profile. It is normal for average egg weight to fluctuate on a daily basis due to sampling variation.

Female Body Weight Uniformity vs. Egg Weight Uniformity

In broiler breeder management, the term "uniformity" refers to managing the variability within a flock during both the rearing and laying periods. Uniformity is normally measured as % coefficient of variation (CV%) which expresses the standard deviation as a percentage of the mean. Unfortunately, many farm managers do not pay as much attention to flock uniformity in the laying period as they do during rear. Feed distribution, feeder space, feed clean-up time and physical feed quality are factors that play key roles in the management of flock uniformity, and should be reviewed to avoid a large amount of unevenness in birds during the laying period. Monitoring feed clean-up time and taking necessary action if it is too long, as well as ensuring the correct feeder space throughout production will help to maintain a good female body weight uniformity.

Broiler breeders should be weighed on a weekly basis throughout the life of the flock, with CV% being documented. According to the results of field data collected and analyzed by Aviagen, there is an indication of a correlation between female body weight uniformity and egg weight uniformity. However, weighing eggs on a daily basis only provides information on average flock egg weight and does not account for natural variation in individual egg sizes. Routinely and accurately monitoring egg weight CV% and comparing it to flock uniformity to obtain the relationship between the two, is a useful management tool. Egg weight CV% should be calculated once per week from the individual weights of eggs that were used in that days bulk weighing sample. To calculate egg weight CV%, the standard deviation of egg weight is divided by the average egg weight and multiplied by 100. The equation below shows an example of this calculation.

$$\text{CV\%} = \frac{\text{Egg Weight SD (g)}}{\text{Average Egg Weight (g)}} \times 100$$

For example a sample of eggs with a mean of 55g and standard deviation of 5.8g:

$$\text{Egg Weight CV\%} = \frac{5.8\text{g}}{55\text{g}} \times 100 = 10.54$$

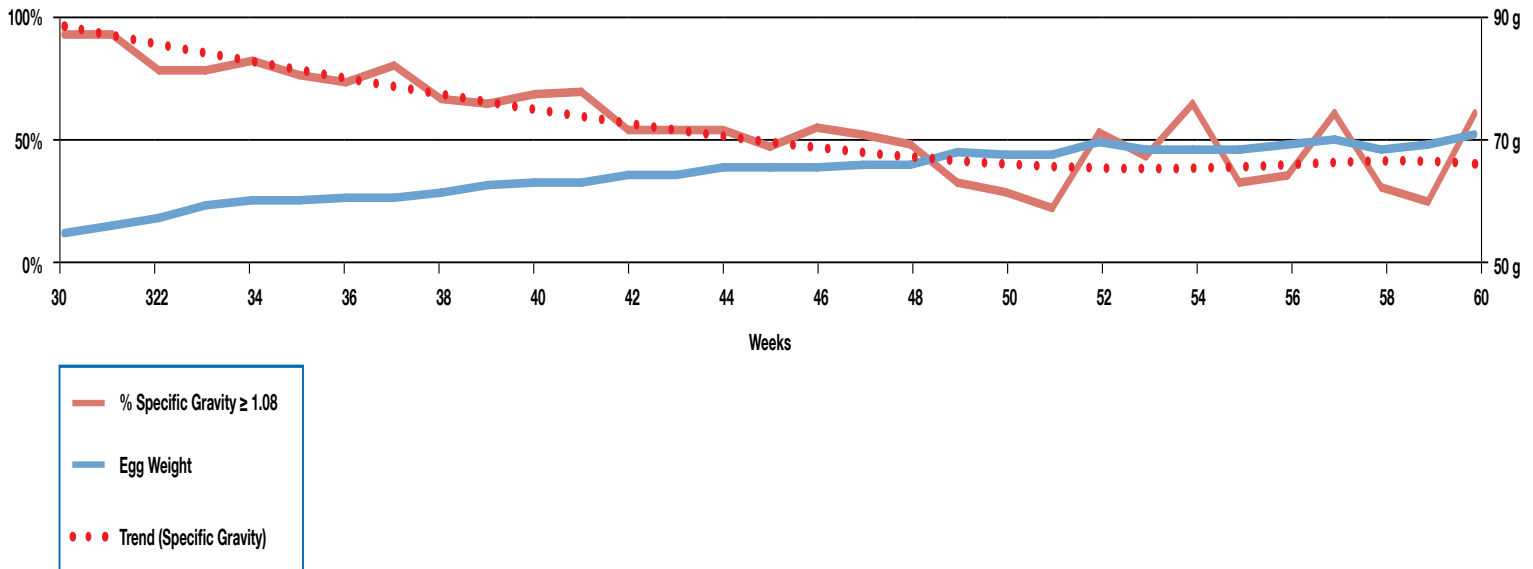
Standard deviation can be calculated using a scientific calculator or in Excel using the STDEV function.

