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Influence of Small and Round Egg Types on Three-Purpose Incubation

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ABSTRACT

Influence of White Leghorns, semi-rustic (Turquino), and heavy breeds, in terms of unsuitable egg for incubation due to low weight or incubation manner, and the chicks weight on the first. The design was completely designed at random, with three treatments (White Leghorn, semi-rustic Turquino and heavy breeds). Three types of eggs were incubated (small, ordinary oval, and normal round eggs), classified according to their weight and shape, following eight incubations of 16 478 eggs. All of them were checked at 21 days and the new chicks were weighed. SPSS 18.0 for Windows was used for simple variance analysis, and Tukey´s multiple comparison of means was utilized. On the first day the chicks´ weight had a significant difference ($P \leq 0.05$) among breeders. The highest heavy weights (oval ordinary and normal round eggs) and small oval eggs in the White Leghorns are below the requirements for industrial exploitation in Cuba. Hatchability was within the set up limits for each purpose in the areas studied. The results for 1 000 eggs of every type in White Leghorn breed accounted for 4.65 (ordinary round); 4.28 (small oval) and 4.55 (ordinary oval eggs weekly), very closely related. These results proved that unsuitable eggs for incubation are being used.

Key Words: *commercial layer replacement, semi rustic, heavy, live weight, unsuitable egg*

INTRODUCTION

World population will surpass the current 7.2 billion and reach 9.6 billion inhabitants by 2050. As a result, the meat and milk demands are estimated to increase 73-58 %, respectively, according to the 2010 levels (FAO, 2011). UNICEF (2088) has said that animal consumption is fundamental to reach food safety; therefore, poultry production plays an important role as protein source to meet people´s demands (FAO, 2002) within a short time.

Sardá (2001) has stated that the ultimate goal of a poultry farm must be producing quality chicks according to age, growing disease-free until the expected production potential is reached and the market demands are met.

One way to increase fertile egg production, at the same cost, without incorporating more breeders, is to use eggs that today are regarded as unsuitable for incubation, without affecting hatchery efficiency. In that sense, authors like Juárez and Ochoa (1995), Nilipour and Bucther (1998), and McLoughlin (2000) have suggested that many fertile eggs considered for elimination may produce high quality broilers, even when they have limited hatching percentage, especially when there is a great demand for fertile eggs, since the unnecessarily rejected eggs cause increased production costs and reduce profitability. The problem surrounding meat production is also observed in egg production, with similar proportions and losses for the economy, translated as lower quantities of eggs for consumption, according Guerra (2006).

When assessing eggs from White Leghorns breeds, Guerra (2006), using six types of eggs classified as unsuitable due to inadequate weight and shape, concluded that the round forms have no effects on hatching. That means that suitable round eggs with the same weight must have similar results in the production process. Moreover, Guerra claims that small and round egg losses on a breeding farm account for 9%, and 18.4%, respectively.

Additionally, Robinson (1996) and McLoughlin (2000) have reported that large eggs have low fertility and hatchability. Therefore, for incubation purpose analysis, only eggs with the highest loss percentages (Guerra, 2006) and others with inclusion criteria for incubation, were used.

The aim of this work is to assess purpose influence (White Leghorns, heavy and semi-rustic animals for breeding, regarding the use of ordinary oval, small oval and ordinary round eggs in hatchability results, and chicks´ weight on the first day.

MATERIALS AND METHODS

Localization

Egg incubation was made at *Luis Gutiérrez Molina Hatchery No. 503,* where replacement of White Leghorns breeds for reproduction is made; the O*svaldo Sánchez Hatchery No. 501*, where broilers are produced, to the north of Camaguey; and *Jesús Menéndez Hatchery No. 502,* km 507 on Carretera Central (west), also in Camaguey, where replacements for Turquino layers are produced.

Experimental design and treatments

The experiment was totally designed at random. In the treatments, three egg types per heavy breed for reproduction (broilers), White Leghorns (eggs), and semi-rustic (Turquino) were used.

1. Small oval eggs, 45-51 g
2. Ordinary oval, 52-65 g, suitable for incubation.
3. Ordinary round, 52-65 g, without anomalies.

Overall, eight incubations were performed, which totaled 16 478 eggs, according to UECAN Standards (2005).

