

# Hatching and post-hatching performances of Indonesian native chicken eggs infused saline solution

*by* Dp Rahardja

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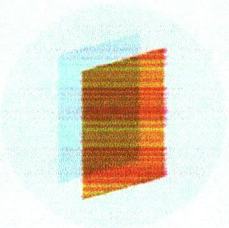
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## Hatching and post-hatching performances of Indonesian native chicken eggs infused saline solution

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**Abstract.** An experiment was conducted to determine the effects of infusing sterilized physiological saline on the hatching and post-hatching performances of the eggs of Indonesian native hen aged 60 weeks reared in the University Farm, which included hatchability, weight of newly hatched, hatching time and growth of the chicken up to 8 weeks of age. In accordance with a Completely Randomized Design (2 treatments, with 3 different times of incubation as replication – 20 eggs per treatment per replication), a total of 120 fertile eggs of approximately the same weight ( $46.53 \pm 2.87$  g) with live embryos which resulted from candling at d 7 of incubation was used, and 60 eggs were subject for the saline infusion. All eggs were sterilized using 70% ethanol, numbered and weighed before incubation, then incubated according to standard hatchery practices. The saline solution was infused through a small hole made manually at a little bit above the narrow end of the egg. The results indicated that infusing saline was significantly reduced hatchability of the egg from  $84.83 \pm 1.89$  to  $79.68 \pm 2.71\%$ . Despite the weight (g) of newly hatched chick was not significantly affected by infusing saline, the relative weight of hatched chick (%) was significantly increased from  $70.69 \pm 1.09$  to  $73.81 \pm 1.18$ . Infusing saline into the albumin resulted in a shorter time required for hatching processes; even though it mostly occurred between d 20 and d 21 of incubation. Growth performance was indicated by a significantly heavier body weight of male chicken, in particular, resulted from the treated eggs ( $896.25 \pm 30.14$  vs  $985.62 \pm 47.61$  g). In conclusion, the present results demonstrate that infusion of sterilized physiological saline into the eggs of the Indonesian native chicken improved hatching and post-hatching performances.

### 1. Introduction

In Indonesia, the largest part of livestock is in the hand of smallholder farmers that are widespread throughout Indonesia, and Indonesian native chicken (INC) is the common type of livestock owned by most farmers and considered to be an important genetic resource, particularly with respect to their excellent for meat and egg production. Unfortunately, the productivity of INC is extremely lower compared to that of imported breeds.

Various efforts have been conducted by research institutions and private sectors to improve the productivity of INC, such as management, breeding and crossbreeding program, nutrition, environmental approach. *In ovo* feeding is an alternative approach for poultry patented by Uni and Ferket [1] and used to improve performance of the chicken. This approach has been widely used by commercial breeders of exotic breeds to improve their strain performances – phenotype, without



alternating the DNA sequence – genotype, and called Epigenetic. This method was developed to overcome the limitation and to improve the intestinal functionality, and nutritional status of the eggs. Therefore, the addition of a nutrient solution into the embryonic amniotic fluid may deliver essential nutrients into the embryo intestine [2]

Many potential nutrient supplements can be included in the *in ovo* feeding solution. Carbohydrates can be used as a source for glucose, which is crucial for the hatching process and hatchling development [3]. Sodium and chloride ions ( $\text{Na}^+$ ,  $\text{Cl}^-$ ) are the major cation and anion of the extracellular fluid, functions primarily in the control of water distribution, fluid balance, and osmotic pressure of body fluids [4]. Sodium is also associated with chloride and bicarbonate in the regulation of the acid-base equilibrium of body fluid and used as an intravenous solution as the source of electrolyte and water for hydration. In studies of *in ovo* feeding, NaCl solution is frequently also used as a standardized solution to dilute a single or combined nutrient [5,6]. In this study, isotonic sterilized saline (0.9% NaCl) solution was infused into the albumen of INC eggs on d 7 of incubation. The objective of this research is to elucidate hatching and post-hatching performances of the INC infused saline solution, which includes hatchability, the weight of newly hatched chicken, hatching time distribution, body weight, and total feed consumption up to 8 weeks post-hatching.