A less uniform flock (CV% > 12) will produce a less uniform egg weight profile, potentially leading to an increase in the number of both small and large eggs, which will adversely affect hatching egg and chick output. This problem may exist throughout the production cycle if the flock is not uniform at the end of the rearing phase. Managing both the female uniformity and absolute egg weight is key to controlling late egg size.

Egg Weight and Hatchability

In the field, the most common method of shell quality measurement is specific gravity, which provides an indirect assessment of shell thickness. Ideally egg specific gravity should be greater than 1.08. Studies have shown that as birds' age and egg weight increases, there can be a decline in specific gravity (as shown in **Figure 1**).

Figure 1. Change in egg weight and the percentage of eggs with a specific gravity above 1.08 through the production cycle.



Egg Production, Female Body Weight and Persistency vs. Egg Size

There is a strong correlation between egg weight and female body weight, especially post-peak. Therefore controlling the rate of body weight gain during the production period will impact the rate of increase in egg size. Controlling excessive egg weight gain during the production period is not only required to regulate egg size, but also helps to maintain persistency in egg production.

The relationship between egg production and egg weight can be described as Egg Mass (Hen-day egg production (%) multiplied by Egg Weight (g) and divided by 100). The equation below shows an example of how to calculate Egg Mass.

$$\text{Egg Mass} = \frac{63.8\% \text{ Hen Week Egg Production} \times 68.5 \text{ g Egg Weight}}{100} = 43.7$$

Egg weight is managed by adjusting feed levels to control body weight and maintain production persistency of the flock. **Figures 2-5** show field examples of performance in terms of egg weight, female body weight, production level and egg mass. When a flock is at high production, the egg size is generally close to standard (**Figure 2**). However, even if a flock is at high production, egg weight can fall below the standard if body weight is too high (**Figure 3**). Larger than anticipated egg size issues emerge when egg production falls lower than standard and feed levels remain too high, particularly after 45 weeks of age. Examples of this are illustrated in **Figures 4 and 5**. Good egg production is not only dependent upon a good peak, but also on persistency post-peak. A more persistent flock does not only produce more hatching eggs, it generally produces eggs that are closer to the target in terms of weight and size, which will also have a positive impact on shell quality post-peak. However, this is strongly related to rearing uniformity and proper management techniques in both the rearing and laying period.

Figure 2. Egg weight on standard with high production and lower body weight.

