Proc. 21st Ann. Con. Animal Science Association of Nigeria 18 – 22, 2016/ Port Harcourt

MCL 005: Effect of *In Ovo* Glucose administration on Fertility, Hatchability and Hatch Rate of Japanese Quail (*Coturnix coturnix japonica*)

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Abstract
The study was conducted to determine the effect of in ovo glucose administration on fertility, hatchability and hatch rate of Japanese quail (Coturnix coturnix japonica). Four hundred and ninety five quail eggs were randomly divided into 5 treatments of 99 eggs each labelled T_1, T_2, T_3, T_4 and T_5, respectively. The control group was without glucose administration while the rest were administered 0.1 ml sterilized water plus 1.8 mg of glucose on d-2, d-4, d-6 and d-8, respectively. The parameters measured were percentage fertility, hatchability and hatch rate. Results revealed significant ($p \leq 0.05$) differences in the number of fertile and hatched out eggs, percentage fertility and percentage hatchability. Eggs injected with glucose on d-4 and d-8 were observed to be more fertile while d-6 eggs had higher hatchability percentage compared to the other treatments. Percentage hatch rate was in the order $T_4 > T_5 > T_3 > T_1 > T_2$. It was concluded that for better fertility, hatchability and hatch rate, it is appropriate to administer glucose during incubation from d-6 to d- 8 when the embryo is developed enough to mobilise nutrient energy for subsequent development.

Key words: *in ovo*, glucose, fertility, hatchability, hatch rate, Japanese quail.

Introduction

Many factors play key roles in influencing hatchability efficiency and growth performance during embryonic and post-hatch life of chicks. These include the genotype, egg characteristics and also the incubation environment [1, 2]. Quail egg like other poultry eggs depend on nutrients within the egg during incubation. Reports by [3] indicate that the nutrients are needed for metabolic processes of the growing embryo during incubation period. According to [4], the injection of an amino acid mixture into growing embryos in broiler breeder eggs resulted in a higher body weight at hatch and at d-56 of age when compared with chicks from control embryos. The authors [5] also suggested that increase in hatching weight observed in 7-day-old embryos injected with amino acids could have been due to a higher content of amino acids in the yolk or the better utilization of amino acids by the embryo. Administration of vitamin D precursor into eggs from day 0 of incubation in Japanese quail has also been reported [6]. Weak hatchlings or embryonic deaths have been associated with energy deficiency [7]. There is the need to find ways of improving the energy store of developing eggs in order to enhance not only their growth and development, but also embryo survival. *In ovo* glucose administration is one of such ways. *In ovo* glucose administration is important in the initiation of embryonic development and furthermore, as a source of ready energy which can be broken down through anaerobic catabolism during incubation. *In ovo* injection of glucose according to [8] and [9], provides energy in broiler chickens embryos and, thus, improves egg hatchability, chick hatch-weight and performance of the chickens. However, such information is not extensive and conclusive especially with regards to Japanese quail. This study was carried out therefore to generate information on the effect of varying days of *in ovo* glucose administration on fertility, hatchability and hatch rate of Japanese quail (*Coturnix coturnix Japonica*).

Materials and Methods

This study was conducted at the Teaching and Research Farm of the Department of Animal Production Technology, Federal University of Technology Minna, Gidan Kwano Campus. Minna is located between

latitude 9^0 37' North and longitude 6^0 33' East. It is located in the Southern Guinea Savanna zone of North Central Nigeria. The Japanese quail eggs used in the study were purchased from a quail farmer in Minna. The eggs were from Japanese quail layers aged 36 weeks. The hens were fertilized by natural mating. Four hundred and ninety five quail eggs were used for the experiment. The eggs were incubated at 37.9° C and 62 % relative humidity. The eggs were divided into five treatment groups: treatment 1; the control (without glucose injection), treatment 2, 3, 4 and 5 were injected 0.1 ml sterilized water plus 1.8 mg of glucose per egg on d-2, d-4, d-6 and d-8, respectively of incubation. The dosage rate was adopted by deductive calculations from the report of [10]. The injection (in albumen) was carried out on the 2nd, 4th, 6th and 8th days post incubation after cooling for 10 minutes at a depth of 10 mm into the air cell using a 1ml/100 iu tuberculin injection of 29G x 1/2/ 0.33 x 13 mm. The injection was made via a pinhole which was made at the broad end of the eggs. Prior to *in ovo* injection, the injection site was disinfected with 70 % ethanol. Immediately after the injection, the site was disinfected again and sealed with melted paraffin wax. The eggs were then placed in trays and set in the incubator. Candling and detection of live embryos was carried out on d-13. Parameters evaluated were percentage fertility, hatchability and hatch rate. They were estimated using the formulas:

