THE EFFECT OF TWO DIFFERENT BREEDS OF QUAIL ON HATCHABILITY.

NUR ATHILAH BINTI AZIZ

FACULTY OF AGRO BASED INDUSTRY (FIAT)

UNIVERSITI MALAYSIA KELANTAN

2018

UNIVERSITI MALAYSIA KELANTAN

The Effect of Two Different Breeds of Quail on Hatchability.

By

Nur Athilah Binti Aziz

A report submitted in fulfillment of the requirement for the degree of Bachelor of Applied Science (Animal Husbandry Science) with Honours.

Faculty of Agro Based Industry

UNIVERSITI MALAYSIA KELANTAN

2018

DECLARATION

I hereby declare that the work embodied in this Report is the result of the original research and has not been submitted for a higher degree to any universities or institutions.

_____

Student

Name: NUR ATHILAH BINTI AZIZ

Date:

I certified that the Report of this final project entitled "The Effect of Two Different Breed of quail on hatchability and day-old weight of quail." by Nur Athilah binti aziz, matric number F14A0220 has been examined and all the correction recommended by examiners have been done for the degree of Bachelor of Applied Science (Animal Husbandry Science), Faculty of Agro Based Industry, University Malaysia Kelantan.

_____

Supervisor

Name: DR. NWE NWE HTIN

Date

AKNOWLEDGEMENT

Assalamulaikum w.b.t, I would like to express my deepest appreciation to the Allah S.W.T, for His blessing and guidance both internally and externally throughout this final year project. He bestowed me with the success of such a challenging project.

A special thank you to my supervisor, Dr. Nwe Nwe Htin as she was very attentive towards me and guided me with patient until the end of the project. Besides, a thousand thank you to the Faculty of Agro Based Industry of University Malaysia Kelantan for their concern which allowed me to finish my final year project which helped me to explore more and learn something more valuable for the future.

Lastly, a special thank you as well to my parents for their support towards me which encouraged me to strengthen my heart and finish this final year project. They gave a lot of spirit for me to complete this project and without their support, spirit and encouragement, this project and this degree would not be possible.

Kesan dua baka burung puyuh pada penetasan.

ABSTRAK

Kajian ini bertujuan untuk mengkaji kesan dua jenis burung puyuh, *cortunix Japonica* (burung puyuh Jepun) dan *cortunix English* (White puyuh) berkaitan terhadap kebolehan penetasan dan berat puyuh sehari di bawah pengurusan penetasan yang sama dengan meletakkan kumpulan telur yang berlainan dalam inkubator yang mana; 9.50-10.00g, 10.51-11.50g, dan 11.51-12.50g. Lapan puluh satu biji telur puyuh Jepun dan lapan puluh satu biji telur puyuh Putih digunakan untuk menentukan kadar penetasan dan berat puyuh sehari untuk setiap baka. Berat telur bagi setiap kumpulan akan dikumpulkan dan direkodkan. Matlamat penyelidikan adalah untuk memperoleh baka puyuh yang baik pada penetasan dan berat puyuh pada hari pertama. Suhu penetasan dan kelembapan di telah ditetapkan mengikut susun atur harian untuk menetas seperti 37.5^{o}C, 65-70% kelembapan, pengudaraan yang baik dan menggerakkan telur 45^{0} empat kali setiap 6 jam pada masa yang ditetapkan dalam mesin inkubator. Dari data yang diperoleh, kedua dua jenis burung puyuh sangat ketara pada penetasan % dan embrio mati % tetapi tidak pada berat puyuh pada hari pertama penetasan (DOQ). Kedua dua baka jenis burung puyuh tidak mempengaruhi berat puyuh pada hari pertama.

kata kunci ** Baka burung puyuh * Penetasan * Berat * DOQ * Burung puyuh

The Effect of Two Different breeds of quail on hatchability.

ABSTRACT

This study was aimed to examine the effect of two different breed of quail, *cortunix Japonica* (Japanese quail) and *cortunix English* (White quail) related to hatchability and day-old weight of quail under the same hatching management by placing different groups of egg weight in incubator which are; 9.50-10.00g, 10.51-11.50g, and 11.51-12.50g. Eighty one of Japanese quail and eighty one of White quail were used to determine the rate of hatchability and day-old weight of quail for each breed. The egg weight of each group was collected and recorded. The research goal is to determine the better breed of quail on hatchability and day-old quail on body weight. Incubation temperature and humidity was set according to routine procedure for hatching of quail eggs such as 37.5^0C, 65-70% of humidity, good ventilation and turning the eggs 45^0 twice every day at the constant times in incubator machine. From the data revealed that both breed of quail affect significantly on hatchability % and dead embryo % but not on body weight of day-old quail (DOQ). The two different breed of quail do not significantly affect statistically on body weight of day-old quail (DOQ).