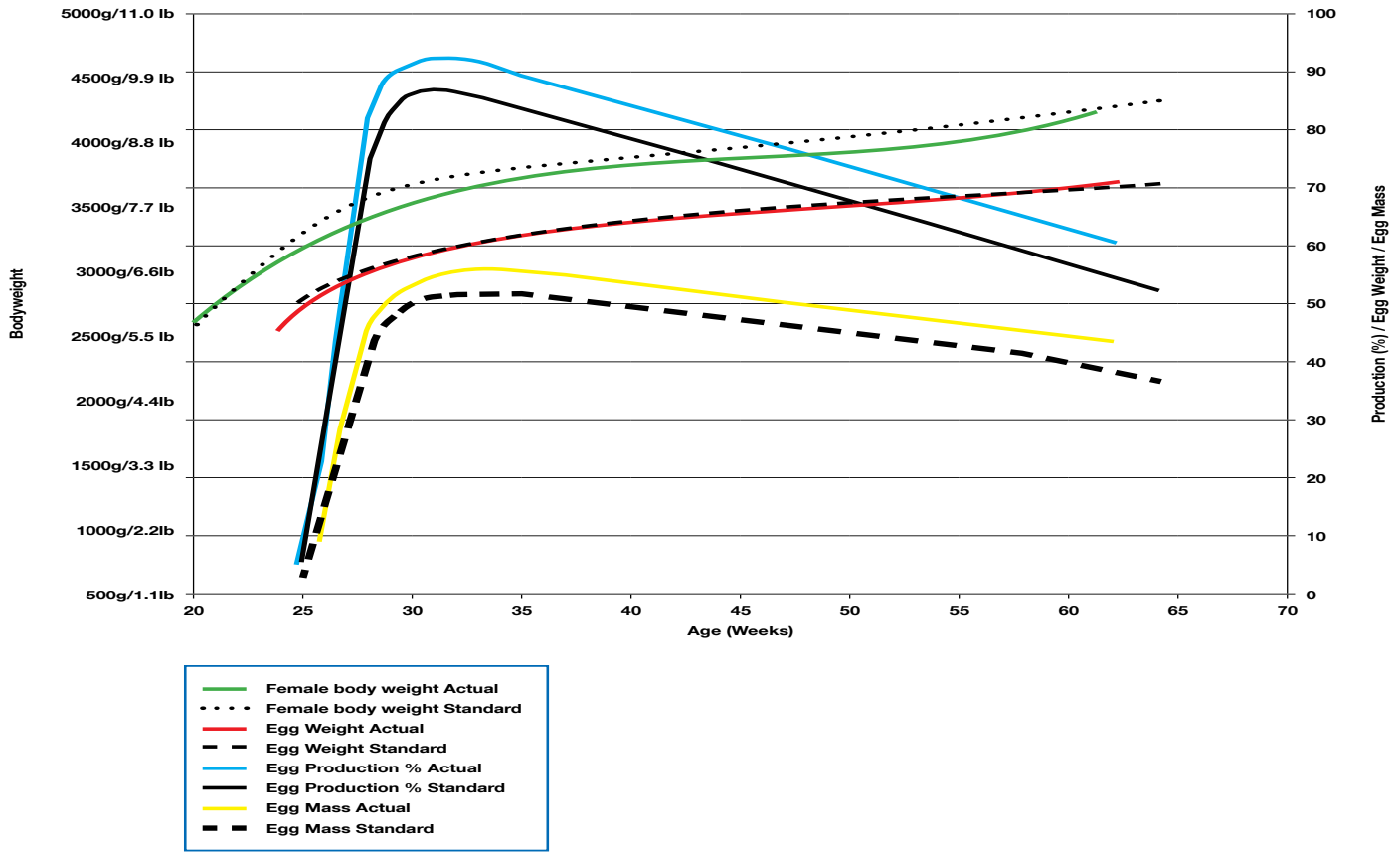


Figure 3. Egg weight below standard with high production and high body weight.