% hatchability = (number of eggs hatched out/number of fertile eggs) x 100.
% fertility = (number of fertile eggs/number of total eggs set) x 100.
% hatch rate = (number of eggs hatched out/number of eggs set) x 100.

Comparism of means was achieved using [11].

Results and Discussion

Table 1 shows the effects of *in ovo* glucose administration on number of fertile eggs and hatched eggs. Significant ($p \leq 0.05$) differences were observed in both parameters. Eggs injected with glucose from d-4 had higher number of fertile eggs and hatch out. The observation of [12] revealed that eggs administered glucose 72 hours post incubation show less developmental defects and lower mortality rate compared to those administered glucose at 21 hours. The low hatched out observed for the control could be due to lower energy availability to the embryos. Figure 1 and 2 shows the pattern of percentage fertility and hatchability of quail eggs due to *in ovo* glucose injection. Significant ($p \leq 0.05$) differences were observed in both parameters The higher % hatchability values observed for eggs injected from d-4 post incubation compared to those of the control, contradicts the report of [9] and [13] who reported higher values for the control in their study with broilers chicken eggs. The result however agrees with [14], who reported increase in % hatchability with increase in L-arginine *in ovo* injection in quail eggs. Figure 3 shows the result of the % hatch rate of quail egg as a result of *in ovo* injection of glucose. The higher % hatch rate observed for treatment 4 could be due to the fact that it is closer to the 7th day of incubation. The report of [15] shows that after 5.5 days of incubation, there is a slight increase in the developmental rate of quail embryos and from 8.5 days of incubation, the rate of development accelerates.

Conclusion

Results of the study indicate that *in ovo* glucose administration during incubation led to increase in fertility, hatchability and hatch rate % of Japanese quail eggs especially if done on the 4th, 6th and 8th day post incubation, respectively.

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Table1: Number of quail eggs set, fertile and hatched

Treatments	Set Eggs	Fertile Eggs	Hatched Out
T1	99	48^{c}	5^{d}
T2	99	42^{d}	3^{e}
T3	99	66^{a}	9^{c}
T4	99	53^{b}	17^{a}
T5	99	66^{a}	11^{b}
Total	495	275	45

T1 = control (no glucose); T2, T3, T4 and T5 = glucose administered at d-2, d-4, d-6 and d-8, respectively.

