Effect of Cleaning and Storing on Hatching Time and Hatching Weight of Mojosari Alabio (MA) Crossbred Duck Eggs

Pengaruh pembersihan dan penyimpanan terhadap waktu penetasan dan berat tetas telur itik persilangan Mojosari Alabio (MA)

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ABSTRACT. The hatchability of duck eggs is influenced by handling before the eggs are placed in the incubator. The research was conducted in Bengkulu City from September to October 2021 to determine the effect of cleaning and storage before incubation of MA duck eggs from crossing Mojosari males and Alabio females on hatching time and hatching weight. The research was conducted using a completely randomized factorial design (4x6). The first factor is cleaning with three treatments, namely control or no cleaning (L0); cleaning using two ml/l disinfectant (L1), cleaning using warm water (L2), and cleaning with distilled water (L3). The second factor is the storage time, namely P0= 0 days, P1= 1 day, P2= 2 days, P3= 3 days, P4= 4 days, and P5= 5 days. There were eight repetitions of each treatment. According to the study, there was an average of 96% egg fertility and 87.45% hatchability. There was no interaction effect (P>0.05) between cleaning and storage on egg hatching time. Cleaning with disinfectant or distilled water shortened the incubation time. Cleaning with distilled water without storage resulted in the highest hatching weight of duck eggs (L3P0) but was not significantly different from treatments L0P1, L1P0, L1P3, L1P5, L2P0, L3P0, and L3P3. Hatching weight is influenced by the interaction effect between egg cleaning and storage.

Keywords: fertility, hatchability, hatching time, hatching weight, MA ducks

INTRODUCTION

The increased preference for duck eggs and duck meat caused a high demand for duck eggs and duck meat. This increased demand is due to the increase in consumer income and wealth. The demand for the duck industry should be supported by the success of supplying one-day-old duck (DOD). The primary elements of reproductive performance and significant economic drivers in the duck industry are fertility and hatchability.

To be able to maintain the continuity of the availability of DOD, it is necessary to handle the eggs, starting from the ducks in the cages to the process of hatching the duck eggs. The use of an incubator for hatching has advantages, including the more significant number of eggs that are hatched at relatively the same time (Nafiu et al., 2014). Along with the development of technology, hatchery is getting more modern and more accessible to implement. The incubator machine is a tool that helps to incubate eggs by imitating the natural state when the brood-stock incubates the eggs (Ahaya and Akuba, 2018). Hatching with an

*Corresponding author: taufikhidayatveydo@gmail.com
Received: 14 August 2023
Revised: 6 March 2024
Accepted: 20 March 2024
DOI: https://doi.org/10.17969/agripet.v24i1.33657

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incubator can also increase the scale of egg production and hatchability because the environmental aspects needed in the hatching process, such as temperature and humidity can be adjusted precisely. Hatching using an incubator is more effective and efficient than hatching naturally (Zakaria, 2010), so farmers prefer to incubate eggs using an incubator (Wakhid, 2016).

The main factors that influence the success of using an incubator in hatching duck eggs are temperature and humidity in addition to air circulation, screening, cleanliness, and hygiene. Production, reproduction performance, and adaptability of the duck varied depending on the type of duck. The relationship between egg weight and hatching weight is thought to be due to nutrient factors (Widianingrum et al., 2020). Egg quality will affect DOD quality. In addition to the hatching process, DOD quality is also influenced by the selection of broodstock. One type of duck that is well known for its superiority is the Master Duck (MA). Master Ducks (MA) are ducks developed by the Indonesian Research Institute for Animal Production (IRIAP MA). They are the result of a cross between Mojosari ducks and Alabio ducks. The advantages of MA ducks include faster body growth, shorter first egg-laying age, high egg productivity, and faster production consistency. MA duck egg productivity at the age of 8 months reaches 80% with an egg weight of 69.7 grams and an average production of 265 eggs/year. According to Susanti and Kumalawati (2019), MA ducks are producers of ducks that have high productivity and adaptability. The presence of MA ducks can increase genetic diversity. MA ducks have high egg productivity, so they are known as laying ducks (Suryana, 2013).

The demand for MA ducks in Bengkulu Province is currently relatively high. Because it is in great demand by the public, technology that can increase the hatchery scale and reduce the embryo mortality rate during the hatching process is needed. One of the technologies that can be applied to the hatching process is cleaning duck eggs by wiping. Egg drying is critical because it is included in the sanitation process. Egg wiping usually uses equipment to keep it clean and avoid pathogenic microorganisms (Nandhra et al., 2015).