*keywords*** Quail breed* Hatching * weight* DOQ* Quail

TABLE OF CONTENTS

CHAPTER 2: LITERATURE REVIEW

CHAPTER 3: MATERIALS AND METHODES

.

LIST OF ABBREVIATION

SEM	Standard Error of the Mean
EWG	Egg Weight Group
EM	Effective Microorganisms

LIST OF SYMBOLS

%	Per cent
^{0}C	Degree Celsius
^{0}F	Fahrenheit
g	Gram

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 Background of study

Poultry sector is the biggest component of livestock industry in Malaysia which supplying about 81% of the total meat and about 100% egg demand by the domestic market. Quail is one of commercially livestock in poultry industry for the purpose of profitable eggs and meat production. Quail farming business is very easy, lucrative and entertaining. It is easy to maintain a quail farm, because quail only need small space for their production as they are the smallest species of poultry bird. According to Panda and Singh (1990) state that Japanese quails is the smallest avian species farmed for meat and egg production. Thus, there many people or farmers are interested in start farming business. However, they need to know which breeds of quail that have good characteristic for them as a starter quail farming business.

According to Skewes & Wilson (2003) state that the electronic control should be set at 99.5^0F (37.5^0C) and expected hatching time for Bobwhite quail was 23-24 day. The ideal temperature on a force-air incubator should be 37.5^oC with relative humidity at approximately 60 percent. Japanese quail eggs will hatch 16-18 days from the time they are set in the incubator (Ibrahim Seker *et al*., 2009). This research objective is to observe the effect of two different breeds of quail on hatchability and body weight of day-old quail Japanese quail breed or White quail breed.

1.2 Problem statement.

Quail farming gives high profits and receives high of customer demand. In addition, the hatchability of fertile eggs increase due to increasing parental age (Seker, Kul, and Bayraktar, 2004) . However, the hatchability and growth performance decreased with increasing length of storage and decreasing hatching egg weight (Petek, Başpinar, Oğan, and Balci, 2005). Besides, hatchability parameters are significantly influence by the eggs weight (Uddin, Paul, and Huque, 1994). The egg characteristics greatly influence the process of incubation (Narushin and Romanov, 2002). This research goal is to obtain the best breed of quail on hatchability and day-old quails on weight for two breed.

1.3 Objective of Study

i. To determine the effect of breed of two different on hatchability of quail eggs.

ii. To compare the day old quail weight of two different breeds.

1.4 Scope of study.

The Japanese quail (*Cortunix Japonica)* and White quail (*Cortunix English*) were used in this study. The quail production in poultry of two different breed quail was measured in term of hatchability.

1.5 Limitation of study

The limitation of this research was the candling process. Candling was an easy, quick way to check on the progress of the developing embryos and ensure the health of incubating eggs. This research not applied candling process because the UMK candling devices were broke.

1.6 Significance of Study.

The production of quails needs to manage as it was important to recover demand on chicken by using better quality quail breed. Therefore, this research was conducted to determine which breed of quail on hatchability and day-old quails weight.

1.7 Hypothesis.

H_O: Japanese quail and White quail have hatchability and day-old body weight.

H_i: White quail have higher hatchability and heavier day-old quail body weight.

CHAPTER 2

LITERATURE REVIEW

2.1 Background of Japanese quail *(Cortunix Japonica*)

Poultry sector is the biggest component of livestock industry demand by the domestic market in Malaysia. Poultry is a principle source of meat protein which is cheap and affordable as there are no dietary prohibitions among local culture and religious norms which are always being the issues among the citizens in Malaysia. Quail eggs are widely consumed and sold as novelty foods and they are notably smaller than duck and chicken eggs around the world (Vali, 2009).

Randall & Bolla (2008) stated that Japanese quails (*Cortunix Japonica*) are tough birds that can flourish in small cages as they are inexpensive to keep as well. Besides, Japanese quails are hardy and resistant to disease but they can affect by common poultry disease. Starting from 1993 until now, poultry breeding have become the most expensive developing branch of animal husbandry. This domestic quail show rapid growth and attains sexual maturity 5-6 weeks of age with a weight of 160-250 (Imelda, 1997).