## 2. Material and Method

A total of 150 native chicken eggs of 6 days collection from University farm were used. All Eggs were cleaned, numbered and weighed individually, then set in a semi-automatic incubator at 37.5 °C (99.5 °F) and 60% relative humidity. All eggs were examined by candling at d 7 of incubation; the infertile eggs and the eggs with dead embryos were removed.

In accordance with a Completely Randomized Design (2 treatments, with 3 different times of incubation as replication of 20 eggs per treatment per replication), a total of 120 fertile eggs of approximately the same weight ( $46.53 \pm 2.87$  g) was used, and 60 eggs were randomly determined as subjects for the saline infusion treatment. Successively after candling, each of these eggs were marked for a point (a little bit above of narrow end of the egg), then cleaned and disinfected the point area with an ethyl alcohol-tissue paper, and a piece of plastic tape of 1 x 1 cm used to cover the point; A pointed tip of small scissor was used to make a small hole in the middle of the tape. A 0.5 ml 0.9% sterilized saline solution was infused into the albumen of each egg using automatic syringe equipped with a 22 gauge needle to a depth of 10-13 mm. In the end, the hole was sealed with the plastic tape, then returned back to the incubator. Since d 3 to 18 of incubation, the eggs were turned 3 times daily continually. After d 18 up to hatching, the eggs were set in the hatcher unit.

After hatching, all newly hatched chicks were weighed, fitted with wing tags numbered as egg numbers, recorded, and then transferred to animal house, reared for 8 weeks. They were fed with the same commercial ration containing 21.0 g protein/kg and 13.0 MJ metabolizable energy (ME)/kg (table 1). Food and water were provided ad libitum, and body weight was measured 2 weekly. Along the experiment, each replication group of 2 treatments was reared in the same pen of 2.5 x 3 m<sup>2</sup>.

Hatchability percentage was calculated based on the number of newly hatched chicks as a percentage of the incubated fertile eggs per replication of every treatment. Hatching time was recorded every 12 h intervals from d 19 to d 22 (456 to 528 h) of incubation. The weight of newly hatched chicken was recorded using a digital balance to the nearest 0.01 g. Resulted data were analyzed by using the general linear model procedure of Statistical Packages of the 13.1. version of Systat. Significant differences among treatment means were determined using least significant difference (LSD) test. Statements of statistical significance were declared  $p < 0.05$  or  $p < 0.01$  unless noted otherwise.

## 3. Results and Discussion

There are some interesting results of infusing sterilized saline solution on the fertile eggs of Indonesian native chicken. The effects on hatchability, newly hatched chick weight (g and % of fertile

hatched egg weight), incubation period and hatching distribution over the incubation period of the *in ovo* infusion of saline solution are shown in table 1.

Infusion of saline solution seems to shorten the hatching time by about 14 h, in which at d 19 to d 20 of incubation, there were more amount of the infused eggs group hatched than that of the un-infused egg group, despite the hatching time of both egg groups mostly occurred between d 20 to d 21 of incubation.

Hatchability of the infused eggs ( $79.68 \pm 2.71\%$ ) was significantly lower compared to that of the untreated one ( $84.83 \pm 1.8\%$ ). In this research, a negative effect of saline infusion on hatchability may apparently be resulted from technical reason of infusion into the eggs, which disturbed the internal environment of the eggs, and early development of the embryo, which then lead to embryo death. Observation on the failed egg to hatch indicated that the embryo death occurred mostly between d 7 to d 14 of incubation.