The results of the study by Septiyani et al. (2016) showed that wiping duck eggs with 100 grams of betel leaf extract (Piper betle L) effectively increased hatchability and reduced embryo mortality by 16.46%. Nandhra et al. (2015) added that betel leaf extract in dipping Mojosari duck eggs with a concentration of 10% had the highest effect on hatchability and lowest mortality. Meanwhile, the sanitation process, namely wiping quail eggs using noni leaf extract, can reduce embryo mortality (Mirawati et al., 2020). Rosidi (2018) explained that handling salt water with the spray technique on duck eggs hatched using an incubator, can also affect fertility and hatching time. The sanitation process can also be done by wiping using disinfectants, namely formaldehyde, iodine, alcohol, potassium permanganate, and phenol. The wiping process that uses high concentrations of disinfectants can affect egg hatchability (Septiyani et al., 2016).

Egg hatchability is the number of eggs that hatch compared to the number of fertile eggs and is expressed as a percentage. Egg quality (including its treatment and storage) affects hatchability and temperature, and relative humidity also significantly impacts the outcome of the incubation process (Salamon, 2020). Egg quality significantly affects embryo development (Alabi et al., 2018). Another factor that causes low hatchability is storage time for hatching eggs. Pereira et al. (2021) recommended that the egg storage period of Pekin ducks intended for incubation be less than 10 days. The storage time of duck eggs is negatively correlated with hatchability (Dassidi et al., 2022). In addition to hatchability, fertility and hatching weight play an important role in DOD production (Suryana, 2013).

To maintain the continuity of the availability of quality DOD in meeting the high demand for MA ducks in Bengkulu Province, a study on MA duck egg hatchability needs to be done. This study aimed to determine the effect of handling storage time and sanitation of crossbreeding duck eggs of Mojosari males and Alabio females (Master Hybrid) before hatching using an incubator on hatching time and hatching weight.

**MATERIALS AND METHODS**

The research was conducted in Sungai Serut District, Bengkulu City from September to November 2021. The eggs for the study were collected from Eggs from 7 months of brood stock, which were reared intensively. The egg was laid from crossbred ducks of male Mojosari ducks and Alabio females with a ratio mating was 1:6. The reason for using duck eggs from a crossbred male Mojosari and female Alabio is because they
have high productivity of up to 95%, average egg production of 70%, and a production period of 10-12 months/year without feather loss (Polana, 2018). There are 15 male ducks and 93 female ducks. The average body weight of males is 1.74 kg/head and females are 1.62 kg/head. About 192 eggs were selected from observation of external physical appearance (oval shape, not too big or too small, and the egg shell is clean and smooth) and the weight of the eggs (55-65 g). The number of eggs was collected over 5 days.

The egg is then stored for duration based on the treatment (0, 1, 2, 3, 4, and 5 days). The temperature of the storage room is recorded in the morning, afternoon, evening, and night to obtain the average temperature during storage. The average egg storage temperature in the morning is 33.4°C, in the afternoon 37.4°C, in the afternoon 35.8°C, and at night 33.8°C. After storing, the eggs were treated with cleaning (four treatments) namely control (L0) no cleaning; cleaning using disinfectant dengan bahan aktif at 2 ml/L water (L1), cleaning using warm water with temperature 35-40°C (L2) and cleaning using distilled water at temperature 20-25°C (L3). Disinfectants are used specifically to remove odors caused by viruses and bacteria from livestock products. The disinfectant material is made from Liquid Smoke in the dosage according to the product instructions.

The study used a randomized complete design in a factorial 4x6 arrangement. The first factor was cleaning with three treatments namely control (L0) no cleaning; cleaning using disinfectant at 2ml/L water (L1), cleaning using warm water with temperature 35-40°C (L2), and cleaning using distilled water at temperature 20-25°C (L3). The second factor is the duration of egg storing time before it was incubated, namely P0= 0 days, P1= 1 day, P2= 2 days, P3= 3 days, P4= 4 days, and P5= 5 days. Each treatment has eight replications.

The incubator temperature was kept at 39°C, during hatching, the eggs were turned over 3 times a day from day 5th to day 23rd during incubation. On the day 5th -7th the eggs in the incubator egg were observed to have their fertility by candling the eggs, the germinated eggs were fertile. The parameters measured were hatching duration (days), fertility (%), DOD hatching weight (gr), and hatchability (%). Hatching duration is the time the egg needs from the first time kept in the incubator until the egg is hatching. Fertility is the number of embryonated eggs divided by the number of eggs incubated multiplied by 100. The fertile egg was observed using candling. The hatchability is the number of telur yang menetas dibagi jumlah telur yang fertil times 100. Hatching weight was done by weighing ducklings after 2 hours of hatching. Time hatching is the time is taken from the first day when the egg is kept in an incubator until the duckling hatches.

