



## Broiler Chick Quality And Scoring Methods

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**Abstract:** The day old chick quality has a great importance for hatcheries and also broiler producers. It is an indicator of hatchery success and assurance of broiler productivity. Chick quality is affected by a number of factors from the time of fertilization to placement time at broiler houses. Generally, these factors are classified as pre-incubation and incubation factors. These factors affects embryo development and chick quality, and in this way post-hatch broiler performance. Day old chick quality is assessed by considering some parameters as colour, vitality, navel quality, yolk uptake, leg confirmation, well formed beak, chick hatching weight, yolk free body weight and chick length. While some of these parameters are qualitative, others are quantitative characteristics of chicks. Because of assessing of qualitative parameters, some scoring systems have been developed to convert these factors into a quantitative score. For this reason, visual scoring, Tona or Pasgar score, day old chick weight, yolk free body weight and chick length are used largely for measurement chick quality. In this review, definition of the day old chick quality, effecting factors and also scoring methods are explained.

**Key Words:** Broiler, Chick quality, Incubation, Chick weight, Tona.

### Broiler Cıvciv Kalitesi ve Skorlama Yöntemleri

**Özet:** Etlik cıvcivlerde bir günlük yaştaki cıvciv kalitesi hem kuluçkahaneler hem de broiler yetiştiricileri açısından büyük önem taşımaktadır. Cıvciv kalitesi kuluçkahanelerin başarı göstergesi ve broiler yetiştiriciliğinde verimliliğin ön koşuludur. Cıvciv kalitesi, döllenme anından başlayarak cıvcivlerin kümeslere yerleştirilme anına kadar birçok faktörden etkilenmektedir. Genel olarak, bu faktörler kuluçka öncesi faktörler ve kuluçka koşulları olarak gruplandırılmaktadır. Bu faktörler embriyo gelişimi, cıvciv kalitesi ve dolayısıyla çıkış sonrası broiler performansını etkilemektedir. Cıvciv kalitesi, renk, canlılık, göbek kalitesi, sarı kesesi emilimi, bacak konformasyonu, gaga şekli, cıvciv çıkış ağırlığı, sarı kesesiz cıvciv ağırlığı, cıvciv uzunluğu gibi bazı parametrelerin dikkate alınmasıyla değerlendirilmektedir. Bu parametrelerden bazıları cıvcivlerin kalitatif, bazıları ise kantitatif özelliklerdir. Bu yüzden, cıvciv kalitesinin ölçülmesi için görsel skorlama, Tona yada Pasgar skoru, cıvciv çıkış ağırlığının değerlendirilmesi, sarı kesesiz cıvciv ağırlığının belirlenmesi, cıvciv uzunluğunun ölçülmesi gibi bazı skorlama yöntemleri geliştirilmiştir. Bu derlemede, cıvciv

kalitesinin tanımı, civciv kalitesini etkileyen faktörler ve kullanılan skorlama yöntemleri açıklanmıştır.

**Anahtar Sözcükler:** Broiler, Cıvcıv kalitesi, Kuluçka, Cıvcıv ağırlığı, Tona.

## **Introduction**

The day old chick quality is an important criteria for hatchery success and also profitability of broiler producers. In hatcheries, the essential goal is to maximize hatchability with a great number of high quality, saleable chicks that are demanded by broiler producers for their high viability and performance (Decuypere and Bruggeman, 2007).

The day old chick quality is determined by procedures from egg handling to chick hatching. The affecting factors are classified as pre-incubation factors and incubation conditions. While pre-incubation factors include egg breeder age, strain, health, hatching eggs quality, egg handling and storage; incubation conditions include incubation temperature, humidity, ventilation and turning (Deeming et al., 1996; Christensen et al., 2001; Peebles et al., 2001; Tona et al., 2003; Decuypere and Bruggeman, 2007). For example, broiler breeder age affects egg weight and in this way one day old chick weight, length and the incidence of worse quality chick (Hill, 2001; Tona et al., 2001; Boerjan, 2002; Tona et al., 2004).

It was found that there is a crucial hinge between chick quality and broiler performance. So chick quality is determined by quantitative and qualitative scoring considering various numerical or observation quality criterias in hatcheries (Decuypere and Bruggeman, 2007). Some of chick quality parameters are hatching chick weight, body length, leg and toe length, chick appearance, vitality, alertness, navel condition etc. (Tona et al., 2004a; Willemsen et al., 2008). Some various scoring systems are developed considering different quantitative and qualitative parameters by researchers, like Tona score or Pasgar score (Boerjan, 2002; Tona et al., 2003).