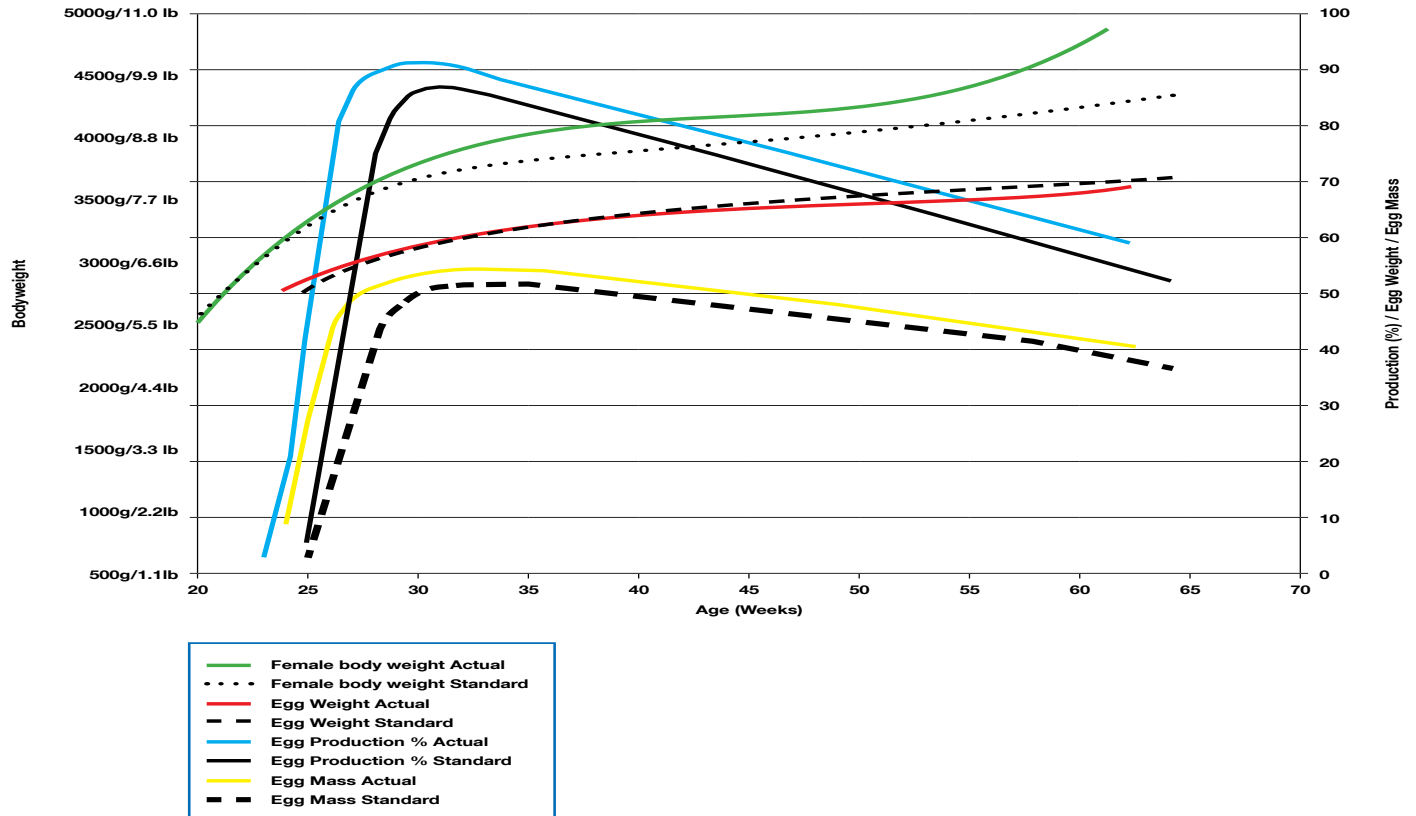


Figure 4. Egg weight over standard with low production and low body weight.