Measurements and analysis

The eggs were subjected to a final biological control at 21 days, always following the pervious standards, and the chicks´ weight was measured on the first day.

The original percent data were transformed by arcsin square root of the proportion (percent divided by 100).

For analysis of the indicator results, simple variance analysis was done, in order to determine the possible effects of breeding (White Leghorns, heavy and semi- rustic) on every egg type; and Tukey´s mean comparison test, if necessary, using SPSS for Windows, version 18.0 (2012).

RESULTS AND DISCUSSION

Table 1 shows that the incubation results in the chick´s weight indicator on the first day had significant differences ($P \leq 0.05$) in the breeds for reproduction. Other indicators, like hatched chicks, first grade chicks and hatchability had no significant differences between them, which indicates the possibility to use ordinary oval eggs in machine hatching, without affecting efficiency of the process.

The results achieved in the hatched chicks' indicator are higher in all the cases to the ones achieved by Sardá (1983), with 72 % hatchability.

The results of this research are not as high as the ones by Guerra (2006) in the following indicators: hatched chicks (84.5 %), first grade chicks (80.5 %), and hatchability (85 %) in White Leghorns breeds for reproduction and similar eggs. These results have been conditioned by improved conditions at the incubation facility, thus producing higher volumes, and also because White Leghorns breeds have better overall results than the other two studies mentioned.

These results are also better that Robinson (1996) and UECAN (2004) for White Leghorns breeds (the other purposes are similar); at Hatchery No. 503, 76.6 % hatchability was achieved between January and July of that same year.

Tables 2 and 3 show the results for eggs with acceptable weight for incubation, and, like Table 1, significant differences ($P < 0.05$) between breeds for reproduction are observed for chicks on the first day. Regarding hatched chicks (Table 2), similar differences are observed, with higher results for the White Leghorns breed eggs, whereas the eggs from semi-rustic and heavy breeders have no difference between them.

The indicators analyzed have a similar behavior to the ones in table 1, according to the previous authors. Only semi-rustic and heavy layers, showed lower results, as mentioned above.

The weight indicator on the first day produced better results than UECAN (1998), which sets the lowest weight limit for incubation at 30 g. However, UECAN (2005) places the limit in 32 g; hence, they are lower than the ones achieved in this research. All this does not at all invalidates these eggs (small oval) for any reproductive breeds, including the heavy types, where weight on the first day is more important for sacrifice. McLoughlin (2000) demonstrated that broilers from these eggs take a day longer to reach sacrifice weight (2 kg).

The same author also says that delay may be avoided if handling is made on a differentiated basis during the first week, by raising protein administration and increasing 1ºC in the heater.

Through the application of flexible handling suggested by Pérez (2003) in relation with the formation of weight groups and considering the remarks on heater use, animals hatched from

these eggs may reach a successful final stage. This criterion has been sustained by Guerra (2006) on commercial layer replacements.

This author found that the chicks hatched from these eggs without flexible handling, which remained with the other two types, achieved weights that did not differ significantly in 18 weeks. Even though these chicks underwent delayed weight increase, when they were separated from the rest in the 12th week, a possible compensatory weight increase occurred, which led them to reach normal values in weeks 18-20.

Although the chicks from White Leghorns and semi-rustic reproductive breeds have significant differences, their weights are higher than the minimum for UECAN (2005). The fact that ordinary round eggs with similar results at the end of incubation and weights ranging within the Cuban standards are not used for commercial incubation is appalling, producing sensible losses. What is lost today may well serve as replacements for the three types of layers, since they make up for 18.4 % of losses in White Leghorn breeds; and along with small oval eggs, they make up for 27,4 % of the overall production of reproductive breeds (Guerra, 2006).

By estimating egg production using 1 000 eggs of the types studied, and also considering the results shown in tables 1, 2 and 3 for White Leghorn reproductive breeds, along with the results by Guerra (2006) when assessing layer replacement growth using the types of eggs in the study, the following results are observed (Table 4):

From Table 4 it can be inferred that the use of the egg types in the study may bring a possibility to increase the number of eggs using the same number of layers, as suggested by Emsninger (1992), which contributes to the economy of the breeding farm, by selling eggs at a higher price without extra spending, also reported by Juárez and Ochoa (1995) and Nilipour and Bucther (1998).

