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Physiological Differences, Physical Characteristics, and Some Plasma Parameters on Chicks Hatched from Multi Stage Incubator System Versus Single Stage Incubator System

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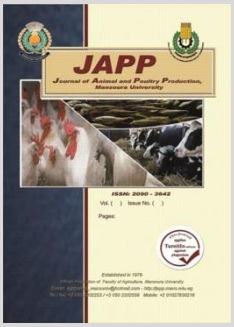

ABSTRACT

This study aimed to investigate the physiological differences, physical characteristics, and some plasma hormones in chicks hatched from multi-stage and single-stage incubator systems. A total of 7200 eggs were obtained from broiler breeder flock (cobb-500) at 37 weeks of age. Eggs were randomly divided into two groups, each of 3600 eggs, with three replicates of 1200 eggs. The first group was multi stage incubator and the second group was single stage incubator. Results showed that there was no significant difference between the two incubation systems in terms of hatchability. Furthermore, hatchability percent for fertile egg have significant differences favor a single-stage machine, this demonstrates the superiority of single stage machines. There was a significant difference between the two systems for the percentage of dead pipped embryonic and late embryonic with the single stage system having a lower percentage of both. Chicks hatched from the single stage incubator had a heavier body weight and longer body, leg, and gut. The blood plasma of chicks that were hatched using a single stage system contained a higher concentration of both total proteins and globulins, it was also observed the activity of liver enzymes especially AST and increasedT4 concentration compared to blood plasma of chicks hatched multi stage system. The result reflected an increase in the value of triiodothyronine, triiodothyronine to thyroxine ratio and corticosterone concentration (0.34 nmol/l, 0.02 ratio, and 18.5 ng/ml, respectively) in the blood plasma of the hatched chicks in multi-stage hatching machines.

Keywords: Multi; Single; Stage; Quality; Hormone

INTRODUCTION

Commercial hatcheries are continuously seeking for ways to increase their production by improving the quality and consistency of day-old chicks and by enhancing hatchability because of how crucial the hatching process is. Switching from a multi stage incubation system (MS) to a single stage incubation system (SS) may help these findings. The multi stage incubator is usually filled with eggs of different embryonic ages. Therefore, the multi stage incubation environment cannot, by its nature, create optimum conditions for every egg. Temperature, humidity, and ventilation are set at a fixed point throughout the whole incubation period. Villanueva *et al*. (2016) reported that eggs from several broiler breeder farms are incubated in the same machine using multi stage incubators, which can hold embryos at various developmental stages and can hold three or four batches of eggs every week (Baracho *et al.* 2010). Older embryos are said to transfer heat to younger embryos during incubation in an MS, creating a thermal equilibrium inside the setter (Araüjo *et al.*, 2016). But this can also raise the temperature. In contrast, a single stage means that all eggs within an incubator are set together. So, all eggs are in the same embryonic stage. This enables the user to adjust the temperature, humidity, and ventilation set points according to the needs of the embryo, possibly leading to improved hatchability and chick quality. The next benefit is the improved biosecurity as provided by every all-in all-out system. This is confirmed Molenaar *et al*. (2010) reported that single-stage incubators are laden with a single batch of eggs, so all embryos are at the same developmental stage. This allows the temperature, humidity, and ventilation to be set according to the needs of the embryos. Single stage incubation systems are recommended for incubating eggs from modern high yield broiler strains, whose embryos generate more heat than slow-growing strains (Boerjan, 2004). Additionally, an SS provides better sanitary conditions because the machine is emptied at same point, which facilitates thorough washing and disinfection.

Therefore, this study aimed to investigate the physiological differences, physical characteristics, and some plasma hormones in chicks hatched from multi stage versus single stage systems.

MATERIALS AND METHODS

A comparison of multi stage (Petersime Vision) *VS.* single stage (PetersimeFocus). Incubators carried out in the commercial Dakahlia poultry hatchery, Qalubia Governorate, Obour, Egypt. The laboratory analyses were performed at laboratories of Faculty of Agriculture; Mansoura University; Egypt.

