International Journal of Animal Science and Technology
2023; 7(2): 31-34
http://www.sciencepublishinggroup.com/j/ijast
doi: 10.11648/j.ijast.20230702.14
ISSN: 2640-1282 (Print); ISSN: 2640-1312 (Online)

The Eggs Turning Frequencies and Turning Angle During Incubation

Adnan Jabbar

Salman Poultry pvt. Ltd (Sadiq Group of Companies), Rawalpindi, Pakistan

Email address:
sbhatcheryislamabad@gmail.com

To cite this article:
Adnan Jabbar. The Eggs Turning Frequencies and Turning Angle During Incubation. *International Journal of Animal Science and Technology*. Vol. 7, No. 2, 2023, pp. 31-34. doi: 10.11648/j.ijast.20230702.14

Received: February 6, 2023; **Accepted**: May 16, 2023; **Published**: June 15, 2023

Abstract: The aim of this study was to standardize the turning frequencies for incubator manufacture to achieve maximum profitability for poultry industry. The eggs (n=2692800) from Ross, Cobb and IR SP01, 02, 03 (Young Flocks 24-30 weeks), SP04 (Prime flock 31+), SP165, ZF168, JV-06, SP173 (Old flocks 51+) and molted flocks (60+ weeks) flocks SSF24, SSF25, SSF26, SP162, SP167 were collected and divided into two groups (control & experimental). In control group the turning duration was 45 minutes for day (1-6), from 7 to 19th day the turning duration was between two consecutive turnings was 60 minutes. The turning angle 45°was same for all incubation days in setters. The time between two consecutive turnings at 180° was one minute from day (1-16th), 5 minutes, 10 minutes and 15 minutes for day (17th, 18th, and 19th) respectively. The fans rotations were also same inside incubators 55 minutes clockwise and 5 minutes anticlockwise for all incubation days. In Experimental group (G-B) the eggs turning was performed after every 45 minutes for the first six days (0-6 days), (from 7-13th days) the eggs turning was performed after every 60 minutes, (14-15 day) the eggs turning was after every 55 minutes, (16th day) the turning was after 50 minutes and last three days (17-19 days) in setters the eggs turning was after 45 minutes. The turning angle 45°was same for all incubation days in setters. The fans rotations were also same inside incubators 55 minutes clockwise and 5 minutes anticlockwise for all incubation days (table 2) Group-B. The time between two consecutive turnings at 180° was one minute from day (1-16) and 5 minutes, 10 minutes and 15 minutes for (17, 18, and 19 days) respectively. The hatchery parameters fertility (94.10 ± 0.49 ^{a}, 93.82 ± 0.48^{a}), Hatchability (86.04 ± 1.42^{a}, 86.76 ± 1.18^{a}), candling (5.90 ± 0.49^{a}, 6.18 ± 0.48^{a}) and dead in shell (8.06 ± 1.14^{a}, 7.06 ± 0.95^{a}) were insignificant (P<0.05). The embryonic mortalities e-g early (0.66 ± 0.12^{a}, 0.55 ± 0.10^{a}), mid (0.26 ± 0.04^{a}, 0.28 ± 0.05$^{a)}$ and late embryonic mortalities (7.14 ± 1.10^{a}, 6.23 ± 0.93^{a}) were also insignificant (P<0.05). In conclusion the change in turning frequencies after day thirteen may not affect the incubation standard.

Keywords: Dead in Shell, Incubation, Turning Frequencies

1. Introduction

The profitability of hatchery is determined by the percentage of chick's production as well as energy conservation. The market competition as well as energy conservation also force to deal the incubation with more precise methods. Thus providing the ideal condition for incubation to growing embryos is crucial. One of the crucial method during incubation is eggs turning to produce quality chicks along energy conservation. Eggs turning can affect the percentage of incubation and quality of chicks [1]. The turning of eggs during incubation is vital for growing embryo [2].

The commercial incubators provide eggs turning 12 times a day [3]. The turning of eggs during incubation is necessary to avoid sticking of embryonic layers with shell, proper exposure of eggs to heat and embryo rotation for adequate feeding [4]. The improper turning becomes source of high embryonic mortality in terms of dead in shell [5]. Turning is essential for preventing adhesion of the embryo to the inner shell membranes, optimum development of the extra-embryonic membranes. Turning can prevent improper adhesions of the embryo to the inner shell membrane or of allantois to the yolk sac early in the embryonic development [6]. The change in turning angle or turning frequencies becomes source of early, mid and late embryonic mortalities [3].