CONCLUSIONS

Defective eggs from White Leghorns, Turquino and heavy (EBH) breeds, thus classified according to their weight or shape, may me incubated with good results, thus offering another alternative for use in the poultry business.

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The final results of incubation have shown that the types of eggs studied can be used for any of the purposes analyzed; only chicks from small oval eggs on the first day have slightly lower weights, according to the Cuban standards for industry.

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Table 1. Behavior of last check at 21 days

Indicator	White Leghorns	Semi rustic	Heavy		
	mean	mean	mean	E.T	SIG
		Small oval			
Hatched	1.13 (81.54)	1.07 (76.68)	1.05 (75.11)	0.022	NS
First grade female chicks	1.08 (77.39)	0.99 (70.56)	1.00 (71.06)	0.019	NS
Second grade female chicks	0.20 (4.15)	0.17 (3.05)	0.20 (4.05)	0.012	NS
Unhatched	0.37 (8.81)	0.48 (13.39)	0.48 (15.40)	0.041	NS
Hatchability	1.09 (78.24)	1.04 (72.95)	1.04 (72.90)	0.022	NS
Weight on the first day (g)	31.40^{a}	31.03^{b}	31.38^{c}	0.053	*

The data were transformed by arcsin, the original data are in percents and within parenthesis.
Different superscripts mean that every indicator has significant differences. *P < 0.05, according to Tukey

Table 2. Behavior of the last check at 21 days

Indicator	White Leghorn	Semi rustic	Heavy		
	mean	mean	mean	E.T	SIG
		Ordinary oval			
Hatched chicks	1.16^{a} (84.01)	1.00^{b} (69.61)	0.97^{b} (67.61)	0.054	*
First grade female chicks	1.12 (80.80)	0.94 (64.45)	0.92 (62.95)	0.054	NS
Second grade female chicks	0.17 (3.21)	0.09 (1.53)	0.15 (2.53)	0.028	NS
Unchatched	1.32 (6.37)	1.29 (4.17)	28 (5.67)	0.009	NS
Hatchability	1.13 (82.00)	1.05 (71.45)	1.04 (71.44)	0.022	NS
Weight on the first day (g)	35.51^{a}	33.883^{b}	38.54^{c}	0.091	*

The data were transformed by arcsin, the original data are in percents and within parenthesis.
Different superscripts mean that every indicator has significant differences. *P < 0.05, according to Tukey

Table 3. Behavior of last check at 21 days.

Indicator	White Leghorns	Semi rustic	Heavy		
	mean	mean	mean	E.T	*Sig*
		Normal round			
Hatched chicks	1.21 (83.70)	1.01 (70.53)	0.93 (70.54)	0.063	NS
First grade female chicks	1.10 (78.74)	0.94 (65.51)	0.92 (65.59)	0.05	NS
Second grade female chicks	0.29 (4.96)	0.22 (4.14)	0.25 (4.14)	0.022	NS
Unhatched	0.33 (7.84)	0.32 (9.49)	0.32 (9.49)	0.025	NS
Hatchability	1.11 (79.54)	1.02 (73.83)	1.01 (73.83)	0.022	NS
Weight on the first day (g)	36.79^{a}	33.37^{b}	37.90^{b}	0.099	*

The data were transformed by arcsin, the original data are in percents and within parenthesis.
Different superscripts mean that every indicator has significant differences. *P < 0.05, according to Tukey

Table 4. Expected production estimates, from incubation to week 69 after laying, using 1 000 eggs

Type of egg	Hatched eggs	First grade female chicks[1]	Female chicken 20 weeks old[2]	Bird average/week[3]	Number of eggs achieved¤	Egg average/week/bird[4]
Ordinary round	1 000	787	732	461	14 994	4,65
Small oval	1 000	774	705	456	13 657	4,28
Ordinary oval	1 000	808	747	522	16 618	4,55

1 Results from tables 1, 2 y 3.
2 Viability percent in each type, (Guerra 2006).
3 Selection percent set by UECAN (2005).
4 Weekly laying percent per hen (Guerra, 2006).