It was also reported that, the Japanese quail had high ability to survive and low rate of mortality. The mortality rate of Japanese quail was dependent on the fattening performance of different group. The decreasing of group size, the decreasing that mortality rate (Ibrahim Seker *et al*., 2009).

2.2 Taxonomy of Japanese Quails *(Cortunix japonica)*

Kingdom: Animalia

Phylum: Chordata

Class:Aves

Order:Galliformes

Family: Phasianidea

Genus: Cortunix

Species: Japonica

Figure 2.1: Taxonomy of Japanese quails (Termmink and Schlegel, 1849)

2.3 Background of White quail (*Cortunix English)*

The White Quail first appeared in print in *The North American Review* in 1935 and it is an identification with the land and nature as a living entity. According to Meyer and Michael J (2008) the way to rearing quail on nature, the surrounding needs to change to fit the conception of artificial atmosphere because this animal is wild animals.

2.4 Taxonomy of White Quails (C*ortunix English)*

Kingdom: Animalia

Phylum: Chordata

Class:Aves

Order:Galliformes

Family: Phasianidea

Genus: Cortunix

Species: English

Figure 2.2: Taxonomy of White quails (Termmink and Schlegel, 1849)

2.5 The physical effect of eggs characteristic on hatchability.

The embryo development and successful hatching process played an important role in the physical characteristic. Firstly, the eggs parameters most influenced such as weight, shell thickness and porosity, shape index, length ratio and the content consistency. According to Narushin *et al*.(2002), the requirement for the embryo's development was mostly meet the physical characteristic average value. The thicker the shell than average, the incubation process would more successful. This was means the eggs parameter not falls in to average range, and the eggs are more pointed rather than round and the contents firm.

The thicker shells and firmer interiors lead to in eggs weight increase. The heavier eggs result in more successful embryo hatching. However, a breakdown in the interactions of parameter and a collapse in physiological function leaded any abnormality eggs physical character. Between 20-40% failure consequences of chicken eggs still fail to hatch (Narushin *et al*., 2002).

There was relationship between hatchability and egg weight of the quail. The higher the egg weight, the lower the hatchability. The correlation between egg weight and hatchability was reported when 10g increase in egg weight would lower the 10.7% rate of egg hatchability (Narushin and Romanov, 2002). Whereas decrease 10g in egg weight would lower the 3.9% rate of egg hatchability. The good hatchability as far as chicken, turkey, duck and ostriches are preferable to have eggs weight average(Narushin and Romanov, 2002).

The hatchability of incubated eggs in hen is lower in light eggs than heavy eggs. However, the hatchability of incubated eggs in quail is higher in light eggs than heavy eggs. A greater weights of eggs higher the percentage of the dead embryos for quail eggs (Narushin and Romanov , 2002). The increase in eggs weight above the optimum value lowered hatchability of eggs. Therefore, the eggs with higher hatchability are from optimum value of eggs will used. Thus, eggs characteristics greatly influence the process of incubation by interacting with the chain of both physiological and energetic features of the developing embryo (Michael and Ramanov, 2017).

Besides, shell parameters play part on egg hatchability where the egg shells have two functions during development of embryo. Firstly, the thick eggshells and strong surface will protect the embryo development from external. Second, the shell must be fragile and thin sufficiently for easy the chick pass the barrier to the hatching process. Thus, the optimum shell parameter will be used in this research (Narushin & Romanov, 2002)

Next, the pores of shell act to supply the developing embryo with oxygen and high pore concentration will not allow penetration of pathogenic micro-flora into the egg. The normal shape of quail eggs hatch more successfully. The abnormally shape of quail eggs change the orientation at embryonic development stage in egg (Narushin & Romanov, 2002). The hatchability of eggs wills less success if the eggs are more rounded eggs will be consider in this research.

2.6 The parental age on hatchability and day-old quail weights.

According to Seker *et al.*, (2004) the age of 10 weeks in respect of the fertility had good performance and better hatchability of incubate eggs in hens. Thus, the young of parental eggs, the more successful on hatchability, but in were hen. The parental age of quail is important factor in successful on hatchability and day-old quail weight. The parental age of quail on age of 10 and 20 weeks have significant effect only on the fertility and the hatchability of fertile eggs. However, it is no significant effect on the day-old quail weight.

