PERFORMANCE OF MOJOSARI DUCK HATCHED FROM TRADITIONAL HATCHERY SUPPLEMENTED WITH THE DIFFERENT LEVEL OF OXYGEN (O_2)

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ABSTRACT

A research was done to determine the concentration and proper supplementation time of oxygen in traditional hatchery to improve the productivity of Mojosari duck at starter period. Fertile duck eggs were hatched in an oxygen-enriched environment during day 1, 2 and or 25 till hatched to test the hypothesis that prenatal oxygen supplementation treatments has separate effects on the developing embryo and day old duck. Prenatal exposure oxygen but no interaction between oxygen supplementation and time of oxygen supplementation treatments improved hatchability. Day old duck weight and weight gain were effected by oxygen supplementation and time of O2 supplementation treatment and also their interaction. It was concluded that the highest hatchability and weight gain at starter period were resulted in the treatment of O_2 supplementation for 21 % on day 1, 2 and day 25 till hatched. The highest day old duck weight was resulted in the control treatment.

Key words : Duck, Oxygen, Hatchability, Day old duck, Weight gain

INTRODUCTION

Over the years poultry hatchery operations have increased in size. This change has prompted increased expectations of improved hatchabilities and better duck performance. An effective hatchery technology is criticed to achieve a high level of hatchability and ensure the production of high quality of duck. The application of technology for management using traditional hatchery will improve the productivity of Mojosari duck. For the propose of optimization of application for the hatchery technology, we should pay attention many factors that associate with hatchery process. Prediction of oxygen (O_2) concentration in hatchery was one of the important factor where influence the hatching process.

Oxygen is the most important for development and multiplication of microorganism. Through the respiration, O_2 is used to oxidation cells in the body for biology activity for the growth and development of organism (Stanley and Andrykovitc, 1984). The previous study was found that the hatchery process using 21% of O_2 concentration for the growth of embryo was the best. Hatching time is plateau phase of O_2 consumption after pipping period or period of change from chorioallantois respiration to lung respiration.

MATERIALS AND METHODS

Experiments were conducted in eight hatcheries were used paraffin. The traditional hatcheries had capacity of 150 eggs and made in Mitra Jaya Malang. The oxygen concentration was monitored using percent oxygen monitor.

Nine hundreds eggs of Mojosari Duck were used as samples. They were taken by purposive random sampling method. Randomized complete design for this experiment, using 3x2 factorial with five replications was used for statistical analysis. The first factor was O_2 supplementation (A_1), O_2 supplementation tills 21% (A_2) and O_2 supplementation till 25% (A_3). The second factor was time of O_2 supplementation that consists of two variations: day one till day two and day 25 till hatched (B_1); day 25 till

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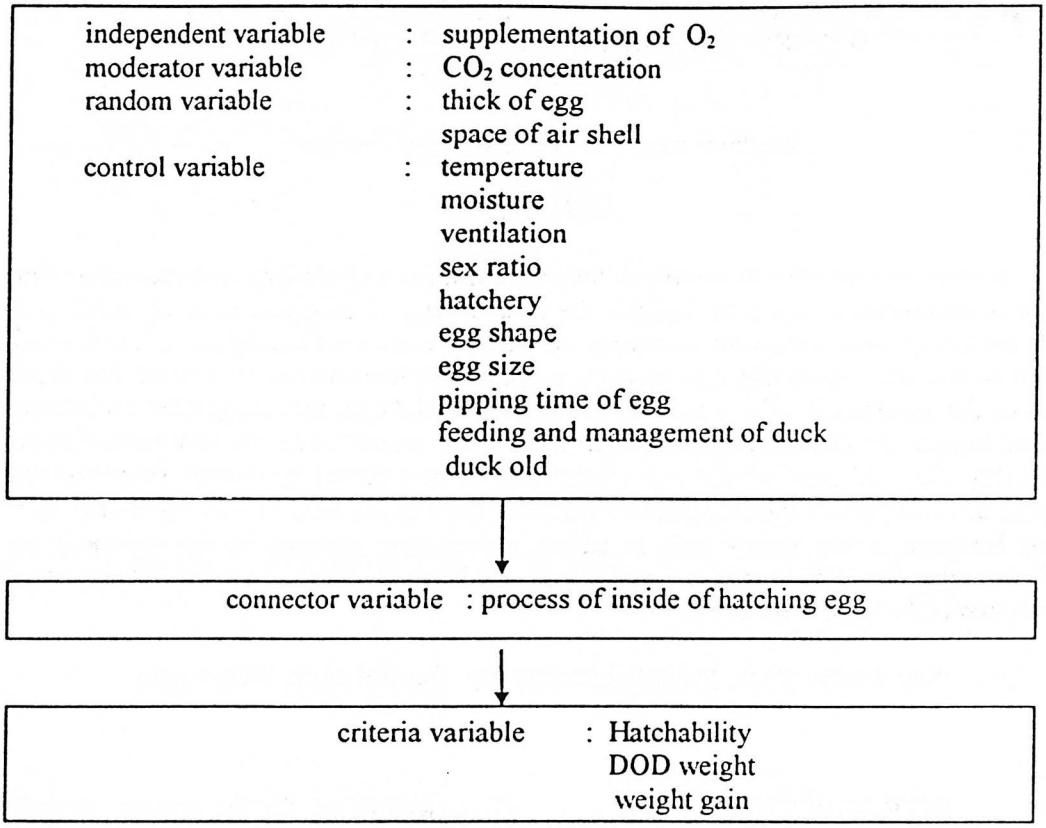

Figure 1. Classification of variable of investigation

hatched (B_2). Variable observed include hatchability, DOD weight and weight gain of starter duck. T test Scheffe was used to know the differentiation between the treatments with probability test was used of 0.05 or 0.01. Classification of variable in his experiment was shown in figure 1.