Incubation management:

A total of 7200 eggs with an average weight of 57-64 g were obtained from a commercial broiler breeder flock (cobb-500) at 37 weeks of age. Egg received hatchery at temperature18°c stored 4 days in troll's egg were randomly divided into two groups each of 3600 eggs, each include three replicates of 1200 eggs; The first group is a multi-stage and the second group is a single stage. All eggs were

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normally incubated depending on the type of incubator in automatic incubators. The first group was multi stage (Petersime Vision) incubator with normal incubation 99.5°F and RH 85 wet bulb degree (°F). At the 18th day of incubation, all eggs were transferred to the hatchery at 98ºF and RH 84°F (wet bulb) and gradually increased to 89°F (wet bulb) at the end incubation period, (Tables 1 and 2). The second group was single stage (Petersime Focus) incubator, with variable system temperature 100.1°F at entry day, gradually decreases to 99.9°F (*ovo scan*) day15 until transfer to hatch at 18th day. It controlled temperature, humidity, ventilation and CO2 at each stage of incubation, (tables 3 and 4).

Table 1. Program of multi stage (Petersime Vision) incubator

Temperature ° F	Wet bulb ° F	Ventilation%	Turn angle
99.5	84.5	35-85	90° every hour

Table 2. Program multi stage (Petersime Vision) hatchery

Age		Temperature	RH ° F	Ventilation
Day	hour	°F	(Wet bulb)	%
18	00	98.0	84	40-50
19	12	98.0	85	25-25
20	10	98.3	86	25-65
20	16	98.0	88	45-75
20	18	97.0	89	80-100

Table 3. Program of single-stage (Petersime Focus) incubator

Age/ day		Temperature (ºF)		Ovo scan	Vent. %		CO2%		RH °F		D. W. L	
D	H	Min	Max	prog	Min	Max	Min	Max	Min	Max	D H	%
00	00	100		100.1	0	15	0.85	0.85	90.0	96.0	00:00	0.0
01	00	99.8	99.9	100.0	0	20	0.85	0.85	90.0	96.0	03:00	0.9
01	12	99.6	99.7	100.0	0	25	0.85	0.85	88.0	95.0	06:12	1.9
02	12	99.2	99.6	99.8	5	50	0.45	0.55	86.0	92.0	09:00	1.9
06	00	99.0	99.5	99.8	10	60	0.35	0.45	84.0	89.5	09:12	3.2
07	00	98.9	99.5	99.8	25	70	0.20	0.40	82.0	88.0	10:00	3.5
09	00	99.0	99.5	99.9	50	80	0.20	0.40	80.0	85.0	12:00	4.9
11	00	99.0	99.6	100.0	80	100	0.20	0.30	87.0	80.0	14:00	6.5
12	00	98.5	99.5	100.0	90	100	0.20	0.30	76.0	79.0	16:00	8.3
13	00	98.1	99.1	99.9	90	100	0.20	0.30	75.0	78.0	17:00	8.5
14	00	97.9	98.9	99.9	90	100	0.20	0.30	75.0	78.0	18:12	11.0
15	22	97.5	98.4	99.9	90	100	0.20	0.30	75.0	78.0		
16	00	97.4	98.0	99.9	90	100	0.20	0.30	75.0	78.0		
17	00	97.2	97.7	99.9	90	100	0.20	0.30	75.0	78.0		
18	00	96.8	97.4	99.9	90	100	0.20	0.30	75.0	78.0		

Table 4. Program of single-stage (Petersime Focus) hatchery

Day	hour	Temperature (ºF)	RH (ºF)	Ventilation %	D H	Maxim range Co2 %
18	00	98.5	78.0	40:100	18:00	0.35
18	18	98.5	81.0	0:100	18:18	0.70
19	00	98.3	83.3	40:60	19:00	0.45
19	12	98.8	85.0	0:5 - 10:100	19:10	0.55
20	08	98.5	87.0	25:60	19:12	0.65:1.05
20	10	98.3	88.0	35:65	20:10	1.05
20	14	98.2	89.0	40:70	20:12	0.85
20	16	98.0	89.0	60:75	20:14	0.75
20	18	97.8	88.5	70:95	20:16	0.65
20	20	97.6	88.0	80:100	20:18	0.50
20	22	97.5	87.5	80:100	20:20	0.45
20	23	96.5	87.0	80:100	20:23	Open
21	00	96.3	86.5	80:100	21:00	Open

Description of the incubator:

Incubator temperature, relative humidity and CO2 were variable, in a single-stage incubator; relative humidity also CO2 from zero day to 18th day of incubation because of is a large amount of eggs enter at once and the embryonic development is in one phase, The purpose of factor control is to reach the optimal adverb of embryonic development and this development is inferred by sensing the heat of the egg from *ovo scan* (It is one of the components of the incubator).