## **Pre-Incubation Factors Affecting Day Old Chick Quality**

The day old chick quality depends on firstly broiler breeders age, due to changings in hatching egg weight and also egg quality characteristics. It is reported that as broiler breeders get older, egg weight increases (Roque and Soares, 1994), shell thickness decreases (Peebles et al., 2000), and proportion of yolk increases (Suarez et al., 1997). Hatching eggs obtained from younger breeders have better albumen quality and thicker shell. The chicks hatched from these eggs have a higher percentage of better quality one day old chicks (Tona et al., 2004a). Old breeder flocks produce a greater number of heavier chicks due to increasing of egg weight (Suarez et al., 1997; O'Dea et al., 2004). On the other hand, the percentage of subnormal quality chick increases in older broiler breeder flocks (Tona et al., 2001; Boerjan, 2002; Tona et al., 2004a).

The other factor is egg handling and storage time and conditions. Eggs can be stored for a week without a significant reduction in hatchability. When eggs are stored more than a week, embryonic abnormalities and mortalities can increase. Also in longer storage times,

hatchability and chick hatching weight decreases, hatching time delays and also albumen characteristics, albumen/yolk ratio becomes worse (Tona et al., 2004a; Decuyper and Bruggeman, 2007).

## **Incubation Factors Affecting Day Old Chick Quality**

Incubation factors such as temperature, humidity, turning and ventilation influence day old chick quality in the way of chick hatching weight, body length, activity, yolk sac uptake, navel closure and also posthatch performance (Meijerhof, 2003; Willemsen et al., 2008). Poor incubation conditions result in an increased embryo mortality, poor embryo development, lower hatchability and also worse broiler performance (Meijerhof, 2003).

Optimum incubation temperatures is one of the most important factors to assure optimum embryo development, successful hatching process and it is also important for posthatch performance (Lourens, 2003; Willemsen et al., 2008). Lourens et al. (2005) concluded that in the case of the eggshell temperature was maintained at 37.8 °C during incubation period, higher embryo development, hatching and also posthatch performance were achieved. Fluctuations in eggshell temperature causes negative impacts on organs development, embryo growth and chick quality. It results in major economic losses due to negative effects on posthatch performance and slaughter yield (Wilson, 1991; Shafey, 2004).

Incubation humidity has significant effects on embryo development and chick quality (Preez, 2007). The optimum range of humidity is between 40-70% (Lundy, 1969, Preez, 2007). Deeming (2000) reported that lower humidity results in smaller, dehydrated and sticky chicks while higher humidity causes larger, weaker and sometimes sticky chicks. The other problem is unhealed navels in the case of high humidity during incubation (Preez, 2007). During the incubation process, optimum egg weight loss should be approximately 10-14% of initial egg weight (Ar and Rahn, 1980).

Ventilation is essential to exchange oxygen, carbon dioxide and to prevent excessive heat production by embryo during incubation. In setter or hatcher, lower levels of oxygen and higher levels carbon dioxide because of inadequate ventilation can result in fluid accumulation around embryo (Deeming, 2000). The acceptable range of carbon dioxide level in multi-stage incubators should be 0.1-0.4%, but in hatchers 0.5-0.8% level of carbon dioxide is restrictive for chicks survival rate (Decuyper et al., 2001).

Deeming (1989) reported that turning of eggs is essential in point of correct development of extra embryonic membranes. The lack of turning causes embryo adhesion to inner shell membrane, embryonic malpositions, retarded growth of the area vasculosa, decreased utilisation of albumen and yolk, a deficiency of sub-embryonic fluid and decreased oxygen exchange. In addition to these, absence of turning results in lower hatchability, and those chicks often hatch late and clammy (Deeming, 2000).

## **Chick Quality Scoring Methods**

The one day old chick of good quality can be defined as clean, dry, without dirt, contamination and deformities, with bright and clear eyes, clean and completely sealed navel area (Deeming, 2000; Decuyper et al., 2001). Any yolk sac or dried membrane

should protrude from the navel, and any signs of respiratory diseases should be observed (Preez, 2007). The whole body and legs should have normal confirmation, there should be no swelling or lesions on hock, or skin. The beak and toes should be well formed, firm and straight. It should be alert, active and interested in its environment, responding to sounds (Tona et al., 2005).