Besides, the weight of egg had an effect on the quail weight which the quail weights increase due to increase in egg weight. The parental ages are the factor that effect significantly on fertility. According to Seker *et al*.,(2004) the parental weight age of both groups consisting of 22 and 65 weeks age was no effect on chick weight. The hatchability of fertile eggs in age groups of 10 week and 20 weeks of Japanese quail was between 74.72% and 69.44% respectively (Seker *et al*.,2004) . In addition, the young group was higher hatchability of fertile eggs compared with the older group (Seker *et al*.,2004)

According to Sahan *et al*., (2000) reported that the parental age affected the embryo mortality in early middle and late periods and that rate is excessive in hens with 66 weeks age. Regarding to the fertility for the Japanese quail at 20 and 10 weeks age, the fertility of the group of 10 weeks is found lower than the value of 87% at age of 11-13 weeks age (Dixon *et al*., 1990).

2.7 The quail breed production.

In order to provide good production of quail, the selective breeding is the most important technique, to improve the genetic potential of birds in a given set of environmental condition. According to Daida & Rani (2017) state that the body weight gain of the progeny is higher at 3 weeks of age (50.29±0.94g) and at the end of six weeks of age the body weight gain of progeny is observed to be (38.68±0.65g) for female quail birds' performance and the body weight gain and feed conversion ratio of the progeny were ranged from 17.14±0.26g to 34.64±0.52g and 2.36±0.04 to 5.17±0.07 at first week of age to six weeks of age for male quail birds' performance.

That report showed that the growth and production performance can be enhanced through selection process. The body weight was increased as age increases in both male and female quail population. Body weight gain increased up to 3weeks for Japanese quail. Besides, the egg production of quail is effect by the housing system.

According to Ahmed (2015) state that the total egg production per cent was 63.54±1.68 and 46.67±1.6% for the quails reared on the battery cages and floor pens, respectively. That reported show that there were highly significant differences ($P < 0.001$) in the total egg production due to the housing system.

In addition, the production of quail weight effect on taking of effective microorganism (EM) in quail drinker (Sharifuddin, 1995) . Quail Production Quail production is a relatively new agricultural industry in Malaysia. To ensure profitability, farmers were use agrichemicals to maximize weight gain, control diseases and reduce excitement.

According to Sharifuddin (1995), state that he birds were divided into two groups, with and without EM in their drinking water. Birds that received EM in drinking water (1:1,000 dilutions) showed a higher weight gain of 6 percent; lower mortality rate, from 28 to 22 percent; and lower slaughter age, from 38 to 35 days, compared with birds that didn't receive EM. Thus, EM is proven that can provide substantial economic benefit to the quail production.

2.8 The market of quail in Malaysia.

The chick of day-old quail normally is selling RM0.25/chick and the meat of quail is around RM16-RM18/kilogram in Malaysia. The rearing quail is more easy because of the small quail size, lower cost of feed and treatment, do not spent higher on labour cost and it is better management.

According to Siddique and Mandal (1996) state that the layer quail farms costs were lower, compared to quail breeding farms. The differences in costs were highly statistically significant. Thus, people in Malaysia prefer to do quail rearing in large scale than small scale as hobby. It was reported by Economics of Japanese quail farming in Dhaka. The author reported that, the larger layer quail farm are more profit earners than the small layer quail. Therefore, quail farming can be a greatly supplement income and protein requirements in the country.

CHAPTER 3

MATERIALS AND METHODES

3.1 The eggs weight and day-old weight of Japanese quail and White quail.

This research was conducted at Jeli Campus of University Malaysia Kelantan, Malaysia. The 81 egg Japanese quail (*Coturnix japonica*) and 81 eggs White quail *(Coturnix English*) were used to conduct the research project were obtained from the local farmer.

Firstly, the eggs which was from quail breeder needed to check if there any cracked or broken eggs. The cracked or broken eggs were discarded. The egg was separating based on their weight, normal size, and cleanliness. The weights of eggs were weighed by using an electronic scale with sensitivity 0.01g. The normal size of eggs is not too big and not too small. The dirty eggs were discarded. The weights of eggs of Japanese quail and White quail were grouped according to their weight as follows; 9.50-10.00g, 10.51-11.50g, and11.51-12.50g.