Multiple stage conditions are fixed and depend on the different ages in the same unit where there are 6 to 5 different ages to enter a batch of the machine day after day the temperature was 99.5 °F with relative humidity 85ºF (wet bulb).

Eggs were turned automatically through an angle of 90 every hour until the 18th day of the incubation period, ventilation channels were opened automatically and measured as relative value of the air inlet opening area of the ventilation channels as referred in the following table. After 18.5th day, during the last three days of the incubation period, the temperature decreased from 98.٣ºF to 96.3ºF coincided with relative humidity values of 83.4ºF (wet bulb) to 86.5ºF (wet bulb), respectively, for the 19th; 20th and 21th.

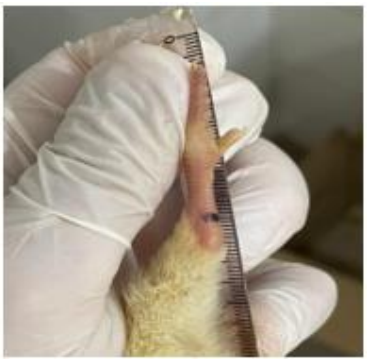
During the three days of hatch wear recorded hatch window three times 19 d:12 h, 20 d:00, 20 d:12 h. The hatch window was calculated as the percentage of chicks hatched during the time indicated previously.

This percentage was calculated by dividing the number hatching of hatched chicks by the number of eggs in each tray.

All hatched chicks were used to calculate the hatchability of fertile (scientific hatchability%) or total set eggs (commercial hatchability%) and chick non hatched eggs and classified by breakout.

After post hatch chosen 25 chicks from each incubator system to determine chick quality measurements chick weight, length (The length of a chick is measured by measuring from the beginning of the beak to the end of the chick's middle toenail; Pic.1), leg (Pic. 2) and gut length, yolk sac weight, yolk free body mass (YFBM), liver weight, and also phenotype to all chicks (Chick class A and chick class B and C) and navel score (Pic. 3) (Tona *et al*., 2003).

Picture 1. chick length



Picture 2. leg length

Picture 3. navel score 1

Plasma parameters:

post hatch was randomly chosen 15 chicks from each system incubator blood samples were collected, (The blood sample was collected from the chicks by slaughtering with a surgical scalpel, cutting the jugular vein, and then filtering the blood with a tube containing 0.1 ml heparin), and the sample was centrifuged at 3000 rpm per minute for 15 minutes to separate the plasma. plasma concentration of glucose, total lipide, triglyceride, cholesterol, HDL, LDL, total protein, albumin, globulin, AST, and ALT were measured by commercial kits (commercial kits spectrum diagnostic kits S.A.E., Egyptian company of Biotechnology, 2022).

Total concentrations of plasma T3 and T4 were determined using commercial kits of a diagnostic examination (Equipar, Italy) according to the methods described by Sterling (1975) and Liewendahl, (1990), respectively. Plasma corticosterone level was also determined using commercial kits of diagnostic examinations [Diagnostic Product Corporation (DPC) Los Angeles,U.S.A] According to the method described (Sainio et al. 1988).

Statistical analysis:

The statistical analysis of results was performed by using a one-way analysis of variance of the GLM procedure of the Statistical Analysis System (SAS, 2006). Significant differences between means of different estimated variables were identified by Duncan's new multiple range test at $P \leq 0.05$ (Duncan, 1955). The following statistical model was used:

$$Yij = \mu + Ei + eij.$$

Where:

Yij = observed trait;
μ = the overall mean;
Ei = Effect of incubation type system.
eij = experimental random error.