Although weights of the newly hatched chicken from the treated and untreated eggs were not significantly different, the proportion of the weight of the hatched eggs was increased significantly from  $70.69 \pm 1.09\%$  to  $73.81 \pm 1.18\%$ . These results as other previous studies using commercial breeds especially infusion of NaCl, maltose, sucrose, and dextrin [7,8], arginine [9],  $\beta$ -hydroxy- $\beta$ -methyl butyrate [10], albumin [11], and zinc-methionine [12] to fertile broiler eggs improved performance in broiler chicks by increasing embryo weight. Also, Ohta and Kidd [13] reported that the injection of various amino acid solutions to amniotic fluid enhanced the embryonic growth during the incubation.

**Table 1.** Effects of saline solution on Hatchability, Weight of Newly Hatched Chick and length of incubation period of the Indonesian native chicken eggs, and the performances of the chicken to 8 weeks

Parameters	Treatment		P value	
	Untreated egg	Treated Egg		
Weight of incubated Fertile eggs (g)	$46.54 \pm 4.82$	$46.70 \pm 4.96$	$P > 0.05$	
Hatchability (%)	$84.83 \pm 1.89$	$79.68 \pm 2.71$	$P < 0.01$	
Weight of Newly Hatched Chick (g) (WNHC)	$33.03 \pm 3.49$	$34.46 \pm 3.73$	$P > 0.05$	
Weight of Hatched Egg (g) (WHE)	$46.72 \pm 5.05$	$46.70 \pm 5.04$	$P > 0.05$	
Ratio WNHC / WHE (%)	$70.69 \pm 1.09$	$73.81 \pm 1.18$	$P < 0.05$	
Length of Incubation Period (h)	$496.14 \pm 4.39$	$482.80 \pm 0.65$	$P < 0.01$	
Distribution	456 – 480	$6.25 \pm 2.87$	$16.47 \pm 4.11$	$P < 0.01$
of Hatching Time (%)	481 – 504	$81.25 \pm 4.65$	$83.53 \pm 3.76$	$P > 0.05$
	505 – 528	$12.50 \pm 2.46$	0.0	$P < 0.01$
Body weight at 8 weeks (g)	Male	$896.25 \pm 30.14$	$985.62 \pm 47.61$	$P < 0.05$
	Female	$737.00 \pm 28.47$	$771.11 \pm 64.26$	$P > 0.05$
Feed intake up to 8 weeks (g)		$2212.78 \pm 42.67$	$1934.72 \pm 23.35$	$P < 0.01$

Previous studies have indicated that hatching weight is a major predictor of market weight in commercial chickens. Wilson [14] reported that each 1 g heavier in body weight at hatch leads to 8 to 13 g of increase in BW at market age. Although this correlation between hatch weight and market weight may differ among strains, the influence of hatch weight on market weight is apparently increasing as broiler breeding companies continue to select for ever increasing growth rate [15,16,17]. Uni et al. [18] stated that a 2-g difference in body weight at hatch due to *in ovo* feeding resulted in 50

to 60 g of increasing body weight at d 25. In this study, the treated eggs of Indonesian native chicken infused saline solution at d 7 of incubation generated a significant heavier body weight than that of untreated egg by about 80 – 90 g in male and 30-40 gr in female at d 56 post-hatching, even though there was no significant difference in absolute weight (g) of newly hatched chick. Additionally, with heavier body weight, total feed intake up to d 56 post-hatching was also significantly lower. It means a better feed utilization efficiency. Apparently, there is a possible relationship between saline infused and function of the digestive system. Sodium ( $\text{Na}^+$ ) and Chloride ( $\text{Cl}^-$ ) ions may play role in the organogenesis of the digestive system and then in the activity of apical and basolateral transporter in the absorption of glucose and amino acids [19, 20, 21, 22, 23]

#### 4. Conclusions

Based on these current results, it can be concluded that infusion saline solution as additional electrolytes and water into the egg of the INC resulted in better hatching and post-hatching performances. Although hatchability tends to decrease, there are some positive results, which are a shorter hatching time, an increased relative weight of newly hatched chick, feed intake and its utilization efficiency, and lead to heavier body weight achieved at d 56 post-hatching.

#### 5. Acknowledgment

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