The collected eggs were numbered due to the above mentioned weight group according to the breed then they were set in incubator under 37.5^{o}C with relative humidity of 70-75%. The mean values of egg weight used in this experiment are indicated in appendices.

3.2 Incubator management.

3.2.1 Temperature of incubator.

The best temperature for hatching eggs will be 99.5°F (37.5°C). Too high or too low temperature would kill the embryo. The eggs were set under 37.5°C during incubator period and then kept under 37°C at release stage which is 14 day. This is because the chick generates their own heat at release stage. The temperature of incubator should adjust to maintain the proper check temperature. According to Randall & Bolla (2008) the normal incubating temperature for Japanese quail was 38.3°C (101°F) for the first week, 38.8°C (102°F) for the second week and not exceeding 39.5°C (103°F) until hatching is completed.

3.2.2 Humidity of incubator.

Before placing the eggs in the incubator, allow cools eggs to warm slowly to room temperature and stored for one day or not more than 4 days for best hatch rate. The relative humidity should not fall below 25% or above 60% between setting and three day to hatching. During the last three day, the humidity level should be increase to between 70-80%. The area humidity was playing role in give an impact on how much water to keep in incubation to get correct humidity range. The water level need to check to avoid water dries out. The water was to add every day (Archer and Cartwright, 2000) .

3.2.3 Turning of incubator.

The eggs will be turned 4 times in 6 hour during the incubation period. However, this research was using automatic incubator which automatically turning the egg. After 14 day of hatching, the eggs were put horizontally in the hatching chamber. Do not turn eggs during the last three day before hatching. This is because, the embryos are moving into hatching position (Archer and Cartwright, 2000).

3.2.4 Ventilation

The ventilation requirements for hatching process were controlled automatically in the incubator.

3.3 Fertility, embryonic mortality and day-old quail quality of two different breed of quail.

The data for fertility %, hatchability % and dead embryo % were calculated as follows:

(%) Non-fertile = (number of non-fertile/ total numbers eggs place into incubator) x 100

(%) Dead embryo= (number of dead embryo/ total numbers eggs place into incubator) x 100

(%) 1^{st} class of quail = (number of 1^{st} class of quail/ total numbers eggs) x 100

(%) 2^{nd} class of quail = (number of 2^{nd} class of quail/ total numbers eggs) x 100

(%) Fertility= (number of fertility eggs/ total numbers eggs place in incubator) x 100

(%) Hatchability of incubated eggs= (number of release chicks/ total number of egg placed into incubator) x 100

(%) Hatchability of fertile eggs= (number of released chicks/number of fertilized eggs placed into incubator) x 100

Ibrahim Seker *et al*. (2009), the data for fertility %, hatchability % and dead embryo % were stated. But, only the effect of quail breed on hatchability % and body weight of day-old quail was statistically analyzed.

3.4 Statistical Analysis

The data were statistically analyzed using the General Linear Modal (GLM) produce of SAS for the effect of breed on hatchability %, the effect of egg weight on hatchability %, the effect of breed and egg weight on hatchability %, the effect of breed on day-old body weight of quail, the effect of egg weight on day-old body weight of quail, the effect of breed and egg weight on day-old body weight of quail, the effect of breed on dead embryo %, the effect of egg weight on dead embryo % and the effect of breed and egg weight on dead embryo %. The least square for two breed were used Duncan Multiple Range Test (DMR) test. Statements of statistical significant were based on ($P<0.05$).

CHAPTER 4

RESULTS

Table 4.1: The effect of breed on hatchability % (Mean ± SEM)

Breed	Hatchability %
Japanese quail	51.85 ±5.24[b]
White quail	79.01 ±6.53[a]

[a-b,] ,The different superscripts within a column significant at (P<0.05).

Regarding with hatchability %, breed of Japanese quail had significant effect on hatchability % (P>0.05). The White quail breed had significantly higher hatchability % than Japanese quail. The significant hatchability % on breed of quail was indicated in Table 4.1.

Table 4.2: The effect of egg weight on hatchability % (Mean ± SEM)

Egg weight group (EWG)	Hatchability %
EWG 1	72.23 ± 4.76[a]
EWG 2	66.67 ± 9.07[a]
EWG 3	57.41 ± 12.31[a]

[a-b,] ,The different superscripts within a column significant at (P<0.05).

EWG 1 = 9.51 -10.50 gram.

EWG 2= 10.51 -11.50 gram.

EWG 3 = 11.51-12.50 gram.