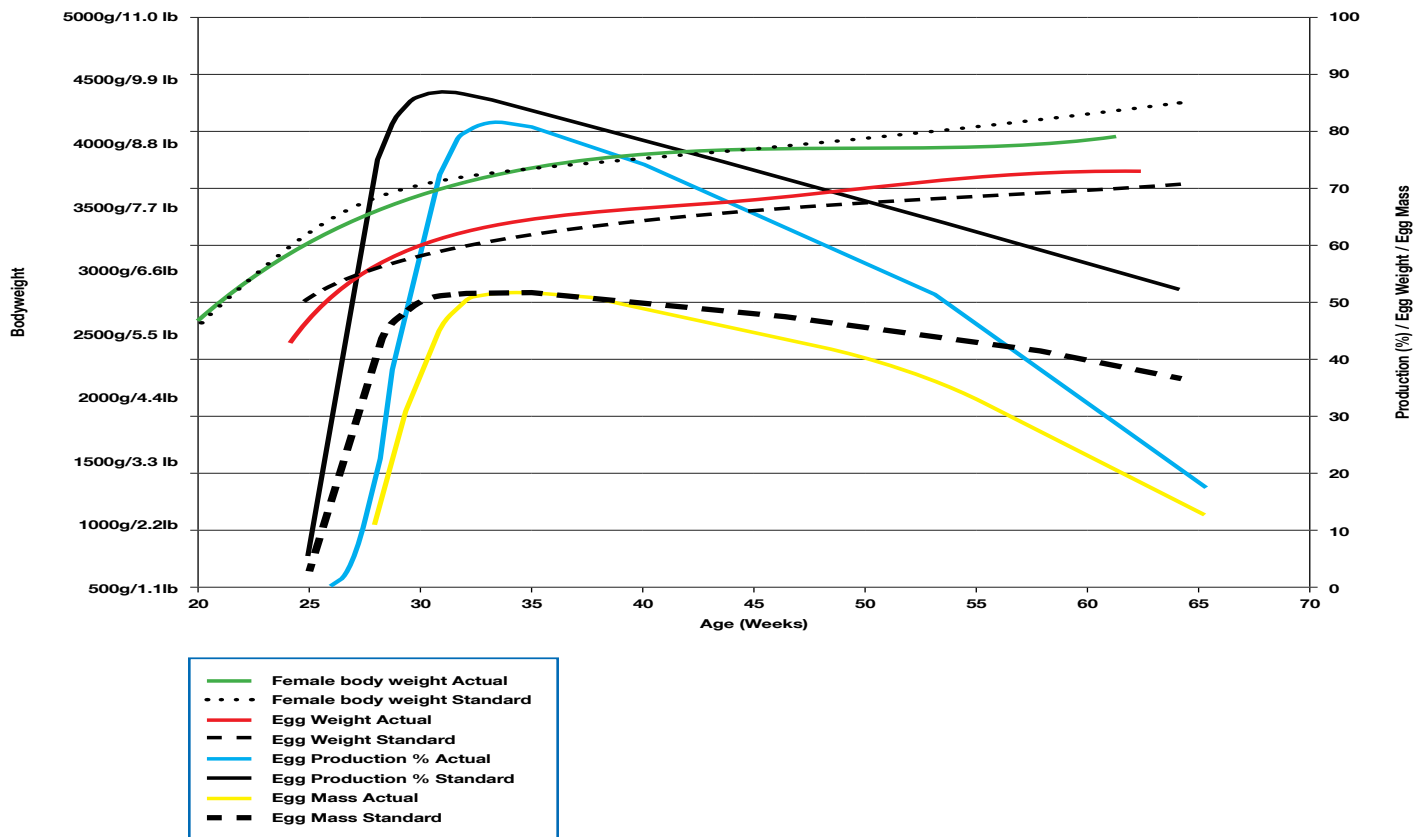
