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MORTALITY OF LAYING HENS AND BROILERS UNDER DIFFERENT REARING SYSTEMS*

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SUMMARY: Poultry farming under free range alternative production systems has shown an increasing tendency in recent years. In contrast to conventional facilities where all production parameters are controlled by the producer, one of the major constraints identified in free range systems is the inability to control range-related production factors. Free range involves birds living outdoors for a large part of the day with plenty of fresh air, sunshine and open space to roam in, which can promote their health and welfare. However, free range birds may come into contact with adverse factors such as parasites, predators and disease vectors that can contribute to mortality as one of major production parameters in poultry farming. The objective of this study was to report findings of a number of studies to point to differences in mortality rate between conventional birds and birds kept under alternative rearing systems, and identify the most common causes of mortality.

Key words: mortality, free range, broilers, laying hens

Introduction

In conventional egg and poultry meat production, the effect of environmental factors is either very low or absent due to the fact that all parameters that may adversely affect production (diet, temperature, humidity, light regimen) are controlled by the producer. In addition, a high level of biosecurity is relatively easy to achieve under these systems [6]. In contrast, alternative poultry production systems may experience problems with disease vectors and parasites due to a close contact between poultry and feces, parasites and wild birds as vectors of diseases [34]. Outdoor runs may impose increased welfare risks associated with an increased contact with infectious agents, greater difficulties to maintain good hygienic standards, possibly imbalanced diets and predation threats [19]. The major cause of mortality in these systems is a high rate of exposure to diseases and parasites under outdoor conditions, with missing mortality due to predation being recognised as a separate problem [31]. Some of the main reasons for moving poultry production into indoor production facilities include diseases, parasites and predator attacks [8]. This problem has been particularly challenging in recent years as alternative poultry production systems have gained increasing importance. There are still many factors that threaten and constrain this production (avian influenza virus, Pasturella and many other parasites, predators, feather pecking and cannibalism). The objective of this paper is to report findings of a number of studies to point to differences in mortality rate between conventional birds and birds produced under an alternative system, and identify the most common causes of mortality.

Mortality of laying hens

When analysing mortality as an important parameter in poultry production, overall conditions in both the barn and free range environment must be considered, since many events and unfavourable conditions can cause bird death [4]. Layer mortality is caused by a number of factors, such as early rearing conditions, farm management during the laying period, and choice of layer strains [36]. Newcastle Disease is believed to one of the most important disease in free-range systems. During outbreaks of the disease up to 80% of the population may die [24].

Under all rearing systems, birds can develop pathological behaviour such as feather pecking and cannibalism, which are among major causal agents of mortality in laying hens. Blokhuis et al. (2007) investigated different layer housing systems and found one-third of all mortality cases to be caused by feather pecking and cannibalism, whereas Weitzenburger et al. (2005) reported that cannibalism accounted for as much as 65.5% of mortality of laying hens housed in a variety of furnished cages. Sparks et al. (2008) surveyed British certified organic pullet producers and found annual mortality to range from <2% to > 7%. Most producers reported a mortality rate of less than 5%. Causes of mortality included smothering, non-specific diseases, unknown cause and predation, with smothering and cannibalism accounting for the highest and lowest percentage (25% and 6.2%) of all mortality, respectively. In Denmark, Van de Weerd et al. (2009) identified layer mortality of about 10% in free range systems, and 9.0% and 11.9%

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for brown-feathered laying hens and 8.6% and 6.8% for white-feathered laying hens under organic system in 2004-2005. Oden et al. (2002) found that rearing white-feathered genotypes can lead to reduced layer mortality due to their lower susceptibility to feather pecking and cannibalism as primary causes of mortality. However, Van de Weerd et al. (2009) recommended rather the contrary – breeding non-white genotypes for free range systems in order to be less conspicuous to predators as major causative agents of layer mortality. The most common predators listed by Henry (2002) include eagles, raccoons and foxes. Gayer et al. (2004) on six German free-range farms calculated that predation losses within one laying period ranged from 0.8% to 12.5% (96 to 445 hens) per farm. The economic significance of predation for the farmer will largely depend on the size of his flock, with larger flocks being proportionally less affected than smaller ones.