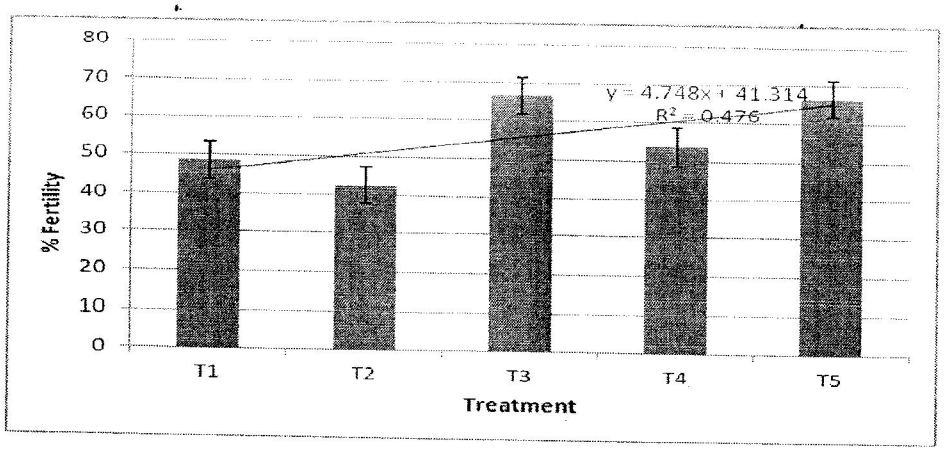

Figure 1: Percentage fertility of quail eggs after *in ovo* injection of glucose
T1 = control (no glucose); T2, T3, T4 and T5 = glucose administered at d-2, d-4, d-6 and d-8, respectively.

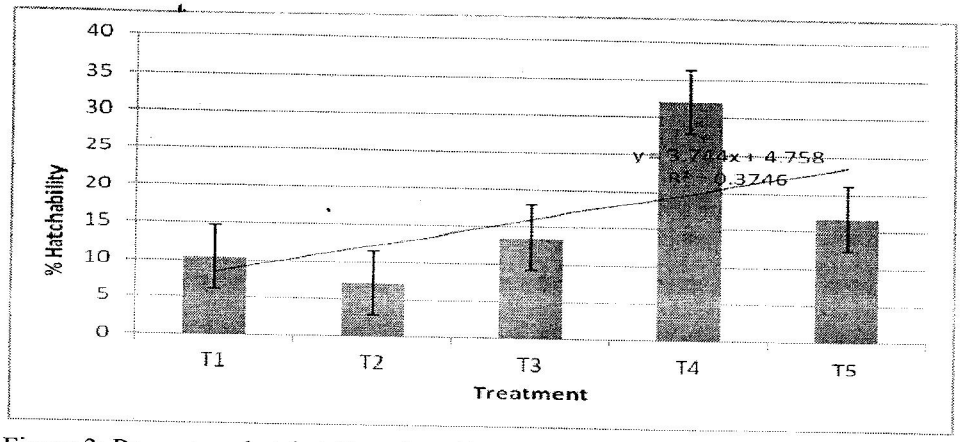

Figure 2: Percentage hatchability of quail eggs after *in ovo* injection of glucose
T1 = control (no glucose); T2, T3, T4 and T5 = glucose administered at d-2, d-4, d-6 and d-8, respectively.

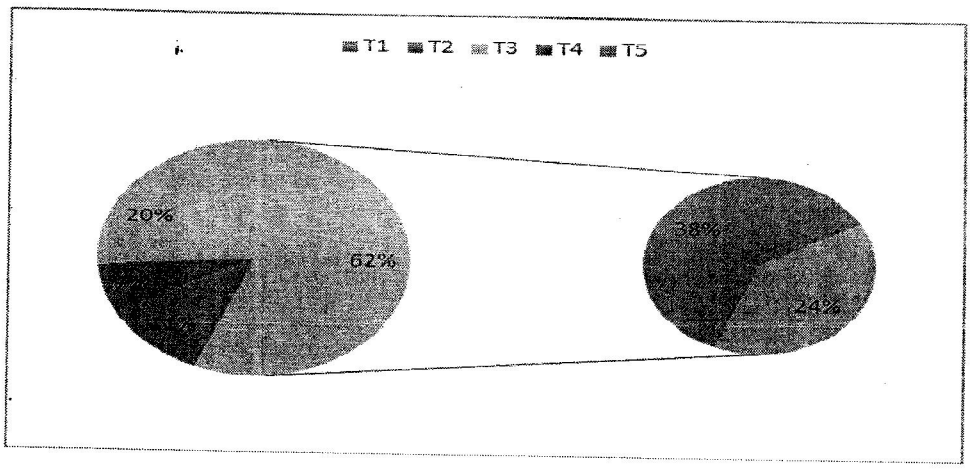

Figure 3: Percentage hatch rate of quail eggs after *in ovo* injection of glucose
T1 = control (no glucose); T2, T3, T4 and T5 = glucose administered at d-2, d-4, d-6 and d-8, respectively.