Data obtained were analyzed using ANOVA for a randomized complete design in factorial arrangement 4x6 (four treatments of egg wiping, six treatment days of egg storage before the egg hatched). Data analyses were done using the SAS program 9.1 version. The study was continued with the Duncan test when the significant difference between treatment means was detected.

RESULTS AND DISCUSSION

Fertility and Hatchability

Egg fertility is the percentage of eggs that show embryonic development of all hatched eggs (Abd El-Hack et al., 2019). Duck egg fertility in the present study was not affected (P>0.05) by the interaction of the storing and cleaning factors or by the main factor effect of storing or cleaning. The embryonated fertility of the MA ducks’ egg in the present study was an average of 96% with a hatchability average of 87.45%. All the fertile eggs as many as 190 eggs are hatched. Egg fertility is greatly influenced by storage capacity and how eggs are handled before hatching. Susanti et al. (2015) reported that storing Arabic chicken eggs up to 6 days before hatching did not affect fertility and hatching losses. At the same time, Suryadi et al. (2018) stated that holding longer than seven days reduced egg hatchability. In the present study, eggs were stored only for up to 5 days, therefore, the egg fertility was similar for all the treatments. This is based on the research results by Herлина et al. (2016), who reported that the length of egg storage does not affect fertility, hatchability, and hatching time.

The hatchability of the eggs in the present study was not affected by any treatment applied to the egg before it was incubated. The average percentage of hatching eggs in the present study was 85.17% is relatively high when compared with the hatchability of MA ducks in the research of Kostaman et al. (2021) which reached 72.74%. Arifin (2013) stated that during the hatching process, the embryo’s growth inside the egg is influenced by shell conditions, egg temperature, and humidity and includes the handling process during hatching. Moreover, according to Widyaningrum (2012), temperature in the
incubator is the most critical factor in controlling the growth and development of embryos during hatching.

**Hatching Time**

The effect of cleaning and egg storing before hatching on the duration of egg hatching (days) is presented in Table 1. Hatching time (duration of hatching) was not affected (P>0.05) by the interaction of cleaning and storing, or by the main factor effect of holding. Hatching time was significantly (P<0.05) affected by egg cleaning. The data is presented as the average of the main factor effects of cleaning and storing (Table 1).

<table>
<thead>
<tr>
<th>Effect of cleaning (L)</th>
<th>Hatching time (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L0</td>
<td>26.67±0.53</td>
</tr>
<tr>
<td>L1</td>
<td>26.11±0.20</td>
</tr>
<tr>
<td>L2</td>
<td>26.71±0.30</td>
</tr>
<tr>
<td>L3</td>
<td>26.07±0.31</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effect of storing (days) (P)</th>
<th>Hatching time (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>26.4±0.49</td>
</tr>
<tr>
<td>1</td>
<td>26.5±0.57</td>
</tr>
<tr>
<td>2</td>
<td>26.48±0.53</td>
</tr>
<tr>
<td>3</td>
<td>26.24±0.20</td>
</tr>
<tr>
<td>4</td>
<td>26.36±0.50</td>
</tr>
<tr>
<td>5</td>
<td>26.38±0.45</td>
</tr>
</tbody>
</table>

P values
- L: 0.0001
- P: 0.794
- L*P: 0.523

Note: Superscript with different letter in the same column indicated significantly different (P<0.05); L0: without cleaning, L1: cleaning with disinfectant, L2: cleaning with warm water, L3: cleaning with distilled water at room temperature.

Cleaning using disinfectant (L1) or distilled water (L3) resulted in a similar hatching time and was faster than control (L0) or cleaning using warm water (L2). Ayuningtias *et al.* (2020) stated that active ingredients in disinfectants can kill germs on eggshells and they can affect the hatching process. The hatching time of the MA duck in the present study was like the results reported by Manggiasih *et al.* (2015). They reported the hatching time of local egg ducks was about 633.8 to 651.2 hours or 26.4 to 27.1 days.