The egg weights do not have significant on hatchability % between two different breeds (Japanese quail and White quail). It was indicated in Table 4.2

Table 4.3: The effect of breed and egg weight on hatchability % (Mean ± SEM)

Egg weight group (EWG)	Breed	
	Japanese quail	White quail
EWG 1	66.67 ± 6.41[a]	77.78 ± 6.41[a]
EWG 2	51.85 ± 3.71[ab]	81.48 ± 3.35[a]
EWG 3	37.03 ± 7.41[b]	77.78 ± 16.97[a]

[a-b,] ,The different superscripts within a column significant at (P<0.05).

EWG 1 = 9.51 -10.50 gram

EWG 2= 10.51 -11.50 gram

EWG 3 = .11.51 -12.50 gram

Within a breed (Japanese quail) effect of egg weight on hatchability % of quail was noted. The egg weight group 1 (EWG 1) had significantly highest hatchability % (P>0.05, Table 4.3)

Table 4.4: The effect of breed on day-old body weight of quail (Mean ± SEM)

Breed	Day-old body weight (gram)
Japanese quail	7.85 ± 0.14[a]
White quail	7.80 ± 0.18[a]

[a-b,] ,The different superscripts within a column significant at (P<0.05).

Regarding with day-old body weight of quail, the breed of quail (Japanese quail) do not show significant effect. The breed of the quail do not have significant effect on body weight of quail between two different breeds (Japanese quail and White quail).It was indicated in Table 4.4.

Table 4.5: The effect of egg weight by day-old body weight of quail (Mean ± SEM)

Egg weight group (EWG)	Day-old body weight (gram)
EWG 1	7.87 ± 0.20[a]
EWG 2	7.82 ± 0.20[a]
EWG 3	7.77 ± 0.21[a]

[a-b,] ,The different superscripts within a column significant at (P<0.05).

EWG 1 = 9.51 -10.50 gram

EWG 2= 10.51 -11.50 gram

EWG 3 =11.51 -12.50 gram

There was no significant effect of egg weight of the quail on body weight of day-old quail when Japanese quail and White quail breeds were compared. (P<0.05, Table 4.5).

Table 4.6: The effect of breed and egg weight on day-old body weight of quail (Mean ± SEM).

Egg weight group (EWG)	Breed	
	Japanese quail	White quail
EWG 1	7.80 ± 0.36[a]	7.85 ± 0.28[a]
EWG 2	7.87 ± 0.36[a]	7.87 ± 0.27[a]
EWG 3	7.73 ± 0.37[a]	7.82 ± 0.30[a]

[a-b,] ,The different superscripts within a column significant at (P<0.05).

EWG 1 = 9.51 -10.50 gram

EWG 2= 10.51 -11.50 gram

EWG 3 = .11.51 -12.50 gram

The breed and egg weight of the quail do not significant effect on body weight of day-old quail in both breeds were noted. (P>0.05, Table 4.6).

CHAPTER 5

DISCUSSION

Based on the data from this experiment, indicated that breed of quail had significant effect statistically on hatchability % of quail ($P<0.05$) given in Table 4.1. Significantly higher effect by hatchability % was identified in Japanese quail breed compared to White quail breeds (70.01% > 51.85%) respectively.

The egg weight of quail did not have significant effect on hatchability % of both quail breed (Japanese quail breed verses White quail breed). This result was consistent with the report (Ramaphala and Mbajiorgu, 2013). The author indicated that the size of the egg had no significant effect on fertility % and hatchability % of the egg, but it was study on broiler chicken. According to Rashid *et al*. (2013), egg weight of quail had significant effect on hatchability % and larger eggs had higher hatchability % than that of smaller eggs. But they studied only on Japanese quail breed. The result found that the egg weight of quail had no significant effect on hatchability % was indicated in ($P<0.05$, Table 4.2).

There was no significant interaction between breed and egg weight on hatchability %, and body weight of day-old quail ($P>0.05$, Table 4.6). But, it was quite interesting that the significant effect of egg weight on hatchability % only with Japanese quail breed. The data showed that smaller egg weight (9.51-10.50g) had higher hatchability % and lower dead embryo % ($P>0.05$, Table 4.3).

It was supported by finding Yannakapoulus and Tservesi-Gousi (1987). This finding also was in agreement with the report by (Elibol & Brake, 2017). Those authors also reported that there was decrease hatchability % with larger egg weight.