RESULTS AND DISCUSSION

Reproductive Performance:

Data in Table 5 showed that there were no statistically significant differences between the two incubation systems (multiple stage VS single stage) in terms of hatchability. Furthermore, hatchability percent for fertile egg have significant differences favor a single-stage machine, this demonstrates the superiority of single stage machines, because single stage incubator a 1.47% higher of hatch and it increased by 244 more chicks. This difference in the number of chicks resulted in net economic revenue in favor of the single stage hatching system. The single stage system had a higher percentage of salable chicks (chick class A), which was due to a significant decrease in the number of grade B and C chicks. This gave the single stage system an advantage, even though there was no significant difference in terms of hatching. Additionally, the hatch window was different for the two systems, with the number of hatched chicks decreasing in the 36 hours and 24 hours before hatching ended for the single stage system. This suggests that the single stage system has an advantage in controlling the hatching process, allowing for a more precise hatch window in the final 24 hours of incubation process. It is an important variable in the evaluation of artificial incubation because it can affect the chick's hydration and health.

These results are in agreement with those obtained by Araüjo *et al*. (2016) who found that the recommended hatch window is 24 hours. And better performance in most categories for the single stage machines (Mauldin, 2006) and Araüjo *et al.* (2016) reported The SS incubator shortened hatch window and yielded better hatchling quality. According to Boerjan (2004), the hatch window affects the field performance of broilers. In comparison to chicks that hatch during the intermediate period, those that hatch at the beginning or end of the hatch window have less potential for growth during the first week of rearing (Willemse *et al*., 2008). Hatch windows in commercial hatcheries typically last 24 to 48 hours. Early hatching chicks spend a lengthy time in the hatcher without food or water (Calil, 2013), which can lead to low weight increase, immune system activation, decreased expression of digestive enzymes, and slower organ development (Willemse *et al*., 2008).

Table 5. Effect of type incubator system on hatchability characteristics, physical characteristics (chick grade) and hatch window.

Treat		Incubator type			
		Multi stage	Single stage		
		Mean±SE	Mean±SE	P Value	Sig
Hatchability %		86.47±0.57	87.95±0.54	0.61	N.S
Fertility %		92.58±0.44	92.44±0.44	0.82	N.S
H.O.F %		93.44±0.23	95.14±0.34	0.00	**
Chick A%		84.67±0.60	86.75±0.56	0.01	**
Chick B and C%		1.80±0.22	1.2±0.17	0.02	**
D	H	Hatch window (%)			
19	12	3.30 ±0.29	1.41 ±0.19	0.00	**
20	00	32.22 ±0.77	25.33 ±0.72	0.00	**
20	12	72.36 ±0.74	72.31 ±0.75	0.95	N.S

H.O.F = hatchability for fertile egg; D = day and H = hour

Data in Table 6 showed the residual analysis results (%) of un-hatched eggs, there were no significant difference between the two hatching systems, MS *VS.* SS, for cull eggs, unfertilized eggs, early and mid-embryonic mortality, contamination, and hair crack eggs. However, there was a

significant difference between the MS *VS.* SS for the percentage of mal position and late embryonic mortality, the single-stage system had a lower percentage of both items. The lower percentage of late embryonic mortality in the SS system suggests that the embryos were able to survive the late stages of development more successfully. These findings suggest that the SS system may be a more effective hatching system than the MS system. However, further research is needed to confirm these findings and to determine the underlying reasons for the difference in hatchability between the two systems. These findings agree with those of Mesquita *et al*. (2021), who noted that the SS incubation techniques has been shown to be superior to the MS system in controlling the needs of embryos during development. Also, Mariana *et al*. (2021), reported that the SS incubation system was shown to be superior to the MS system in meeting the requirements of embryos during development. Nevertheless, (Araüjo *et al*. 2016) concluded that both single stage and multi stage incubators provided suitable conditions for embryonic development and had no impact on the capacity of breeder eggs of different ages to hatch when incubated together.

