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Mortality of Laying Hens in Two Municipalities of Camagüey during the 2011-2015 Period

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ABSTRACT

This research took place at the National Poultry Company (UECAN), in Camagüey. The aim of the study was to assess the mortality causes in three layer farms of the company in the municipalities of Camagüey and Minas, in the 2011-2015 period. The mortality control records were reviewed. The items checked corresponded to number of deaths, causes, etiology-related, and year. The death causes were pooled depending on the diseases (colibacillosis, salmonellosis, infectious coryza, mycoplasmosis, and coccidiosis); the noxae caused by undernourishment, animals eaten by rats, accidents, prolapse, cannibalism, and pecking were also among the causes of deaths by mismanagement. It was concluded that the causes of mortality due to mismanagement, prolapse, cannibalism, and pecking, were the highest. The diseases represented the highest noxae causes. The differences between the causes of disease-related deaths and the evidence of mismanagement in the province were striking. The municipality of Camagüey showed higher mortality rates than Minas.

KEY WORDS:/ laying hens, causes of mortality, mortality.

INTRODUCCION

Today, the population of the planet is approximately 6 billion inhabitants, with the addition of 95 million more each year. The UN has estimated that the population of the earth might exceed 10 billion in the coming years (9.4 billion by 2050, and 11.2 billion by 2100) (Dugarte, 2000).

The number of undernourished people in 2010 was 925 million, almost 16% of the population living in developing countries. The fact that almost 1 billion people are still undernourished in spite of the recently-gone food and financial crises, lead to a deeper, more structural problem that threatens the capacity to meet the goals of the millennium to reduce starvation, as part of international agreements, the First Goal of Development of the Millennium (GDM) and the Goal of the World Food Summit (WFS), in 1996 (Windhorst, 2007; FAO, 2010).

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Thanks to advances in genetics, nutrition, and husbandry, according to the National Learning Service, SENA (2013), poultry is growing fast worldwide, with a better supply of eggs (one of the most nutritious foods) for human consumption.

The commercial egg is a complete source of nutrition, providing energy, amino acids, and vitamins. The quality of this biological product may be affected by different factors, such as nutrition, age of chicks, management, genetic line, and sanitary issues (Carvalho *et al.* 2013).

Glatz (2014) said that the estimated daily protein intake per inhabitant ought to be 98 g, of which 61% should come from animals.

During summer, the largest part of the year in tropical regions, the climatic conditions lead to a dramatic reduction of egg yields, as well as increased mortality of many hens. The climatic factors, like maximum and minimum temperatures, and relative humidity, should be considered in open house systems with uncontrolled environmental conditions. It might even be considered that the greatest adverse effect is caused by high humidity, since laying hens have demonstrated that they can be better managed and therefore, increase efficiency, even at high temperatures, if relative humidity is within the permissible ranges or below 50% (Zumbado, 2003).

Studies done by Zumbado (2003) concluded that laying hens reduce 1.5% food consumption (approximately 1.5 g/day) per every 1 °C increase between 10 °C and 35 °C, causing a dramatic impact (−2.5 to −4 g/day), when the increase is 1 °C above 35 °C. The effects of heat-related stress were summarized, namely, a reduction in the intake and metabolism of nutrients, especially amino acids, vitamins, and fatty acids. Bone calcification was inhibited, posture and egg weight were reduced, immunosuppression occurred, and a higher incidence of fatty liver was observed, all of which can bring health issues to the flock.

In developing countries like Cuba, poultry breeding is a way to increase and improve the diet, since birds are short-cycle animals with fast reproduction and elevated energy efficiency in their production. Besides genetic selection, highly developed management practices, and the fight against all mortality-inducing factors, have made poultry production more efficient (Endara & Piray, 2016).

In Cuba, industrial poultry farming is organized through an integrated network of companies under the name *Combinado Avícola Nacional* (National Poultry Combine), founded to ensure a quick and safe way to provide more protein to the Cuban diet. It has been the fastest-growing livestock activity in recent years in the country. All its plans and projects are designed to meet the government's strategy to cut down on imports (Ramírez, 2014).

Sánchez (2014) noted that producing for the people over half a century has been a difficult undertaking by Cuban poultry farmers, in face of one of the toughest challenges: national self-supply of foods.

Poultry farming in Camagüey has shown, among the prioritized programs, the fastest recovery from the severe impact of hurricanes, nearing production indicators from before these the occurrence of these disasters (Rodríguez, 2009).

Mortality of animal population is the total of dead animals from natural causes and sacrificed (normal or urgent), as well as those sacrificed due to veterinary reasons (Mejía & López, 2011).

A way to minimize these challenges is through biosafety, a practice devised to prevent the outbreaks of diseases on the farms (UECAN, 2009).