While measuring the colour, development, navel quality and vitality of the day old chick are subjective and qualitative methods; chick weight, chick length, toe length etc. are objective and quantitative methods. The general visual score is considered in the qualitative method (Deeming, 2000; Meijerhof, 2005). For example, colour is one of the most important parameters, i.e., a clear and deep yellow colour is better than pale and light yellow. Closure of navel is critical for minimizing the risk of *E.coli* infection and mortality (Preez, 2007). The other qualitative parameters are cleanliness, dryness, free from deformities, dirt and contamination, bright eyes, sealed and clean navels, no yolk sac or dried membranes around of navel. Additionally, there are no skin lesions or deformity. Chicks have a good conformation of legs and well formed beak and toes (Decuyper and Bruggeman, 2007).

In hatcheries, defining quality of chicks based on subjective parameters requires experience and also it is difficult to repeat. For this reason, some quantitative scoring systems were developed to quantify chick quality considering objective measurements (Raghavan, 1999; Deeming, 2000; Boerjan, 2002; Tona et al., 2003). With these scoring methods, the one day old chick quality can be measured and predicted the growth potential of the chicks.

It was reported that there are four quantitative methods for scoring chick quality; Tona or Pasgar score, measuring the one day old chick weight, measuring yolk free chick weight and measuring chick length (Meijerhof, 2009).

The first scoring method is Tona or Pasgar score that uses a standardized scoring system with some criterias considering viability, yolk sac uptake, closure of navel, ability of the chick recovering after being placed on its back (Preez, 2007). These scoring methods transfer qualitative parameters into quantitative score (Boerjan, 2002; Tona et al., 2003). Tona method is an assessing system with a total score between 0-100 based on a wide range of parameters (Willemsen et al., 2008). According to this system, the chicks are classified into different qualities to scores and the score of “100” means that high quality chicks.

The second method, considers the one day old chick weight. This measurement should be easily applied and repeated (Deeming, 2000; Decuyper et al., 2002). But in recent times, there has been an argument about if chick hatching weight is really a indicator for chick development, because chick hatching weight is correlated to egg setting weight. Since 1950, it has been reported that there is a significant correlation between egg initial weight and chick hatching weight (Wiley, 1950). It is desired that there is a relationship between the one day old chick weight and slaughter weight. Whereas Powell and Bowman (1964), Proudfoot and Hulan, (1981), Sklan et al., (2003) found a positive relationship; Gardiner (1973); Shanawany (1987), Wolanski et al. (2003), Tona et al. (2004b) found any relationship between two parameters.

In the third method, yolk free body weight is used for correcting egg setting weight. The third method is better than second method, because chick hatching weight includes actual chick weight and also remaining yolk sac weight. This method demonstrates that

how much of egg content converted into embryo, it is more reliable indicator of chick quality (Meijerhof, 2009). At around of 19<sup>th</sup> day of incubation, yolk sac starts to be absorbed by embryo's body cavity. At hatching time, yolk sac should be fully absorbed and the skin of navel completely closed (Meijerhof, 2009). However, opposite of this is possible in large scale hatcheries. If yolk sac absorption is incomplete, the navel closed with scab without yolk sac protruding is called navel button and leakage of liquid is called leaky navel. These problems result in lower body weight at slaughter age (Fasenko and O'Dea, 2008). Also as a result of these navel problems, incidence of yolk sac infections known as omphalitis and posthatch first week mortality shows an increase (Meijerhof, 2009).

The last scoring method considers chick length that is measured from tip of the beak to the middle toe. Also this method is more reliable than the second one. Some researchers found a positive correlation between chick length and body weight at 42-day of age (Hill, 2001; Meijerhof, 2006; Molenaar et al., 2008). It is also emphasized that chick length is an indicator for chick quality and can be measured quickly (Deeming, 2005; Wolanski et al., 2006). Wolanski et al. (2006) found a correlation between chick hatching length and chick hatching weight. Molenaar et al. (2008) found that an increase in chick length in male broilers obtained from same egg size on hatching day resulted in an increasing of body weight.

## Conclusions

In conclusion, the one day old chick quality can be measured with various scoring methods to predict broiler performance under commercial conditions. There are many affecting factors of chick quality classified as pre-incubation factors and incubation conditions. Knowing all of these factors by hatcheries is too important to obtain higher percentage of the best quality one day old chicks. Because hatcheries are paid based on the number of saleable chicks. Also the best quality of chick is desired by broiler production for their better growth performance. Therefore, defining chick quality parameters and determining relationship between these parameters and posthatch performance should be searched in details.

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