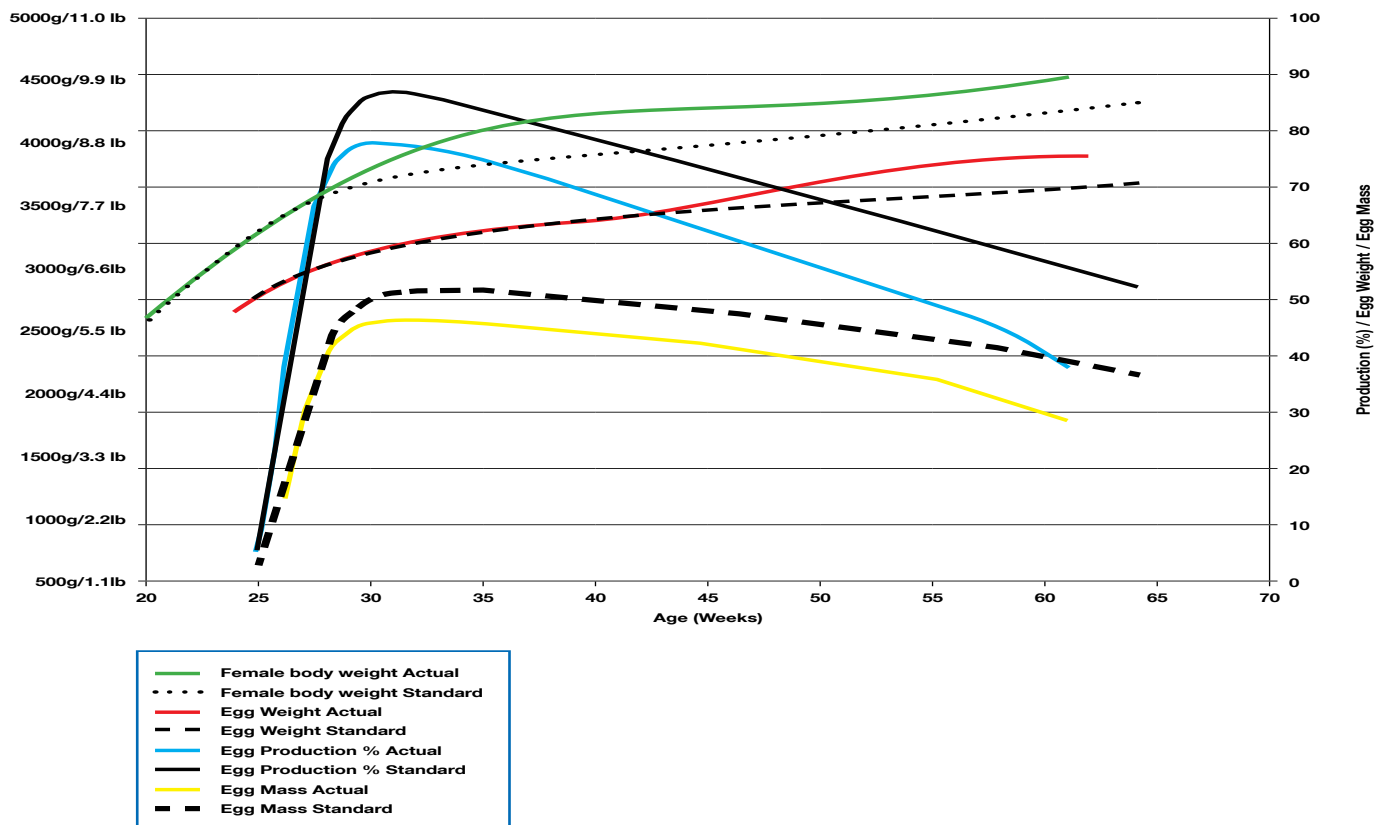