Table 6. The outcomes of residual analysis conducted on un-hatched eggs from both MS *VS.* SS incubators

	Incubator type			
	Multi stage	Single stage		
Items	**Mean ±SE**	**Mean ±SE**	**P value**	**Sig**
Infertile egg%	7.42±0.43	7.55±0.44	0.82	N.S.
Early dead (0-7d)	3.25±0.29	2.61±0.26	0.11	N.S
Mid dead (8-14d)	0.44±0.11	0.52±0.12	0.61	N.S
Late dead (15-21d)	2.16±0.24	0.77±0.14	0.0	**
Dead Pipped	0.11±0.05	0.08±0.04	0.71	N.S
Contamination	0	0.08±0.04	0.08	N.S
Mal position	0	0.19±0.07	0.00	**
Exposed brain	0	0.05±0.03	0.15	N.S
Up side	0	0.05±0.03	0.15	N.S
Early crack	0.05±0.03	0	0.15	N.S
Trans crack	0.08±0.04	0.11±0.05	0.71	N.S
Cull egg %	13.53±0.57	12.05±0.54	0.06	N.S

Physical characteristics:

Table 7 presents some measurements taken to compare chick quality (Tona *et al*., 2003) between M.S *VS.* S.S incubation systems. These measures include body weight of the chick at hatch, weight of residual yolk sac, liver weight, yolk free body mass (YFBM), ratio of liver to body weight, length of chick, gut and leg length. There was a significant difference ($p \leq 0.05$) between M.S *VS* S.S in physical characteristics (Tona *et al*., 2003) of chicks hatched from M.S *V.S* S.S. Chicks hatched from single-stage incubator were a heavier body weight, longer body, gut, and leg, lower relative weight of the yolk sac. This result as agreement with Mesquita *et al.* (2021) who reported that incubation system did effect on chick body weight at pulling and residual yolk sac weight. The present study revealed lower residual yolk sac relative to body weight for chicks of the single stage treatment this can be concluded that chicks of the S.S system consumed nutrients present in the yolk more efficiently and consequently expected better body development, than chicks in M.S. Mesquita *et al.* (2021) found lower residual yolk in the yolk sac and higher yolk free body weight for chicks of the S.S incubator. Da silva *et al.* (2017) concluded that immune globulins are present in the residual yolk sac which guarantee immunity to chick during the first day of life. Mauldin, (2006) demonstrated better performance in most categories for the single stage machines. For example, percentages for actual hatchability, estimated hatchability, and hatch of fertile were all higher for the (S.S) Platinum machines.

From previous studies Araüjo *et al*. (2016), it was found that the single stage machine system provides more precise systems and control over the physical specifications, which allows the operator of the machine to control, provide and improve the consumption of nutrients in the egg, which allows for the healthy growth of the internal physiological organs through the precise system that provides the physiological requirements necessary for the growth of the embryo with these machines. As shown in this study, SS improved the physical quality of newly chicks hatch significantly more than MS, as measured by YFBM, chick length, and leg length. When it came to hatchability, the SS consistently outperformed the MS.

In a comparison analysis of incubation yield in SS and MS, (Mauldin *et al*., 2006) found similar results. Chicks from eggs incubated in SS machine were heavier at hatch than those incubated in the MS machine, as well as heavier at dispatch. This indicates that the eggs that lost less weight during incubation produced heavier chicks, which may be associated with lower dehydration of the embryo during incubation. According to Gonzales and Mello (2012), the water present in the yolk is partially accumulated in the embryo tissues and in the yolk sac. However, Wineland *et al*. (2008) did not observe any differences in chick weight in a study comparing SS with MS incubators in a commercial hatchery.

Table 7. Effect of the incubation type system (M.S *VS.* S.S) on chick quality.

Items	**Multi stage**	**Single stage**		
	Mean ± SE	**Mean ± SE**	**P value**	**Sig**
Chick weight at hatch (g)	41.19±0.45	44.25±0.48	0.0	**
Yolk weight (g)	3.64±0.23	3.26±0.20	0.2	N.S
YW/CW%	8.83±0.55	7.36±0.44	0.04	*
YFBM	9.78±0.66	8.00±0.52	0.04	*
Liver weigh(g)	1.23±0.02	1.34±0.02	0.0	**
LV/CW%	3.00±0.06	3.03±0.05	0.77	N.S
Gut length (cm)	52.46±0.51	58.22±0.63	0.0	**
Chick length (cm)	19.32±0.12	20.08±0.05	0.0	**
Leg length (cm)	4.80±0.05	5.26±0.03	.٠0	**

Y.W = yolk weight; C.W = chicks weight and YFBM = Yolk free body mass.