The research require for the incubator manufacture for eggs turning standardization to achieve maximum production to boost profitability for poultry industry. The purpose of this

study was to evaluate the effect of turning frequencies after day thirteen on incubation efficiency parameters.

2. Material and Method

2.1. Ethical Approval

The experiment was conducted considering all rules and regulations regarding Animal rights (SPCA) Society for protection and care of animals, University of veterinary and Animal Sciences Lahore Pakistan.

2.2. Experimental Site

The experiment was performed at one of the biggest broiler hatcheries of south Asia, SS hatchery Chakri Salman Poultry Pvt. Ltd (Sadiq Group of Companies). The hatchery is located near M-2 in Chakri region District Rawalpindi Punjab Pakistan. The hatchery is facilitated with latest HVAC system, having ISO (international standard organization) 1900-2000 certified. The hatchery can incubate 8.6 million eggs/month through single stage incubator Avida-4 (chick Master USA).

2.3. Experimental Eggs

The eggs were completely divided into two separate groups A (control group) &B (Experimental group), five replicates from each group. The (n=2692800) eggs for each group (A Group) and control (B Group) were collected from all fifteen flocks.

2.4. Experimental Flocks

Fifteen flocks at different age group were selected to collect experimental eggs. SP01, 02, 03 (Young Flocks 24-30 weeks), SP04 (Prime flock 31+), SP165, ZF168, JV-06, SP173 (Old flocks 51+) and molted (60+ weeks) flocks SSF24, SSF25, SSF26, SP162, SP167. The different age group were selected to minimize the effect of age.

2.5. Eggs Grading and Setting

The eggs were sorted for both groups from eggs grading Machine SANOVO STAALKAT Machine number JB 11786-D. The machine has ability to differentiate the eggs based on eggs weight along hairline crack eggs, leak eggs and dirty eggs detection. The eggs grading was performed as described by [7].

2.6. Eggs Fumigation

The fumigation of both groups was performed with $KMnO_4$ and formalin to avoid contamination on eggs surface. The fumigation was performed through automatic fumigation system provided by chick master USA. The fumigation protocol was followed as described by [8].

2.7. Incubation Profile

The eggs from both groups were incubated according to Age wise incubation profile described by [9]. Four setters for each group were selected, two setters with prime incubation profile, one young and one with old age incubation profile provided by chick master.

2.8. Eggs Turning for Control Group

In control group the turning duration was 45 minutes for day (1-6), from 7 to 19th day the turning duration was between two consecutive turnings was 60 minutes. The turning angle 45°was same for all incubation days in setters. The time between two consecutive turnings at 180° was one minute from day (1-16th), 5 minutes, 10 minutes and 15 minutes for day (17th, 18th, and 19th) respectively. The fans rotations were also same inside incubators 55 minutes clockwise and 5 minutes anticlockwise for all incubation days.

Table 1. *Eggs Turning Protocol sb hatchery Rawalpindi Pakistan.*

Day	Turning Angle	Turning Duration Minutes	Turning Duration at 180°	Fan Rotation clock wise Minutes	Fan Rotation anti clock wise Minutes
1	45°	45	1	55	5
2	45°	45	1	55	5
3	45°	45	1	55	5
4	45°	45	1	55	5
5	45°	45	1	55	5
6	45°	45	1	55	5
7	45°	60	1	55	5
8	45°	60	1	55	5
9	45°	60	1	55	5
10	45°	60	1	55	5
11	45°	60	1	55	5
12	45°	60	1	55	5
13	45°	60	1	55	5
14	45°	60	1	55	5
15	45°	60	1	55	5
16	45°	60	1	55	5
17	45°	60	5	55	5
18	45°	60	10	55	5
19	45°	60	15	55	5

2.9. Eggs Turning for Experimental Group

The eggs turning was performed according to incubation profile provided by chick master USA. In Experimental group (G-B) the eggs turning was performed after every 45 minutes for the first six days (0-6 days), (from 7-13th days) the eggs turning was performed after every 60 minutes, (14-15 day) the eggs turning was after every 55 minutes, (16th day) the turning was after 50 minutes and last three days (17-19 days) in setters the eggs turning was after 45 minutes. The turning angle 45°was same for all incubation days in setters. The fans rotations were also same inside incubators 55 minutes clockwise and 5 minutes anticlockwise for all incubation days (table 2) Group-B. The time between two consecutive turnings at 180° was one minute from day (1-16) and 5 minutes, 10 minutes and 15 minutes for (17, 18, and 19 days) respectively.