Regarding with body weight of day-old quail, breed and egg weight had no significant effect (P>0.05, Table 4.4 and Table 4.5). This result was not agreement with (Yannakapoulus and Tservesi-Gousi, 1987). In their studies, the egg obtained from Japanese quail breed in weight groups of 8.59g, 9.52g and 10.56g were used. They reported that the egg weight indicated a positive correlation on the body weight of day-old quail and the eggs in the middle weight (9.10-10.0g) could ensure a successful incubation.

In this study, the egg weight of quails less than 9.50g were not used. Only egg weights of above 9.50g were used in this experiment. The egg weight used in the present experiment was larger than 10g. Therefore it was assumed that the egg weight larger than 10g did not have significant effect on body weight of day-old quail.

In conclusion, this study reveal the significant effect of breed on hatchability % and dead embryo % of quail (P>0.05), but not significant affect on body weight of day-old quail.

CHAPTER 6

CONCLUSION

The data from this research reveals that the breed of quail affect significantly on hatchability % but not on body weight of day-old quail. The egg weight of quail had no significant effect statistically on hatchability % and body weight of day-old quail. There is no interaction between breed and egg weight on hatchability % and body weight of day-old quail. The significant effect statistically of egg weight on hatchability % is noted only within Japanese quail breed.

RECOMMENDATION

It is quite interest to conduct further study on the effect of the other quail breed on hatchability % and quality of day-old quail as there are many other different quail breeds. Besides, many factor that are related with quail breed such as embryonic mortality %.

REFERENCES:

Ahmed, S. A. (2015). Effect of housing system and sex ratio of quails on egg production, fertility and hatchability., (October).

Catwright, A. L. (2000). Incubating and Hatching Eggs. *The Texas A&M University System*, 1–12.

Dixon, R.J., G.G. Arzey and P.J. Nickholls, 1992.

Production, hatchability and fertility of egg from breeding japanese quail (Cortunix coturnix japonica) fed diets containing furazolidone. Br. Poult. Sci., 33:835-845.

Daida, K., & Rani, M. S. (2017). Selective Breeding of Japanese Quails for Improvement of Performance, *6*(4), 2500–2506.

Elibol, O., & Brake, J. (2017). Effect of Egg Weight and Position Relative to Incubator Fan on Broiler Hatchability and Chick Quality 1, (December), 1–6. https://doi.org/10.3382/ps.2008-00014

Hussain, J., M. Akram, K. Javed, H. A. Ahmad, A. Mahmud, S.Mehmood, S. Ahmad, F. Ahmad, A. S. Jatoi, Y. Abbas and Hussnain. F. 2016. Quail Breeder's Production Performance In Response To Selection For Higher Three Weeks Body Weight. The Journal of Animal & Plant Sciences, 26(3): Page:588-593 ISSN: 1018- 7081

Imelda, S. (1997). Behavior of japanese quai (cortunix japonical) kept in semi-natural aviiaries.

Retrieved from http;//evolution. data. unibe.ch/WelfarePdfs?Schmid_AABS1997.pdf.

N.O.Ramaphala and C.A. Mbajiorgu. (2013). Effect of Egg Weight on Physical.Pdf.

Narushin, V. G., & Romanov, M. N. (2002). Egg physical characteristics and hatchability. *World's Poultry Science*, *58*(3), 297–303. https://doi.org/10.1079/WPS20020023.

Panda B., R. P. Singh, 1990. Developments in processing quail meat and eggs, *word's Poultry Science Journal*, 46(3), 219-234.

Petek, M., Başpinar, H., Oğan, M., & Balci, F. (2005). Effects of egg weight and length of storage period on hatchability and subsequent laying performance of quail. *Turkish Journal of Veterinary and Animal Sciences*, *29*(2), 537–542.

Randall, M., & Bolla, G. (2008). Raising Japanese quail. *Primefact. 602. Second Edition*, (January), 1–5. https://doi.org/10.1017/CBO9781107415324.004

Rashid, A., Khan, S. H., Abbas, G., Amer, M. Y., Ahmad Khan, M. J., & Iftikhar, N. (2013). Effect of egg weight on hatchability and hatchling weight in Fayoumi, Desi and crossbred (Rhode Island Red X Fayoumi) chickens. *Veterinary World*, *6*(9), 592–595. https://doi.org/10.5455/vetworld.2013.592-595

Sahan, U . and A.Ipek,2000. Effect of breeder age and incubation humidity on hatching characteristic of broiler breeder eggs.J. Poult. Res.,2:2:11-14.

