International Journal of Applied Poultry Research

ISSN: 2222-1263
www.ijscience.com

Effect of Spraying Japanese Quail Eggs with Different Levels of Glucose Solution on Hatchability Traits

Merkhan M. Mustafa

School of Animal Production, Faculty of Agriculture and Forestry, University of Duhok, Iraq

A B S T R A C T

This study was undertaken to evaluate the effect of spraying hatching eggs with various levels of glucose solution (control, positive control, 5, 10 and 15% with antibiotic) on hatching traits of Japanese quail. Two hundred and seventy Japanese quail eggs were obtained from the Department of Agricultural Research, Mosul. Breeders were ten weeks of age and fed ration containing 21% protein and 2800 kcal/kg energy. Eggs were distributed into five treatments with two replicate for each treatment and sprayed with a glucose solution before setting in the incubator and was repeated on day 15th when transferred eggs to hatchery section. At the end of hatching process, all unhatched eggs were broken to estimate age of embryonic mortality. Results revealed that hatchability from total and fertile eggs was significantly higher compared with control; early, medium, late and total embryonic mortality was lower in T3 (glucose solution 5% + 0.025g /100ml). Chick weight at hatching was significantly higher in T5 (glucose solution 15% +0.025g /100ml) compared to control.

Key words: spray, glucose, antibiotic, hatching, quail

Corresponding author: Merkhan M. Mustafa, School of Animal Production, Faculty of Agriculture and Forestry, University of Duhok, Iraq.

How to cite this article: Mustafa MM, 2013. Effect of spraying Japanese quail eggs with different levels of Glucose solution on hatchability traits. Int. J. Appl. Poult. Res. 2(1): 12-14.

INTRODUCTION

Establishment of a stable and sufficient glucose status is critical for the late-term embryonic developmental during hatching process as well as in post hatch development of chick until feed consumption is initiated. Glucose available in egg at incubation plays an important role in the initiation of embryonic development and further as an energy substrate via anaerobic catabolism (Moran, 2007). Toward the end of incubation, embryos use their energy reserves to meet the high demand of glucose to fuel hatching activities (Christensen *et al*., 2001). The glycogen reserves in liver and glycolytic muscles of the bird are withdrawn as embryos go through the hatching process (Christensen *et al*., 2001). Uni *et al.* (2005) reported that maintenance of glucose homeostasis during late-term embryonic development is dependent upon the amount of glucose held in reserve primarily in the form of glycogen in the liver and upon the degree of glucose generated by gluconeogenesis from protein which is mobilized first from amnion albumen and then from muscle. A portion of the albumen is absorbed by the small intestine to expand body glycogen reserves (Moran, 2007). Moreover, John *et al*. (1988) indicated that glycogen is a major source of energy during the hatching process in turkey and that glucose supplementation did enhance the overall glycogen storage in the muscles and liver. Insufficient glycogen and albumen will force the embryo to mobilize more muscle protein toward gluconeogenesis, thus restricting growth of the late-term embryo and hatchling (Hamer and Dickson, 1989; Elwyn and Bursztein, 1993; Vieira and Moran, 1999a&b; Uni *et al.*, 2005). Moreover, treatments of eggs with an antibiotic solution were also considered useful in reducing bacterial infection and then decrease the mortality (Saif *et al.*, 1970).

The objective of this study was to evaluate the effects of spraying Japanese quail hatching eggs with different glucose solutions together with antibiotics on hatchability traits.

MATERIALS AND METHODS

Two hundred and seventy hatching eggs were obtained from Japanese quail aged ten weeks and fed ration contained (21%) crude protein and (2800 kcal/kg) energy reared at the Department of Agricultural Research, Mosul. Eggs were divided into five groups (54 eggs each) with two replicates and treated as follows:

T1:- Negative control (without any treatment)
T2:- Positive control (distilled water + 0.025g Gentamycin/100 ml)
T3:- Glucose 5% + 0.025 g Gentamycin/100 ml
T4:- Glucose 10% + 0.025 g Gentamycin/100 ml
T5:- Glucose 15% + 0.025 g Gentamycin/100 ml

Dried eggs were incubated in forced draft-type incubator at 37.5^{0}C temperature and 55% relative humidity. On 15th day of incubation, also eggs

Table 1: Effect of spraying Japanese quail hatching eggs with different levels of glucose solution on hatching traits