The Pneumatic air compressor (ATLAS COPCO GX4FF EP) with capacity of 10 HP 3Kw was used for turning of eggs inside incubators.

Table 2. *Turning Protocol sb hatchery Rawalpindi Pakistan.*

Day	Turning Angle	Turning Duration Minutes	Turning Duration at 180°	Fan Rotation clock wise Minutes	Fan Rotation anti clock wise Minutes
1	45°	45	1	55	5
2	45°	45	1	55	5
3	45°	45	1	55	5
4	45°	45	1	55	5
5	45°	45	1	55	5
6	45°	45	1	55	5
7	45°	60	1	55	5
8	45°	60	1	55	5
9	45°	60	1	55	5
10	45°	60	1	55	5
11	45°	60	1	55	5
12	45°	60	1	55	5
13	45°	60	1	55	5
14	45°	55	1	55	5
15	45°	55	5	55	5
16	45°	50	10	55	5
17	45°	45	15	55	5
18	45°	45	15	55	5
19	45°	45	15	55	5

2.10. Dead in Shell Analysis

The dead in shell analysis was performed after hatch pull out. The eggs were separated on the basis of embryo formation inside eggs [10].

3. Statistical Analyses

All data were analyzed by using Statistical Analysis System package software (SAS version 9.2, SAS Institute Inc., Cary, NC, USA). All means were compared using t-test and results were presented as mean ± SEM (standard error of the mean). Results were considered significant if $P < 0.05$.

4. Results and Discussion

The current experiment indicates that change in turning duration after day 13th did not affects the fertility, hatchability, candling and dead in shell [11]. All hatchery parameters fertility (94.10 ± 0.49^{a}, 93.82 ± 0.48^{a}), Hatchability (86.04 ± 1.42^{a}, 86.76 ± 1.18^{a}), candling (5.90 ± 0.49^{a}, 6.18 ± 0.48^{a}) and dead in shell (8.06 ± 1.14^{a}, 7.06 ± 0.95^{a}) were insignificant ($P<0.05$). Our results also supported by [12], the eggs turning at 45° throughout the incubation with turning frequency of 24 times daily (2×24) has no effects on hatchery parameters. The time between two consecutive turnings at 180° was one minute up to day fourteen and five and ten minutes for day fifteen and sixteen respectively. For last three days this time was increased up to fifteen minutes. This increase of time at 180°. for last three days helps to control the maximum heat exhaust by growing embryos. This temperature control helps chickens to adopt heat stress in later life [14]. The proper turning of eggs during eggs storage helps to develop blastoderm [14]. The change in turning angle or turning frequencies may become source of early, mid and late embryonic mortalities [15].

Table 3. *Effect of Eggs Turning on Hatchery Parameters sb hatchery Rawalpindi Pakistan.*

Parameters	A	B
Fertility%	94.10 ± 0.49^{a}	93.82 ± 0.48^{a}
Candling%	5.90 ± 0.49^{a}	6.18 ± 0.48^{a}
Hatchability%	86.04 ± 1.42^{a}	86.76 ± 1.18^{a}
DIS%	8.06 ± 1.14^{a}	7.06 ± 0.95^{a}
DIS-Week 1%	0.66 ± 0.12^{a}	0.55 ± 0.10^{a}
DIS-Week 2%	0.26 ± 0.04^{a}	0.28 ± 0.05^{a}
DIS-Week 3%	7.14 ± 1.10^{a}	6.23 ± 0.93^{a}

The change in turning frequencies becomes source of embryonic mortalities Melo et al., 2020. The change in

turning duration after day thirteen don't have any impact e-g insignificant ($P<0.05$) on early (0.66 ± 0.12^{a}, 0.55 ± 0.10^{a}), mid (0.26 ± 0.04^{a}, $0.28 \pm 0.05^{a)}$ and late embryonic mortalities (7.14 ± 1.10^{a}, 6.23 ± 0.93^{a}) table 3. The change in eggs turning frequencies don't have impact on hatchery parameters after day thirteen.