Plasma parameters:

Data in table 8 summarized plasma constituents of chicks after hatching. There were no significant differences in total lipid, triglyceride, cholesterol, HDL, LDL, albumin, and ALT levels between the two groups. However, there were significant differences in glucose, total protein, globulin, AST, T3, T4, T3/T4 ratio and corticosterone concentration. This study found that the blood plasma of chicks that were hatched using the single stage system contained a higher concentration in their blood of both total proteins and globulins. It was also observed that the activity of liver enzymes, especially AST, AST is an enzyme that helps the body break down amino acids. Like ALT, AST is usually present in blood at low levels. An increase in AST levels may mean liver damage, liver disease or muscle damage. This test is sometimes referred to as SGOT,

and increased in T4 concentration with significant differences (P≤0.05) compared to blood plasma of chicks hatched from multi-stage incubator system. The result reflected an increase in the value of hormone triiodothyronine, triiodothyronine to thyroxine ratio and corticosterone concentration (0.34 nmol/l, 0.02 ratio and 18.5 ng/ml, respectively) in the blood of the hatched chicks in multi stage hatching machines. The increase in these values of hormone T3; T3/T4 ratio and corticosterone in blood of chicks hatched from multi stage incubator due to the difference in the ages of pushing in the insertion at the beginning of embryonic development.

Table 8. Measurements of some plasma components of chicks hatched from multi stage systems verses single stage

Measurements	Multi stage	Single stage	P value	d.f
	Mean±SE	Mean±SE		
Gluc. (mg/dl)	234.0±3.0	190±4.8	0.0	**
TL. (mg/dl)	367.7±14.2	394.2±12.0	0.16	N.S
TG. (mg/dl)	68.9±2.6	73.40±2.6	0.24	N.S
Chol. (mg/dl)	103.2±6.7	99.87±6.8	0.73	N.S
LDL (mg/dl)	73.3±5.4	65.0±2.3	0.17	N.S
HDL (mg/dl)	25.9±1.6	31.2±2.5	0.09	N.S
T.P. (g/dl)	3.2±0.1	3.6±0.04	0.01	*
Alb. (g/dl)	1.2±0.02	1.3±0.05	0.15	N.S
Glob. (g/dl)	2.0±0.08	2.3±0.06	0.05	*
Alb. /Glob. ratio	0.6±0.02	0.6±0.04	0.67	N.S
AST (u/l)	24.9±0.9	29.1±1.4	0.02	**
ALT (u/l)	32.4±0.3	36.2±2.3	0.10	N.S
T3 (nmol/l)	0.34±0.01	0.31±0.01	0.03	*
T4 (nmol/l)	15.9±0.40	19.1±0.4	0.0	**
T3 / T4 ratio	0.02±0.001	0.01±0.001	0.0	**
Cortico. (ng/ml)	18.5±0.19	14.6±0.5	0.0	**

Gluc.= glucose; TL.= Total Lipid; TG.= Triglycride; Chol.= Cholestrole; LDL= Lowe density lipoprotein; HDL= High density lipoprotein; T.P. = Total protein; Alb.= Albumine; Glob.= globuline; Alb. /Glob.= Albumin to globulin ratio; AST= Aspartate transaminase; ALT= Alanine transaminase; T3= Triiodothyronine; T4= Thyroxine and Cortico. = Corticosterone.

Plasma glucose and corticosterone at hatch were slightly higher in chicks hatched from multi-stage incubator system than for those in the single-stage incubator. Higher corticosterone could point to a more energy-demanding hatching process in multi- stage system (Piestun *et al*., 2008), resulting in increased gluconeogenesis (Joseph and Ramachandran, 1992) and higher plasma glucose at hatch lowering circulating T3, may be considered a physiological adaptation to maintain nutritional reserves (Decuypere *et al*., 1983), which could be related to the slightly lower yolk uptake in the hatchers chick from a single-stage incubator system, this is due to the low weight of the residual yolk sac in the chicks that were hatched from a single-stage machines.