Traits / Factors	Fertility %	Hatchability percentage		Embryonic mortality percentage				Chick weight (g)
		Total eggs	Fertile eggs	Early	Medium	Late	Total	
Over all mean	82.14±1.45	53.58±3.97	64.71±4.02	9.69±1.22	8.29±0.73	17.25±3.05	35.24±4.18	9.39±0.22
T1	86.53±1.92^{a}	59.61±1.92^{b}	68.87± 0.69^{b}	8.89±0.19^{bc}	6.62±2.07^{a}	15.51±1.87^{bc}	31.02±3.75^{b}	9.15±0.05^{b}
T2	81.12±0.35^{b}	58.47±0.78^{b}	72.07±0.64^{ab}	11.58±2.05^{ab}	9.30±0.21^{a}	6.92±2.16^{d}	27.81±4.00^{b}	8.98±0.02^{b}
T3	86.66±0.29^{a}	66.69±1.48^{a}	76.97±1.97^{a}	5.13±0.13^{c}	7.63±2.36^{a}	10.26±0.26^{cd}	23.02±1.97^{b}	9.19±0.02^{b}
T4	80.88±1.7^{b}	51.08±1.08^{c}	63.15±0.0^{c}	7.89±2.63^{bc}	7.89±2.63^{a}	21.05±0.0^{b}	36.84±5.26^{b}	8.93±0.02^{b}
T5	75.49±1.42^{c}	32.05±1.28^{d}	42.50±2.50^{d}	15.0±0.0^{a}	10.0±0.0^{a}	32.50±2.50^{a}	57.50±2.50^{a}	10.70±0.30^{a}

$^{a, b, c, d}$ Values within columns with no common letter differ significantly; T1 = control, T2 = positive control (distilled water +0.025g /100ml), T3 (glucose solution 5% +0.025g /100ml), T4 (glucose solution 10% +0.025g /100ml), T5 (glucose solution 15% +0.025g /100ml)

were sprayed with the same solution and transferred to hatcher unit (36.5^{0}C temperature) and (65% relative humidity). At the end of hatching time on day 18th, unhatched eggs were broken to determine the age of embryonic mortality (early, medium and late). In addition, all hatched chicks were weighed with balance (accuracy 210g ± 1g).

All results were statistically analyzed by General Linear Models (GLM), one-way analysis of variance, using SAS software (SAS Institute, 2002).

$Yij = \mu + Ti + eij$

Where: Yij = Performance traits measured on the j th traits in the I th treatment.

μ = Overall mean.

Ti = Effect of the treatments (i= 1, 2, 3,..).

eij = Random error effect.

Differences among means were separated using Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

The overall mean egg fertility and hatchability based on total eggs and fertile eggs and total embryonic mortality percentage and chick weight at hatching were 82.14%, 64.7%, 35.24% and 9.39g respectively (Table 1). It appears from results presented in Table 1 that treatments affected significantly (P<0.05) fertility rate. The highest (86.66%) and lowest (75.49%) fetility percentage were recorded in T3 and T5 respectively. Although the eggs were divided randomly in the treated groups, however, no obvious reason could be offered for the lower fertility in T5 as compared with other treatments. Also results indicated that treatments had a significant (P<0.05) effect on hatchability percentage based on both total and fertile eggs. The highest values were obtained from eggs treated with 5% glucose, whereas the lowest hatchability percent was observed in eggs treated with 15% glucose. This reduction in hatchability percent may be due to the sticky eggs shell that affected the respiration and lead to embryonic mortality. These results are in agreement with those reported by Mosaad *et al.* (2011) and Moran and Reinhart (1981) who reported that providing eggs with glucose and antibiotics improved the hatching success. Ipek *et al*. (2004) and Salmanzadeh (2012) found that *in ovo* injection of hatching eggs with different glucose solution levels had a significant effect on hatchability percentage.

