Analaysis of The Effect of Relative Humidity in The Eggs Incubator

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Abstract. This study aimed to verify the effect of relative humidity during incubation of duck eggs in the incubator on the rate of decline in egg weight, hatching day old duck weight, length and hatching eggs energy difference duck. Duck eggs taken from the poultry business in Meunasah Krueng, water fence, Lambaro, Aceh Besar. Then each egg was placed in an incubator unit in the three experimental groups, namely low humidity (57/58% RH), intermediate humidity (67/68% RH) and high humidity (71/72% RH). Incubation process done manually with temperature 38 ^{o}C incubator. Eggs were coded X and O adjacent to facilitate marking a reversal in current twice a day. Primary data retrieval from the first day until the fifteenth day by weighing the eggs and using electronic scales. Changes in egg weight reduction on the fifteenth day following (10.666%), (3.853%) and (2.859%) for the treatment of low humidity, intermediate and high, then the day of hatching eggs weigh hatching day old duck also showed that the weight is also affected by incubation and humidity differences by ANOVA analysis it can be concluded that the changes in egg weight reduction greatly influence the hatching duck weight difference and the difference so long incubation energy hatching day old duckling have more energy at low humidity (57/58% RH).
Keywords: Egg weight, hatching daily weight children, humidity the old hatchery, energy.

Introduction

Efforts to increase the population of poultry like duck, chicken and quail takes effort to get the population by various means hatching eggs. Naturally done by hatching eggs hatch by a parent, just that the number of eggs that can be hatched very little, therefore, hatching naturally in the commercial breeding business is no longer done because it is not efficient, unlike the case with laying ducks, since the first ducks not incubate, brood because the nature is not owned by poultry, eggs from poultry is hatched by natural selection, and therefore the effort to expand and maintain duck populations is needed, one way to overcome this problem include using the incubator (hatching machine).

Today the use incubator (hatching machine) is a common and widely used and are readily available in some places that provide it, even civil society can make your own, however many cases encountered during the hatching process was not done perfectly. One cause of this is the relative humidity adjustment factor incubator space which have a major impact on the quality of hatching. If the relative humidity (RH) is too low or too high will affect the development of the embryo in the egg and the rate of change of the water in the egg during incubation can be controlled through adjustment of relative humidity in the incubator.

According to Romao (2009) standard requirements relative humidity incubator for duck eggs hatching process between 36.05 ± 6.06% RH up to 76.50 ± 4.40% RH. Moisture is too high will prevent the evaporation of water from the egg, in addition if the humidity is too low can cause too much evaporation of water from the egg and causes death of the embryo. Relative humidity also affects the metabolism of calcium (Ca) in the embryo. At high humidity, transfer the eggs to Ca from Kerambang bones in embryonic development will be more. Embryonic growth could be slowed by the state of air humidity is too high or too low, then the embryo will be obtained at the optimum relative humidity is close to the maximum (Parry, 2011). Testing the rate of change in egg weight using F statistic test performed using analysis of variance (ANOVA). This analysis aims to find out how far the hypothesis of the study that has been done so that it deserves to be accepted or rejected based on the data already in the plot into a table form.

F statistic is the ratio between the total numbers of inter-group variation (variation between categories relative humidity) with the total variation that comes from within each group (variation of egg weight). This study aims to determine how much influence the evaporation of water in the duck eggs during incubation at a constant temperature varies with the humidity in the incubator on the rate of weight change and the situation of children hatching eggs produced.

Matrials and Methods

The research method used is the technique of observational studies, where data collection is done by the experimental method in the laboratory of the research object (population or sample). Data collected in the form of secondary data from several related literature, and primary data obtained or collected directly from observation and direct measurement of the object of research.

Duck eggs for this study were taken from a farm in the village of Meunasah Krueng ducks, Kemukiman Pagar Air, Lambaro, Aceh Besar and then selected based on the criteria of hatching eggs. And verification is done in research laboratories Thermal Engineering, Department of Mechanical Engineering, Faculty of Engineering, Syiah Kuala University.

This study used an incubator based on the dimensions that have been made so that the indoor thermal energy transfer process occurs from electrical energy light bulbs to an aluminium plate and forwarded to the hatching incubation, with this heat, so the water can evaporate inside the container so that the relative humidity incubator indoors can rise as needed required. Figure 1show the dimensions of the incubator from the front which is used in this study, while Figure 2 shows the dimensions of a side incubator used in this study.