CONCLUSION

Single stage incubation provides results exceed that of multi stage incubation through less cull chicks, improved quality and hatch, producing more viable, hydrated and healthy chicks. The results of plasma hormone analysis indicated increase in level of T3; T3/T4 ratio and corticosterone of chicks hatched from multi-stage incubator due to the difference in the ages of pushing in the insertion at the beginning of embryonic development.

REFERENCES

Araüjo, I. C. S., Leandro, N. S. M., Mesquita, M. A., Café, M. B., Mello, H. H. C., and Gonzales, E. (2016). Effect of incubator type and broiler breeder age on hatchability and chick quality. Brazilian Journal of Poultry Science, 18, 17-25.

Baracho, M. S., Nääs, I. D. A., and Gigli, A. (2010). Impact of environmental variables in multi setter incubation in broiler's production. Engenharia Agrícola, 30, 563-577.

Boerjan, M. (2004). Single stage incubation is the most natural choice. World Poultry, 20(7), 18-20.

Calil TAC. Inovação nos procedimentos de incubação, transferência e (2013) nascimento do pinto. In: Macari M, Gonzales E, Patrício IS, Naass, IA, Martins, PC. Manejo da incubação. 3ª ed. Campinas: FACTA.

Da Silva, M.; V. Labas; Y. Nys and S. Rehault-Godbert. (2017). Investigating proteins and proteases composing amniotic and allantoic fluids during chicken embryonic development. Poult. Sci. 96:2931–2941.

Decuypere, E., Scanes, C. G., and Kühn, E. R. (1983). Effects of glucocorticoids on circulating concentrations of thyroxine (T4) and triiodothyronine (T3) and on peripheral monodeiodination in pre-and post-hatching chickens. Hormone and metabolic research, 15(05), 233-236.

Duncan, D. B. (1955). Multiple range and multiple "F" test. Bio- metrics.11,1-42.

Gonzales E, Mello HHC. O ovo e a água. (2012).In: Macari M, Soares NM. gua na avicultura industrial. 2ª ed. Campinas: FACTA;. p.187-189.

Joseph, J., and Ramachandran, A. V. (1992). Alterations in carbohydrate metabolism by exogenous dexamethasone and corticosterone in post-hatched white leghorn chicks. British Poultry Science, 33(5), 1085-1093.

Liewendahl, K. (1990). Assessment of thyroid status by laboratory methods: developments and perspectives. Scandinavian Journal of Clinical and Laboratory Investigation, 50(sup201), 83-92.

Mariana A. Mesquita; C. S. Itallo; M. B. C. Araújo; A. Emmanuel; A. G. Mascarenhas; B. C. Fabyola; J. H. Stringhini; S. M. Leandro and E. Gonzales. (2021). Results of hatching and rearing broiler chickens in different incubation systems. Poul. Sci., 100: (1), 94-102.

Mauldin, J. M. (2006). Hatchery breeder tip: Results from a study of single stage vs multistage incubation in a Georgia hatchery.

Mesquita, M. A., Araújo, I. C., Café, M. B., Arnhold, E., Mascarenhas, A. G., Carvalho, F. B., and Gonzales, E. (2021). Results of hatching and rearing broiler chickens in different incubation systems. Poultry Science, 100(1), 94-102.

Molenaar, R., Meijerhof, R., van den Anker, I., Heetkamp, M. J. W., Van den Borne, J. J. G. C., Kemp, B., and Van Den Brand, H. (2010). Effect of eggshell temperature and oxygen concentration on survival rate and nutrient utilization in chicken embryos. Poultry Science, 89(9), 2010-2021.p.345-370.

Piestun, Y., Shinder, D., Ruzal, M., Halevy, O., and Yahav, S. (2008). The effect of thermal manipulations during the development of the thyroid and adrenal axes on in-hatch and post-hatch thermoregulation. Journal of Thermal Biology, 33(7), 413-418.

Sainio, E. L., Lehtola, T., and Roininen, P. (1988). Radioimmunoassay of total and free corticosterone in rat plasma: measurement of the effect of different doses of corticosterone. Steroids, 51(5-6), 609-622.

SAS (2004).SAS® User´s Guide. Statistics version 10thed., SAS Institute Inc., NC.USA.