Figure 5. Egg weight over standard with low production and high body weight.

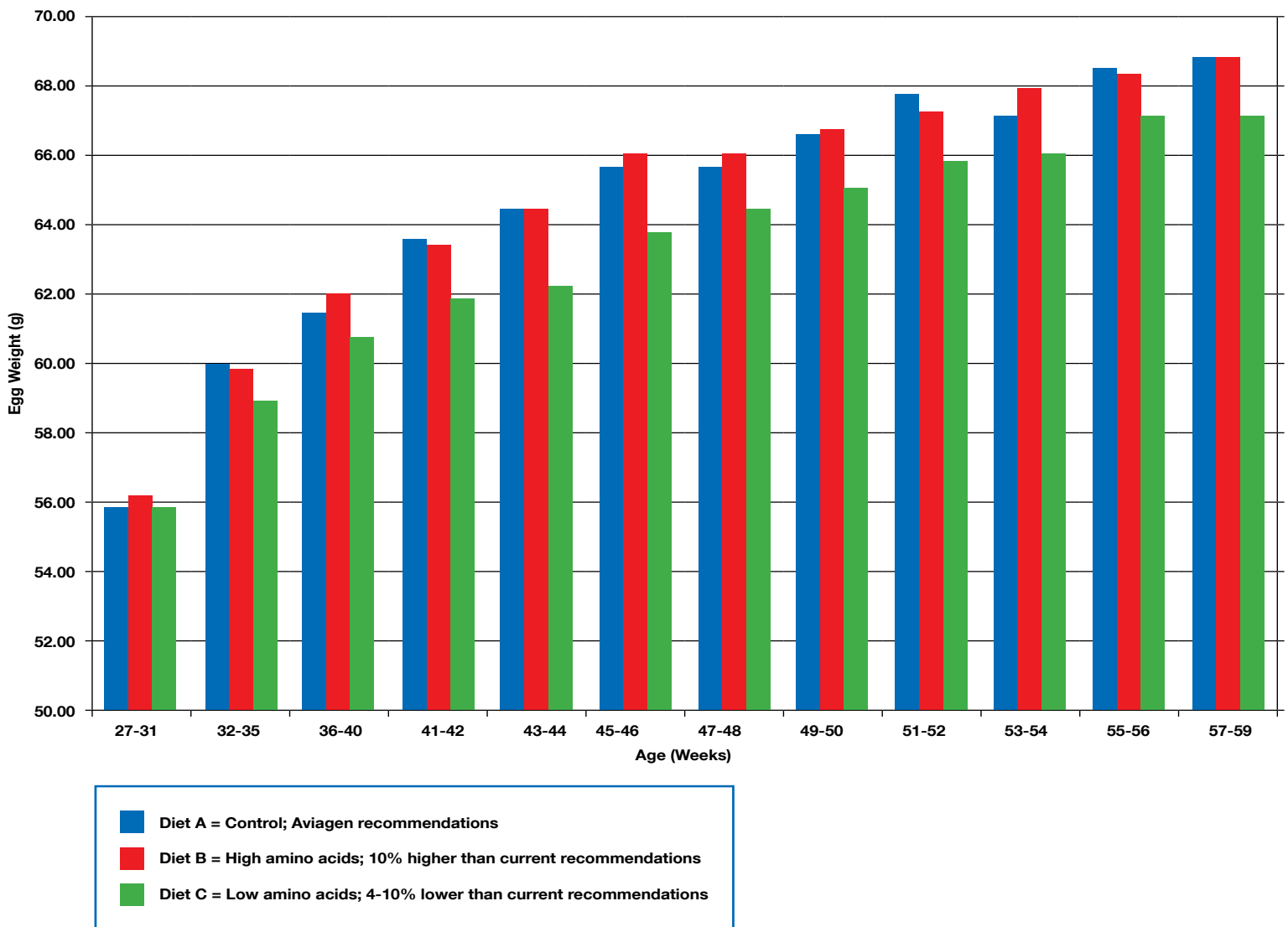


Nutrition

Trends in daily egg weight act as an indicator of whether or not the birds are receiving the proper nutrition to support egg production, body weight and egg size. Research with layer hens has shown that nutrient intake influences egg size, as nutrient levels shift from deficiency to adequacy. In broiler breeders more limited research and field observations have confirmed, to varying degrees, the effect of nutrient supply on egg size. Nutrient response is highly dependent on the production stage of the hen. During the early laying phase, altering the nutrient specification appears to have the greatest effect on egg size. During the late production stages, the challenge becomes not overfeeding nutrients that may impact egg size, directly or indirectly through their effect on female body weight. The key nutrients that have been shown to influence egg size include:

1. **Energy** - the most critical nutrient for egg production; daily energy intakes different from Aviagen recommendations will affect egg size.
2. **Linoleic acid level** - influences egg size through its role in lipoprotein synthesis; levels above 1.25% have not been shown to further increase egg mass.
3. **Dietary amino acids** - levels have been shown to have an effect on egg size (Figure 6). Researchers have associated the effect on egg weight to dietary methionine and cystine levels.

Figure 6. The effect of dietary amino acid levels on egg weight.



Summary

It is essential to focus on consistent management techniques to achieve the highest possible number of fertile hatching eggs per hen housed to produce the maximum number of quality chicks. Poor egg shell quality, particularly due to excessive egg size late in production, will negatively impact hatchability and chick yield. Increases in female body weight above the standard will cause an increase in late egg size. It is, however, possible to manage this with effective techniques such as strict control of body weight during rear, adjusting the optimal amount of peak feed and proper post-peak feed withdrawal time and amount. Flocks with poor persistency tend to exhibit a late egg size issue. Because of this, it is important to understand and manage female persistency to help increase the number of hatching eggs while avoiding large eggs post-peak.

Highly variable flocks in lay will lead to a variable peak production and a greater percentage of oversized eggs. To manage this, egg related parameters such as egg weight should be measured daily, while egg weight CV% and body weight CV% should be measured on a weekly basis. This will provide trends within the farm or company and improve the ability to intervene in time to control late egg size.

A balanced ration is fundamental throughout the life of the flock; however, during the early laying phase inappropriate dietary nutrient levels appear to have the biggest effect on egg size. During the late production stages, not overfeeding nutrients becomes a challenge that will either directly or indirectly impact egg size. When formulating diets to help control late egg size, particular attention should be paid to energy, linoleic acid level and dietary amino acid levels (methionine and cystine).

Controlling late egg size is seen as a challenge; however, by implementing the strategies highlighted in this article it is possible to continue to achieve excellent hatching egg output by controlling egg size.

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