5. Conclusion

The turning of eggs during incubation is vital for growing embryos. The lack of turning becomes source of loss in term of high dead in shell and less hatchabilities. The most of studies indicate that the eggs turning is crucial up to day thirteen. The change in turning frequencies after day thirteen may not affect the hatchery parameters, but the energy conservation will improve.

Conflict of Interests

All the authors do not have any possible conflicts of interest.

Acknowledgements

The author is thankful to Director of Sadiq Poultry (Pvt) limited Mr. Salman Sadiq for his full support and encouragement during the whole period of research work.

References

[1] Moraes TGV, Romao JM, Teixeira RSC, Cardoso WM 2008 Effects of egg position in artificial incubation of Japanese quail eggs Anim. Reprod., v. 5, n. 1/2, p. 50-54, Jan./Jun. 2008 file:///C:/Users/ABC/Downloads/animreprod-5-1-50.pdf

[2] Yoshizaki N and Saito H (2002) Changes in Shell Membranes during the Development of Quail Embryos 2002 Poultry Science 81: 246–251.

[3] Gabriel da S. Oliveira, Vinícius M. dos Santos, y, Jullyana C. Rodrigues, y and Sheila T. Nascimento 2020 2020 Effects of different egg turning frequencies on incubation efficiency parameters Poultry Science 99: 4417–4420.

[4] Yoshizaki N and Saito H 2008 Changes in Shell Membranes during the Development of Quail Embryos Department of Biological Diversity, Faculty of Agriculture, Gifu University, Gifu 501-1193, Japan file:///C:/Users/ABC/Downloads/1-s2.0-S0032579119435773-main.pdf

[5] Elibol O and Brake† J (2006) Effect of Egg Turning Angle and Frequency during Incubation on Hatchability and Incidence of Unhatched Broiler Embryos with Head in the Small End of the Egg1 Poultry Science 85: 1433–1437.

[6] Melo E. F 2020 Effect of egg storage duration and egg turning during storage on egg quality and hatching of broiler hatching eggs Animal The international journal of animal biosciences (http://creativecommons.org/licenses/by-nc-nd/4.0/).

[7] Jabbar A 2019 The Influence of Hairline crack Eggs on Hatchery Parameters and Chicks Performance". EC Veterinary Sciences 4. 5 (2019): 325-333.4.

[8] Jabbar A, Yousaf A, Hameed A, Riaz A and Ditta YA (2019) Influence of Fumigation Strength on Hatchery Parameters and Later Life of Chicks. Journal of Holistic Veterinary Science and Animal Care. 1 (1): 101.

[9] Jabbar A and Yousaf A (2017). Effect of age wise incubation programme on broiler breeder hatchability and post hatch performance. Online Journal of Animal and Feed Research, 7 (1): 13-17; Jan 25, 2017 ISSN 2228-7701.

[10] Kalita N, Pathak N, M. Ahmed and Saikia G. K. (2013) Various causes related to dead-in-shell embryos of crossbred (PB-2 x Indigenous) chicken egg. Veterinary World, EISSN: 2231-0916 Available at www.veterinaryworld.org/Vol.6/Oct-2013/16.pdf

[11] Charles Deeming D 2009. The role of egg turning during incubation AVIAN BIOLOGY RESEARCH 2 (1/2), 2009 67-71 file:///C:/Users/ABC/Downloads/175815509x431849.pdf

[12] Elibol O and Brake† J (2006) Effect of Egg Turning Angle and Frequency during Incubation on Hatchability and Incidence of Unhatched Broiler Embryos with Head in the Small End of the Egg1 Poultry Science 85: 1433–1437.

[13] Ozlu. S, Uçar A, Erkuş T, Nicholson A. D, and Elibol O 2021 Effects of turning and short period of incubation during long-term egg storage on embryonic development and hatchability of eggs from young and old broiler grandparent flocks. Poultry Science 100: 101026 https://doi.org/10.1016/j.psj.2021.101026

[14] Grochowska E, Kinal A, Sobek Z, Siatkowski I, and Bednarczyk M 2019 Field study on the factors affecting egg weight loss, early embryonic mortality, hatchability, and chick mortality with the use of classification tree technique Poultry Science 98: 3626–3636 http://dx.doi.org/10.3382/ps/pez180

[15] Yalcin S, Özkan S, Shah T 2022 Incubation Temperature and Lighting: Effect on Embryonic Development, Post-Hatch Growth, and Adaptive Response Frontiers in Physiology Department of Animal Science, Faculty of Agriculture, Ege University, Izmir, Turkey.