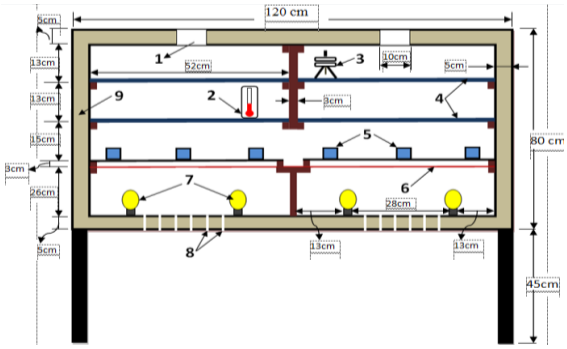

Figure 1. Incubator looks ahead

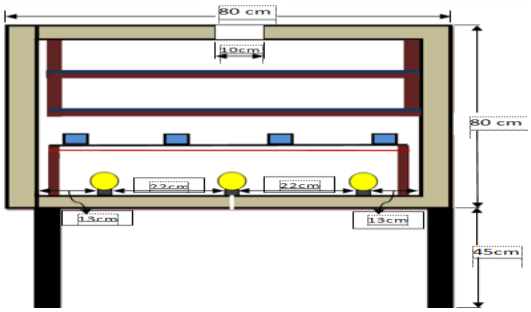

Figure 2. Incubator side view

Duck eggs that have been verified and then weighed using electronic scales weighing, Sartorius AG brand, model CPA 26p, Gottingen as the primary initial data.

Incubation parameters is done manually at a temperature of 38°C, the eggs turned 2 (two) times per day, with a swivel angle 180°C, weighed egg weight data for 15 (fifteen) days, then the relative humidity (RH) for the third incubator is equated 60-65 % RH until the eggs hatch.

Measurements were performed by using a measuring instrument Multi-Function Electronic Environment meter, brand Krisbow, KW 06-291 which measure sound level, light, humidity and temperature. The temperature in the incubator was maintained at 38 ± 5°C using an electric heater which is controlled by means of a series of Thermoregulatory and Thermostats. Primary data changes in a duck egg weight of ten grains each test group and the humidity made Table graph, and then analysed using One Way ANOVA Statistical Hypothesis Testing for treatment.

Results and Discussion

Presentation of Data

Figure 4shows the results of the identification of the relationship - the relationship between egg weight with moisture every day observation, where x_1: low humidity (57/58% RH), x_2: intermediate humidity (67/68% RH), x_3: high humidity (71/72% RH).

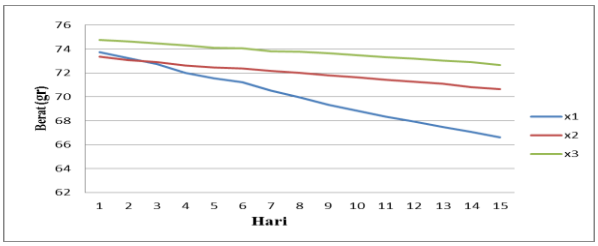

Figure 4. Graph the relationship between egg weight by day incubation

Figure 5 shows the experimental results of this study indicate that the duck weight at hatching day old low humidity (57/58% RH), the ability of duckling energy to interact more strongly up and running than with intermediate and high humidity. Figure 6 explains the relationship of duck eggshell solving ability during incubation in the incubator for varying relative humidity.

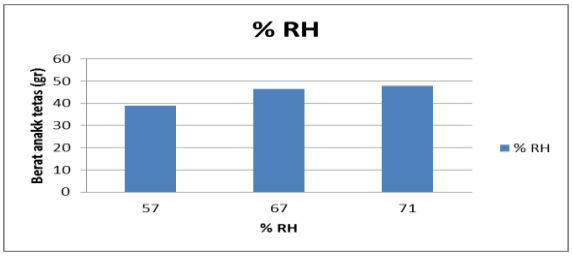

Figure 5. Weight relationship duckling hatching day old child in the incubation of the relative humidity varied.

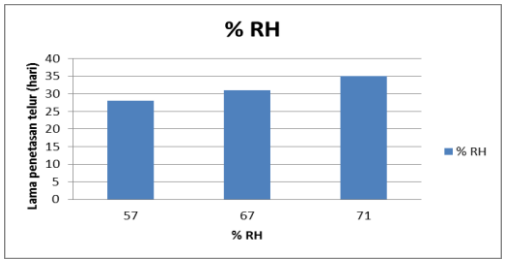

Figure 6. Phase relationship of the relative humidity hatching eggs varied

The Energy in the Room Hatching

The amount of energy in the room hatching equal to the amount the amount of energy supplied by the heat source to power incandescent bulbs of 120 watts. Outdoor temperature 28°C (28°C + 273 = 301 K)

1. The volume of space above the plate incubator [V] (1,2 m x 0,8 x 0,5 = 0,48 m^3)
2. Energy power of 120 watts under an aluminium plate incubator temperature obtained 45°C (45°C + 273 = 318 K)
3. Based on the film temperature is 45°C then acquired properties - physical properties of the fluid as follows:
   - C_p = 1,05 kJ/kg.K
   - ρ= 1,0753 kg/m^3
   - $\dot{m}$ = V . ρ
   - = 0,48 m^3 x 1,0753 kg/m^3
     = 0,516 kg

Based on the parameters that have been given, then the energy in the form of heat in the room gained incubation Q is 8,903 kJ.

Conclusions

By testing variations of humidity that the reduction of water levels in eggs from 3 to 10% during incubation affects hatching daily weight duck. Hatching at low humidity (57/58% RH), duck energy stronger and lighter weight than the middle and high humidity, in addition to the phase of the hatchery are used more efficiently and effectively, and duck weight and energy hatching day old son hatching age day also increased drastically.

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