Seker, I., Kul, S., & Bayraktar, M. (2004). Effects of parental age and hatching egg weight of japanese quails on hatchability and chick weight. *International Journal of Poultry Science*, *3*(4), 259–265. https://doi.org/10.3923/ijps.2004.259.265

Sharifuddin, H. A. H. and A. R. Z. 1991. (1995). Research on nature farming system in malaysia: Application of EM Technology., (September 1990).

Siddique, S. A., & Mandal, M. A. S. (1996). Economics of Japanese Quail Farming in Dhaka Metropolitan City, *2*, 71–84.

Skewes, P. A., & Wilson, H. R. (2003). Bobwhite Quail Production, 1–21.

Temmink & Schlegel, 1.ITIS report. Retrieved Nov 15, 2017 , from IT IS report:

http://www.itiw.gov/servelet/SingleRpt?search_topic=TSN& search _value=176013.

Uddin, M. S., Paul, D. C., & Huque, Q. M. E. (1994). effect of egg wieght and pre-incubation holding periods on hatchability of japanese quails eggs in different seasons. *AJAS*, *7*.

Vali, N. (2009). Probiotic in Quail Nutrition: A Review. *International Journal of Poultry Science*, *8*(12), 1218–1222. https://doi.org/10.3923/ijps.2009.1218.1222

Yannakapoulus, A.L. and A.S. Tservesi-Gousi, 1987.

Relationship of parents age and hatchability egg weight and shell quality to day-old chick weight as influenced by oviposition time. Poult.Sci., 66: 829-833.

APPENDICES A

4.7 The egg weight of quail from two different breeds were grouped as indicate in table 4.7.1(a), 4.7.2(b),4.7.3(c), 4.8.1(a), 4.8.2(b) and 4.8.3(c) respectively.

4.7 The egg weight (Mean ± SEM) according to Japanese quail and replication were indicated in table 4.7.1(a), 4.7.2(b) and 4.7.3(c) respectively.

Table 4.7.1 (a): The egg weight of Japanese quail (Mean ± SEM) of replication 1.

Type of breed	Group of eggs weight	No. of eggs	Egg Weight(g) Japanese quail (Mean ± SEM)
Japanese quail	1	5	10.31 ± 0.06
	2	5	11.27 ±0.05
	3	4	12.12 ± 0.09

Table 4.7.2(b): The egg weight of Japanese quail (Mean ± SEM) of replication 2.

Type of breed	Group of eggs weight	No. of eggs	Egg Weight(g) Japanese quail (Mean ± SEM)
Japanese quail	1	7	10.27 ±0.07
	2	4	11.34 ±0.04
	3	2	11.87 ±0.08

Table 4.7.3 (c):The egg weight of Japanese quail (Mean ± SEM) of replication 3.

Type of breed	Group of eggs weight	No. of eggs	Egg Weight(g) Japanese quail (Mean ± SEM)
Japanese quail	1	6	10.37± 0.05
	2	5	11.39± 0.03
	3	4	12.10± 0.11

Table 4.8.1 (a): The egg weight of White quail (Mean ± SEM) of replication 1

Type of breed	Group of eggs weight	No. of eggs	Egg Weight(g) White quail (Mean ± SEM)
White quail	1	7	10.19± 0.07
	2	8	11.15 ±0.12
	3	9	12.0±0.10

Table 4.8.2 (b): The egg weight of White quail (Mean ± SEM) of replication 2

Type of breed	Group of eggs weight	No. of eggs	Egg Weight(g) White quail (Mean ±SEM)
White quail	1	8	10.30 ±0.06
	2	9	11.10± 0.08
	3	4	12.05±0.12

Table 4.8.3(c): The egg weight of White quail (Mean ± SEM) of replication 3.

Type of breed	Group of eggs weight	No. of eggs	Egg Weight(g) White quail (Mean ± SEM)
White quail	1	6	10.10 ±0.07
	2	5	11.22 ±0.07
	3	8	12.10 ±0.11

Figure A.1: Collect the egg from quail farm.

Figure A.2: The eggs were grouped.

Figure A.3: The eggs were arranged follow by group weight.

Figure A.4: The eggs were put in incubator

Figure A.5: The water was prepare for machine humidity

Figure A.6: The body weight of day-old quail was weight