RESULTS AND DISCUSSION

The average and standard deviation of Hatchability, DOD weight and weight gain as a respon of O_2 supplementation treatment at various time from hatching time was shown in Table 1 and Figure 2.

Hatchability

There was no interaction between O_2 supplementation and time of O_2 supplementation. Its mean both of them was not influence on hatchability. But according to the average, treatment A2B1 (O_2 supplementation up to 21 % on day 1,2 and 25 till hatched) resulted increase in hatchability of 6 % compared with the group without O_2 supplementation (34 % vs. 40 % and 66 % vs. 60 %).

Its mean O_2 supplementation up to 21 % on day 1,2 and 25 till hatched was a good result for increased in hatchability. This result due to O_2 concentration of 21 % in the hatchery as an optimal requirement gave surviving of the embryo. The other case, O_2 supplementation on day 1,2 and 25 till hatched was associated with real condition (the first two days on hatching period and the last three days before hatched) were the critis period for the embryo surviving (Sauveur, 1988), so O_2 supplementation up to 21 % on day 1,2 and 25 till hatched gave a better surviving of embryo to obtained a higher hatchability.

DOD weight

There is interaction ($P<.05$) between O_2 supplementation and supplementation

Table 1. Hatchability of the Egg (%), DOD Weight and Weight Gain of the Duck Starter (g) as The Interaction between O_2 Supplementation and The Time of O_2 Supplementation

Treatment	Hatchability	DOD weight	Weight gain
A1B1	60.00 [a] ± 10.07	46.30 [d] ± 0.81	159.99 [b] ± 6.52
A1B2	60.00 [a] ± 7.56	45.95 [d] ± 0.83	159.51 [b] ± 1.23
A2B1	66.00 [a] ± 10.07	42.32 [b] ± 1.14	196.36 [d] ± 12.63
A2B2	58.00 [a] ± 4.94	44.63 [c] ± 1.39	169.75 [bc] ± 9.89
A3B1	52.00 [a] ± 4.73	40.63 [a] ± 1.11	176.21 [c] ± 5.42
A3B2	24.00 [a] ± 5.76	41.78 [ab] ± 0.52	130.56 [a] ± 9.40

time of O_2 on hatching weight. We could say that both of these treatments gave interaction. The lowers DOD weight for treatment A3B1 (O_2 supplementation up to 25 % on day 1, 2, and 25 till hatched) was 40.63 g. This result due to oxygen concentration of 25 % was more than enough compared with optimum O_2 requirement for the growth of duck embryo. Consequently, as a result, excessive of O_2 in the body was free radical formed (Cohran, 1991). If free radical O_2 in the body could not neutralize for a long time, the growth of embryo was delayed in DOD weight was lower. In another case, supplementation of O_2 on day 1 and 2 (treatment A3B1) gave increase in respiration. Furthermore on day 3 till day 24 of O2 supplementation has a result of decreased in embryo growth due to adaptation of embryo which was grow fast in the earlier time of O_2 supplementation. While supplementation of O_2 on day 25 till hatched of egg gave the effect of change in respiration from low to high. So, The growth and development of embryo cell need more energy sources. Utilization of energy by the embryo maybe even more critical in basal metabolism, growth, muscle activity, exchange of low to rapid metabolism. As same as the idea of Hoyt *et al.* (1978) was found that utilization of O_2 consumption converted to energy (ATP). Poultry embryo utilized energy for basal metabolism, growth, and muscle activity. In the case of not enough nutrition sources inside of the egg that means source of energy was limited. Furthermore, glycogenolysis was effective for energy utilization. Supplementation of O_2 that was more than optimal requirement and glycolysis process inside of the egg may predict of the lowest of DOD weight in treatment A3B1 compared with another treatment.

DOD weight of the treatment without O_2 supplementation (A1B1 and A1B2) resulted in the highest of embryo weight on day 27 with a range of 45 and 46 gram due to stable in treatment compared with another treatment. As same as Bagley and Christenson (1991b) experiment result, they demonstrated that embryo weight of pipping period on group without O_2 supplementation was higher than O_2 supplementation treatment during the first week or the fourth week of hatching period.

Weight Gain

There was interaction ($P<.05$) between O_2 supplementation and O_2 supplementation time on weight gain of duck. The highest weight gain (196.36 g) on treatment A2B1 (group of O_2 supplementation up to 21 % concentration was supplied on day 1, 2 and 25 till hatched) because of : (1) when DOD embryo started to grow with O_2 supplementation up to 21 % on day 1 and 2, the growth with better, especially in the early of embryo development on day 1 and 2 (Metcalfl *et al.*, 1981). This may predicted of better in development of digestive tract system; (2) during development of embryo, two times of stress were occurred such as change of fast to low respiration (on day 3 till 24 during hatching period without O_2 supplementation), and change in low to fast respiration (on day 25 till hatched with O_2 supplementation). It may predict that there was special selection

for the duck embryo (good and normal development of embryo will hatched while embryo with realized stress will not hatched). For that reason, the best result on weight gain of duck was treatment A2B1.

CONCLUSION

Interaction between oxygen supplementation and time of oxygen supplementation resulted in difference of DOD weight and weight gain of Mojosari duck at starter period, but it gave no difference on hatchability. The average of the best DOD weight was 46.12 ± 0.80 g on control (without O_2 supplementation), while the average of the best weight gain and hatchability were 196.36 ± 12.63 g and 66.00 % ± 10,07 resulted in O_2 supplementation treatment up to 21 % on day 1, 2, and 25 till hatched (A2B1).

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