Mortality due to mismanagement is the most frequent one; other causes are drowning, stunting, rejected birds, accidents, prolapse, cannibalism, and pecking (Dottavio & Di Masso, 2010). This responds to the vital space, management, and strict accomplishment of hygiene and sanitary measures, along with proper debeaking. All this contributes to a reduction in deaths during raising and the prevention of prolapse, fights, and feather pecking among birds (Sánchez *et al.*, 2004).

Accordingly, the aim of this paper was to assess the causes of mortality in layer farms of the National Poultry Company in two municipalities of the province of Camagüey, in the 2011-2015 period.

MATERIALS AND METHODS

This research was conducted at the National Poultry Company in Camagüey, National Poultry Combine (UECAN), at 54 Avellaneda Street, Camagüey. The layer farms included in the study were 16, 18, and 19, in the municipality of Camagüey, and 22, 25, and 26 in the municipality of Minas. All the layer farms. Records and technical documents of mortality control of every farm during the 2011-2015 period were consulted (UECAN, 2011, 2012, 2013, 2014, 2015). The number of deaths, causes, etiology, year, and farms, were analyzed. The death causes were pooled according to the diseases (colibacillosis, salmonellosis, infectious coryza, mycoplasmosis, and coccidiosis). Food shortage, animals eaten by rats, accidents, prolapse, cannibalism, and pecking were considered mismanagement practices, and were excluded from the pool. The data were processed by IBM SPSS, version 23.0. (2016). Analysis was made of variables number of dead animals, death cause, and experimental farms. A normality test and ANOVA were performed, considering the farm as factor. The dependent variables included were number of dead animals and the causes of death; Tukey's multiple comparison test was performed to determine the difference among the means. The personnel was consulted, especially veterinary department staff.

RESULTS AND DISCUSSION

Table 1 shows that farms 18, 22, 25, and 26 did not have any significant differences from farms 16 and 19, which, in turn, did show differences between them.

The five-year study reported a mean of 541.04 dead animals (19.96% mortality). Consequently, the data did not coincide with De Armas (2009), who reported a mortality mean of 113.25 (3.41%) in the 2005-2008 period, in the province of Camagüey.

Table 1. Number of dead animals by farm

Municipality	Number of dead animals on poultry farms		
	16	18	19
Camagüey	675.75[b] ±63.019	236.64[a] ±24.87	1363.18[c] ± 1 121.97
Minas	22	25	26
	286.89[a]±23.05	443.62[a]±411.12	240.21[a]±30.04

Note: Unequal letters differ among themselves for the Tukey's test p< (0.05)

That study did not coincide with Soler (2014), who reported a mortality mean of 243.86 (14.28%) in the municipality of Minas, in the 2011-2013 period. Furthermore, the results of research coincided with Lago Verdecia (2014) who reported a mean of 290.52 chick mortality in the province of Ciego de Ávila during the 2010-2013 period.

A review made by Sánchez *et al.* (2004), in the US, Germany, and Denmark, found 5-17% mortality in their respective countries, which was below the data collected in this study. However, the same author reported 36% mortality in laying hens in France; better than the results achieved in this research.

Research made by Ortiz, García & Castro, (2006) in Yucatán, México, in 2000-2002, 2003, and 2005 showed mortality values of 33.33%, 25%, and 20%, respectively. These were only different from the data obtained in this research during the 2000-2002 period, but similar in the other years.

In that sense, Vargas, García, Palma & Librado, (2008), in Puebla, México, reported 28.8% mortality in layers, different from the data obtained in this study.

Moreover, Flores-López and Palacios, (2016), in Nicaragua, framed a mortality standard for Harco Sex Link laying hens, collected throughout growth (6.41%) and laying (1.87%).

Table 2 shows diseases as the main cause of death, with significant differences from the deaths caused by mismanagement. However, a case comparison demonstrated these two groups of data had no differences between prolapse, cannibalism, and pecking from diseases in general.

Table 2. Number of dead animals by causes

Nutritional deficiencies	Accidents	Eaten by rats	Prolapse, cannibalism, and pecking	Diseases
X ± SE	X ± SE	X ± SE	X ± SE	X ± SE
83.20[a]±40.54	97.83[a]±10.10	150.24[a]±9.5	581.20[ab]± 28.65	942.66[b]±67.14

Note: Unequal letters differ among themselves for the Tukey's test p< (0.05)

Often, mortality caused by mismanagement is not given the required significance, thus creating a severe impact on poultry viability and production (Ortiz *et al.*, 2006; Verma, 2016).