**Hatching Weight**

Hatch weight is the weight of DOD after hatching, obtained 2 hours after hatching or DOD feathers are dry. The average weight of DOD MA at hatching is presented in Table 2. The hatching weight was affected by the interaction of factor cleaning and storing. Egg cleaning with disinfectant without storage (L1P0), 3 days storage (L1P3), and 5 days storage (L1P5) displayed a relatively high average weight of DOD but was not significantly different from treatments L0P1, L2P0, L3P0, and L3P3. The average DOD weight in the best treatment was between 40.4-41.6 g with the highest average DOD weight found in the L3P0 treatment (41.6 g). This shows that there is an interaction between wiping treatment and the length of egg storage time on DOD weight.

The high DOD weight of MA ducks from the eggs treated with a disinfectant was thought to be caused by the disinfectant’s ability to protect the eggs from the influence of the external environment. It was also used to exchange oxygen and carbon dioxide. This is the opinion of Zamzamy *et al.* (2014), who state that using the correct dose of disinfectant will optimize sanitation because disinfectants also affect the embryo’s life in addition to preventing pathogenic microorganisms. On the other hand, Sastrawan *et al.* (2013) reported that cleaning the egg using alcohol 70% was better than using warm water in increasing egg quality when the egg was kept at room temperature.

The quality increase was seen from the egg white’s thickness, the yolk’s color, and the egg’s grade. The higher hatching weight of DOD in the present study also occurred in eggs cleaned with water or disinfectant (L1, L2, or L3) without storage. That egg could cause this without storing the eggs in fresh condition, evaporation of the water has not occurred. According to Wicaksono *et al.* (2013), hatching weight is influenced by egg weight, temperature, and humidity. Meanwhile, the low DOD weight produced by cleaning with distilled water is thought to be caused by the low temperature at the packing time, which affects the embryonic development and hatching weight of the duck eggs. This is the opinion of Wicaksono *et al.* (2013), hatching weight is influenced by egg weight, temperature, and humidity.
Tabel 2. Effect of cleaning and egg storing before hatching on duckling weight at hatching (gr)  

<table>
<thead>
<tr>
<th>Cleaning (L)</th>
<th>Duration of storing egg before incubation (P, days)</th>
<th>P0</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
<th>P5</th>
</tr>
</thead>
<tbody>
<tr>
<td>L0</td>
<td></td>
<td>39.3±0.91a</td>
<td>41.0±1.09abcd</td>
<td>39.6±1.30a</td>
<td>40.0±0.77cde</td>
<td>39.8±1.46de</td>
<td>39.7±0.77de</td>
</tr>
<tr>
<td>L1</td>
<td></td>
<td>40.9±1.12abcd</td>
<td>40.2±1.17bcdde</td>
<td>39.1±0.69e</td>
<td>41.4±1.41abc</td>
<td>39.7±1.11de</td>
<td>0.4±1.13bcdde</td>
</tr>
<tr>
<td>L2</td>
<td></td>
<td>40.4±1.06cde</td>
<td>39.6±1.51de</td>
<td>40.2±1.33bcde</td>
<td>40.0±1.53cde</td>
<td>39.6±1.30e</td>
<td>39.0±0.89c</td>
</tr>
<tr>
<td>L3</td>
<td></td>
<td>41.6±1.30e</td>
<td>39.7±1.03de</td>
<td>40.0±0.89cde</td>
<td>41.5±0.55ab</td>
<td>40.1±1.12de</td>
<td>39.3±1.03c</td>
</tr>
</tbody>
</table>

(P values)  
L (cleaning)  0.06  
P (storing)  0.001  
L*P  0.006  

Note: Superscript with different letter in column dan row indicated significantly different (P<0.05); L0: without cleaning; L1: cleaning with disinfectant; L2: cleaning with warm water; L3: cleaning with distilled water at room temperature.

CONCLUSIONS

The incubation time for MA duck eggs is not influenced by the interaction between cleaning and the length of time the eggs are stored before being put into the hatching machine, but cleaning with disinfectant or distilled water shortens the incubation time. There was an interaction effect between cleaning treatment and egg storage time on DOD weight of ducks in the treatment without incubation; cleaning using a disinfectant with a shelf life of 0 and 3 days before incubation; cleaning using warm water at a shelf life of 0 days before incubation; cleaning with distilled water at shelf life of 0 and 3 days before incubation.

ACKNOWLEDGEMENT

We are grateful to Jefri Rawibowo, SP., for his assistance in completing the research activities process.

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Effect of Cleaning and Storing on Hatching Time and Hatching Weight of Mojosari Alabio (MA) Crossbred Duck Eggs. (Erpan Ramon, et al.)