Spectrum Diagnostic kits S.A.E., Egyptian company of biotechnology (2022). Spectrum diagnostic Kits.

Sterling, L.(1975). Diagnoses and treatment of thyroid disease, clereland CRC press.

Tona, K., Bamelis, F. B. V. V. M. J. O. E., De Ketelaere, B., Bruggeman, V., Moraes, V. M., Buyse, J., and Decuypere, E. (2003). Effects of egg storage time on spread of hatch, chick quality, and chick juvenile growth. Poultry science, 82(5), 736-741.

Villanueva, A. P., Ebling, P. D., Pontalti, G. C., and Ribeiro, A. M. L. (2016). Effect of incubation system on the development of intestinal villi, metabolism, and performance of one-to forty-day-old broiler chickens. Revista Brasileira de Zootecnia, 45, 524-531.

Willemsen, H., N. Everaert, , A. Witters, , L. De Smit, M. Debonne, F. Verschuere, P. Garain, D. Berckmans, E. Decuypere, and V. bruggeman. (2008). Critical assessment of chick quality measurements as an indicator of post hatch performance. Poult. Sci., 87, (11): 2358-2366.

Wineland, M. J., E. O. Oviedo-Rondon, H. R. Cutchin, J. H. Small, K.M. Mann, and J. Beavers. (2008). A field comparison of hatch and broiler performance using both single stage and multi-stage incubation. Poult. Sci. 87, Sup. 1. Abstract 149, p. 48. Poultry Science Meeting July 2008.

الاختلافات الفسيولوجية و المظاهر الشكلية و بعض مقاييس البلازما وتركيز هرمون T3,T4 في الكتاكيت الفاقسة من المفرخات ذات المراحل المتعددة مقارن بالكتاكيت الفاقسة من المفرخات احادية المرحلة

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الملخص

تهدف هذه الدراسة إلى دراسة الفروق الفسيولوجية والصفات الفيزيائية وبعض هرمونات البلازما في الكتاكيت المفقسة من أنظمة التفريخ متعددة المراحل وأحادية المرحلة. تمت التجربة على عدد ٧٢٠٠ بيضة من قطيع أمهات الدجاج التسمين (cobb-500) عمر ٣٧ أسبوعًا. تم تقسيم البيض عشوائياً إلى مجموعتين، كل مجموعة تحتوي على ٣٦٠٠ بيضة، بواقع ثلاث مكررات كل منها ١٢٠٠ بيضة. المجموعة الأولى تم تفريخ البيض في حاضنة متعددة المراحل والمجموعة الثانية كانت حاضنة أحادية المرحلة. أظهرت النتائج عدم وجود فروق معنوية بين نظامي التفريخ من حيث نسبة الفقس. علي الرغم من زيادة نسبة الكتاكيت الفاقسة من المفرخ احادي المرحلة بنسبة ١,٤٧% اي عدد ٢٤٤ كتكوت. كان هناك اختلاف كبير بين النظامين بالنسبة لنسبة الناقر الميت والنفوق الجنيني المتاخر، وكانت النسبة الاقل لكليهما مجموعة التفريخ أحادية المرحلة. كانت الكتاكيت الفاقسة من المفرخ أحادي المرحلة أعلي وزن جسم، أطول جسم ,أطول ساق و اطول امعاء. وجد أن بلازما دم الكتاكيت التي تم تفريخها باستخدام نظام المرحلة الواحدة يحتوي دمها علي أعلي تركيز من كل من البروتينات الكلية والجلوبيولين. كما لوحظ زيادة نشاط انزيمات الكبد وخاصة AST وزيادة تركيز T4 مع وجود فروق معنوية مقارنة ببلازما الدم للكتاكيت الفاقسة من الحضانة متعددة المراحل. أظهرت النتائج زيادة في قيمة هرمون ثلاثي أيودوثيرونين ونسبة ثلاثي أيودوثيرونين إلى هرمون الغدة الدرقية وتركيز الكورتيكوستيرون (٢٢,٦، ١٨,٣٣، ١٨,٥٧ على التوالي) في بلازما الدم للكتاكيت الفاقسة في ماكينات التفريخ متعددة المراحل.