Inquiry made by Ortiz *et al.* (2006) in Yucatán, México, found that in 2000-2002, mortality was 19.52% (accidents), 37.06% (prolapse, cannibalism, and pecking), and 43.42% due to other undiagnosed mismanagement-related causes. The 2003 results were completely different: 81.07% (undiagnosed causes), 6.11% (accidents), and 6.70% (prolapse, cannibalism, and pecking). In 2005, it was 9.41%, including 0.41% (prolapse, cannibalism, pecking), 2.17% (accidents), and 85.83% (undiagnosed diseases).

The above-cited author submitted the data gathered during 6 years (16.84%) for prolapse, cannibalism, and pecking, which did not coincide with the current investigation (5.81%).

The findings of Lago Verdecia (2014) in Ciego de Ávila (2011-2014) were close to the data collected in this study. The above author reported a mean of 411.46 (29.71%) deaths related to prolapse, cannibalism, and pecking along a four-year study. In the current study, the mean was 581.20 for this noxa in the five-year study.

Likewise, Soler (2013) reported 472 prolapse, cannibalism, and pecking-related deaths, on a farm in Minas, which was similar to the current results in this study. A review made by Ramírez (2013) in the municipality of Minas found no coincidences with the study previously conducted, according to reports of very high mean mortality values for this noxa: 2010 (1 170), 2011 (8 646), and 2012 (80.80). Nevertheless, Soler (2014) found means of 254. 472, and 891 in the 2011-2013 period, thus coinciding with the 2013 findings of this research, though differences were observed in relation to the values of 2012 and 2014.

Ortiz *et al.*, in a six-year study (2006) in México, observed 15.11% causality. These figures were different from the values reported in this research (9.78%).

Neither, the reports made by Lago Verdecia (2014), of 26.59% coincided with the accident values. Nevertheless, this study showed similar values to Soler (2014), in the 2011-2013 period, in Minas (9.24%).

The findings of Lago Verdecia (2014) in the four-year study on nutritional differences showed a mean of 247.87 (12.87%) of dead animals, which did not come close to the results of the current

study mean (83.20). Likewise, Soler (2014) referred to a mean of 141.50 (10.82%) deaths for the 2011-2013 period, which partially coincided with the findings of this research.

De Armas (2009) reported a mean of 129.83 dead animals due to nutritional disorders, which did not coincide with the current values. Vargas *et al*. (2008), in Puebla, México, demonstrated a mortality case due to nutritional deficiency (11.94%) quite similar to the one found in the current study (8.32%).

This cause of death was strongly related to mismanagement (foods supplied to animals). Proper nutrition is most likely to prevent any cause of death. Accordingly, this study is in line with Mejia & López (2013) and Verma (2016), who referred to the importance of proper nutrition to prevent disorders and deaths in laying hens.

The chicks eaten by rats throughout several years of evaluation showed a mean mortality of 150.24, which differed from the reports made by Ramírez (2013) in Minas. The data of this type of mismanagement on the farms can be seen below: 526 (2010); 213 (2011), and 37. 17 (2012). The results of this research did not coincide with the cited author.

Furthermore, Soler (2013) reported 84 (2011), 46 (2012), and 146 (2013), far from the findings in the first two annals, though similar to the last year of the study. De Armas (2009) on research done in the province of Camagüey, in 2005-2008, referred mean mortality values of 42.93 of laying hens eaten by rats, much lower than the findings of the current study.

However, Lago Verdecia (2014) in Ciego de Ávila province, reported means of 22.13 (4.90%), where the causality values achieved were much lower than the current study.

According to UECAN (2003, 2005) and Rodríguez (2011), when rat sanitation plans are unmet (mismanagement), the number of injured chicks increase.

Interestingly, in the 2011-2015 period, the dead animals showed a mortality mean of 228.11 due to mismanagement in two municipalities of Camagüey province. The deaths caused by nosological entities showed a mean of 942.66 of the mentioned epizootiological aspect. However, De Armas (2009) in the 2005-2008 period, showed a 97.71 disease-mortality index, and 468.26 mismanagement-related deaths noxae in the same location, opposite to this study. A similar behavior to the above-cited author was found by Soler (2014) in the 2011-2013 period, on farms of Minas, who also achieved different mismanagement-related death data of 125.84 and 118.02, respectively.

The study conducted by Lago Verdecia (2014) coincided with the results observed in the behavior of mortality caused by diseases, with values of 156.24 for pathological causes and 134.28 for inappropriate management on the farm.

CONCLUSIONS

In the period covered by this study, diseases represented higher death indicators than mismanagement. Prolapse, cannibalism, and pecking were the highest causes of death.

The mean mortality index in the 2011-2015 period was 541. Mortality in Minas was higher than in Camagüey.

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RECOMMENDATIONS

To study the influence of hygiene programs in incubators, vaccination, and the use of food additives and probiotics, as part of the features of the ration in the prevention of mortality.

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