Spraying eggs with different levels of glucose solution had a significant effect on early, late and total embryonic mortality percentage. The lowest early embryonic mortality was obtained in T3 (5.13%) compared with T2 (11.58%) and T5 (15%). However, late embryonic mortality was lower in T2 (6.92%) as compared with T1 (15.51%,), T4 (21.05 %) and T5 (32.50 %). In addition, the lowest total embryonic mortality was for T1 (23.02%). These results were in contrast with the finding of Ipek *et al*. (2004) who found that *in ovo* injection of hatching eggs with different levels of glucose had no significant effect on late embryonic mortality. Finally, chick weight at hatching was significantly (P<0.05) affected by treatments. The higher chick weight at hatching was recorded in T5 (10.70 g) compared with values of T1 (9.15g), T2 (8.98g), T3 (9.19g) and T4 (8.93g). These results was in agreement with finding of Salmanzadeh (2012) who found that *in ovo* injection hatching eggs with different levels of glucose had a significant effect on chick weight at hatching. While, these results was in contrast with finding of Ipek *et al*. (2004) who found that *in ovo* injection of hatching eggs with different levels of glucose had no significant effect on chick weight at hatching.

Conclusion

It was concluded from this study that spraying Japanese quail hatching eggs with 5% glucose solution and 0.025 g Gentamycin/100 ml would improve hatchability and reduce embryonic mortality percent.

REFERENCES

Bjonnes PO, A Aulie and M Hoiby, 1987. Effects of hypoxia on the metabolism of embryos and chicks of domestic fowl. J Exp Zool, 1: 09-12.

Christensen VL, MJ Wineland, GM Fasenko and WE Donaldson, 2001. Egg storage effects on plasma glucose and supply and demand tissue glycogen concentrations of broiler embryos. Poult Sci 80: 729-735.

Dreiling CE, FS Carman, and DE Brown, 1991. Maternal endocrine and fetal metabolic responses to heat stress. J Dairy Sci, 74: 312-327.

Duncan DB, 1955. Muttipe Range and Muttiple F test. Biometrics, 11: 1-42.

Elwyn DH and S Bursztein, 1993. Carbohydrate metabolism and requirements for nutritional support: Part III. Nutrition, 9: 255-267.

Hamer MJ and AJ Dickson, 1989. Influence of developmental stage on glycogenolysis and glycolysis

in hepatocytes isolated from chick embryos and neonates. Biochem Soc Trans, 17: 1107-1108.

Humphrey BD and SG Rudrappa, 2008. Increased glucose availability activates chicken thymocyte metabolism and survival. J Nutr, 138: 1153-1157.

Ipek A, U Sahan and B YIlmaz, 2004. The effect of in ovo ascorbic acid and glucose injection in broiler breeder eggs on hatchability and chick weight. Arch Geflugelk, 68 (3), 132 – 135.

John TM, JC George and ET Moran, 1987. Pre- and posthatch ultrastructural and metabolic changes in the hatching muscle of turkey embryos from antibiotic and glucose treated eggs. Cytobios, 49: 197-210.

John TM, JC George and ET Moran, 1988. Metabolic changes in pectoral muscle and liver of turkey embryos in relation to hatching: influence of glucose and antibiotic-treatment of eggs. Poult Sci, 67: 463-469.

Moran ET, 2007. Nutrition of the developing embryo and hatchling. Poult Sci, 86: 1043-9.

Moran ET and BS Reinhart, 1981. Providing glucose to turkey hatching eggs via pressure differential antibiotic dipping: Effects on hatchability, poultry quality and subsequent performance. Poult Sci, 60: 1544-1548.

Mosaad NA, EHA Shahein and AA Abdalla, 2011. Effect of dipping chicken eggs in glucose solutions on hatching chicks and subsequent growth. Egypt Poult Sci, 31: (351-360).

Saif MY, KE Nestor and KE McCracken, 1970. Tylosin tartarate absorption of turkey and chicken eggs dipped using pressure and temperature differentials. Poult Sci, 49: 1641-1649.

Salmanzadeh M, 2012. The Effects of In-Ovo Injection of Glucose onHatchability, Hatching Weight and Subsequent Performance of Newly-Hatched Chicks. Brazilian J Poult Sci, 14:137-140.

SAS/STAT, 2002. User Guide for Personal Computers. Release 6.12 SAS. Institute Inc, Cary, NC. USA.

Uni Z, PR Ferket, E Tako and O Kedar, 2005. In ovo feeding improves energy status of late-term chicken embryos. Poult Sci, 84: 764-770.

Vieira SL and ET Moran, 1999a. Effects of delayed placement and used litter on broiler yields. J Appl Poult, Res, 8: 75-81.

Vieira SL and ET Moran, 1999b. Effect of egg origin and chick posth-hatch nutrition on broiler live performance and meat yields. World's Poult Sci J, 56: 125-142.