Croxall and Elson (2007) compared mortality under different rearing systems on a range of farms in Great Britain, The Netherlands and Germany. The lowest mean cumulative mortality during the laying period occurred in furnished cages (3%) and the highest in free range flocks (14%).

Mostert et al. (1995) reported considerably higher mortality in birds reared under floor and free range systems than in caged hens. Senčić and Butko (2007) found Lohman Brown layers to have higher mortality under free range system (6.8%) than in cages (5.5%). In their study conducted from 2001-2004, Fossum et al. (2009) in Sweden showed a significantly higher occurrence of bacterial and parasitic diseases and cannibalism in laying hens kept in litter-based housing systems and free-range systems than in hens kept in cages. The occurrence of viral diseases was significantly higher in indoor litter-based housing systems than in cages. The same authors suggested that to increase the safety of the egg production in litter-based housing systems and free-range systems it is necessary to pay much attention to management and preventive measures, such as biosecurity and vaccinations. Anderson (2010) also found higher mortality in Hy-Line laying hens reared in free range system (28.4%) than in hens kept in conventional system (8.9%).

In contrast, some researchers reported lower mortality in free range systems than in indoor production systems, the reason being higher comfort and increased bird resistance attained through the daily availability of sunlight and fresh air. Ferrante et al. (2009) observed considerably lower mortality in Hy-Line hybrids reared under free range system (2.43%) than under barn system (4.24%). In a study by Mugnai et al. (2009), lower mortality occurred in Ancona laying hens kept under organic (2.4%) and organic plus (1.8%) systems, compared to conventional birds (4.15%). The large impact of farm conditions on mortality was also confirmed by Hegelund et al. (2006) who studied 18 different organic farms with mortality ranging from 8.6% to 62.3% (average mortality: 22.5%). The majority of mortality cases were caused by Pasturella and predator attacks. Yakubu et al. (2007) reported a lower weekly mortality rate for caged Bovans Brown and Lohman Brown laying hens (0.68%) than for hens on deep litter (1.10%).

In Sweden, housing systems for poultry have been assessed since the 1990s, with mortality rate used as a parameter to evaluate new housing systems for poultry (non-cage systems only). This evaluation system defines "normal" mortality in rather general terms, if mortality during the full production cycle is higher than 9%, it is considered higher than the limit set for healthy commercial profitable poultry [36].

Broiler mortality

Mortality of broilers in barn systems can occur due to a range of factors, including low temperatures in early days of life, high temperatures at later stages, water and feed supply problems, inadequate stocking density [30], [14]. Free range can also pose an increased risk of death to a large number of birds due to specific problems, such as diseases, parasites, predators.

Hegelund et al. (2006) observed that predation in organic systems in Denmark accounted for 6.4% of all mortality, which suggests the need to give large attention to this problem. As indicated in the section on laying hens, a possible way to reduce predation in this system is to breed non-white genotypes to be less conspicuous to predators [36]. Moreover, broiler behaviour itself – broilers flocking out of the house after a rain shower to drink from puddles - can cause a high rate of mortality due to the risk of transmission of diverse infectious diseases [13, 17]. Another reason for the high rate of mortality in free range systems is the use of conventional genotypes with a daily gain of up to above 60 g, which coupled with postponed slaughtering age leads to very high body weights and intense growth that place great stress on broiler cardiovascular and locomotor systems [2, 27]. Julian (2004) reported mortality due to a sudden heart attack of 2-4% in male broilers - "matabolic disorders". Another major cause for broiler mortality is temperature [33, 35] which is almost impossible to control under non-commercial systems. Połowiez and Doktor (2011) observed no mortality cases in non-free range birds, whereas mortality in free range flocks was 4.17%. Phelps (1991) reported mortality of 15% in free range systems, and 4% in non-free range system. Duralli et al. (2012) studied mortality in 5 weeks' old broilers and observed mortality of 5.3% and only 2.9% in free range and conventional birds, respectively. Filho et al. (2003) found no significant difference in the rate of mortality between broilers reared under intensive and semi-intensive systems. Conversely, Lima et al. (2005) observed mortality of 1.34% under free range system, and as much as 5.32% under non-free range system. However, given the fact that these results were obtained on different farms using different hybrids, they must not be taken for granted; still, they make a considerable contribution to the suggestion that farm conditions have a crucial effect on the rate of mortality in chickens.

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