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Benefit of Swimming Access to Behaviour, Body and Plumage Condition and Heat Stress Effect of Local Ducks

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Abstract: A study has been conducted with purposes to compare behaviour, body and plumage condition of local ducks kept in commercial farms with and without access for swimming and to assess whether the access can help the ducks to reduce heat stress effect. Twenty eight duck farms were used as respondents, each 14 came from wet and dry system. This study involved 13,820 ducks in total. Data collected were duck behaviour i.e. panting, foraging, preening, bathing and swimming. The behaviours were recorded 5 times a day i.e. 6 am, 9 am, 12 am, 3 pm and 6 pm; body condition with scores of 1 (the whole body was clean); 2 (dirt on shank); 3 (dirt on shank and thigh); 4 (dirt on shank, thigh and chest); 5 (dirt on shank, thigh, chest and wings); 6 (dirt on the whole body); body temperature. Fifteen ducks from each farms were measured their body condition and rectal temperature; farm condition. Hen day production was used to calculate egg production. Data obtained analyzed using description technique analysis and student t test. The results indicated that wet system provided better condition for the ducks although egg production between the two systems were not significantly different.

Key words: Ducks, intensive, welfare, wet system, dry system, climate change

INTRODUCTION

Ducks has an important role as an egg producing poultry in Indonesia. National statistics indicates that the bird produces about 18% of total almost 1.5 million tons of eggs in 2011. Most of the ducks are local breeds which kept under various systems of production (Setioko *et al*., 1985). Intensive production system has been adopted recently since traditional scavenging system faces many obstacles. Under intensive system, the birds are mostly kept in sheds with rice straw bedding and solid floor ranch infront of the sheds (Setioko dan Rohaeni, 2001). Nowadays most duck farmers apply dry system in which the ducks do not have access for swimming. As a waterfowl species, ducks require access for swimming to perform natural behaviour. Provision of a water resource that permits full body access appears to promote efficiency of drinking-related behaviours and preening behaviour (O'Driscoll and Broom, 2011). This access is probably valuable for the ducks to reduce heat stress effect.

As a tropical country, Indonesia suffers from devastating climate change in which, among others, ambient temperature tends steadily to increase annually. This effect becomes more devastating since couple with high ambient air humidity. Several studies have reported that the climate in Indonesia has become warmer during the 20th century with an average annual temperature has increased by about 0.3°C since 1900 (LAPAN, 2012). This phenomenon brings about increasing the risk of ducks to be more succeptable to stress which leads to decrease of production. Ducks are succeptable to climate change because the bird has a certain thermoneutral zone.

Many works have been done to study the effect of open water space on duck behaviour and welfare. However most of the works have not been conducted on commercial farm level. Information on the effect of swimming access in relation to heat stress of ducks are also limited. This study purposes to compare behaviour and body and plumage condition of local ducks kept in commercial farms with and without access for swimming; and to assess whether the access can help the ducks to reduce heat stress effect.

MATERIALS AND METHODS

Method: Survey method was applied with random sampling based on criteria of wet and dry systems of intensive duck farmers. The location was in the coastal area of Cirebon Regency as one of the duck centers in Indonesia.

Materials: The materials used was local laying ducks which were reared by farmers in Cirebon Regency. The ducks were 8 to 16 months old and were intensively kept under wet system and dry system. Intensive system refers to the ordinary way done by the farmers in which ducks were confined around the farmer's houses with closed fence so the bird had no access to the outside

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area and the amount of feed provided could be controlled and measured. While the wet system refers to intensive production system in which swimming access was provided, in contrast dry system does not provide the access. Wet system was found in 'Bebek Jaya' farmer group located in Gunung Jati District, while dry system was in 'Karya Sejahtera' farmer group in Gebang District. In total this study involved 14 farmers from each system with 13,820 ducks.

Data collection:

a) **Farm condition:** calculating duck density/m^2 and flock size (number of duck per flock)

b) Ambient air temperature and humidity

c) **Body temperature:** measuring rectal temperature; 15 ducks from each farms were measured their rectal temperature

d) **Behaviour:** observing daily behaviour i.e., panting, foraging, preening, bathing and swimming; the behaviours were recorded 5 times i.e., 6, 9 and 12 am, 3 and 6 pm

e) **Body and plumage condition score:** inspecting the cleanness of the body with scores of 1 (the whole body was clean); 2 (dirt on shank); 3 (dirt on shank and thigh); 4 (dirt on shank, thigh and chest); 5 (dirt on shank, thigh, chest and wings); 6 (dirt on the whole body); sample of 15 ducks each farms were inspected without capturing the ducks

f) **Egg production:** calculating hen day egg production (% HDP)

Data analysis: Some data were subjected to description technique analysis to have systematic illustration, factual and accurate. The technique was aimed to identify causality relationship by analyzing cause root of a particular phenomenon (Babbie, 1986; Nasir, 1988), while the rest data were analyzed using t test (Gill, 1981).

RESULTS AND DISCUSSION

Farm condition: Average duck density and flock size are presented in Table 2.

Duck density and flock size were higher in wet system. Those number shows that farm condition in wet system was favourable than that in dry system. Overcrowded condition of duck density could lead to feather pecking, fear and cannibalism which are important factors in welfare problems. In addition duck density and group size can affect performance and welfare of duck. Overall production, feather damage and product quality are affected by duck density. Group size affect welfare, as larger groups are more nervous and panic reactions can lead to serious damage and increase mortality (Rodenburg *et al*., 2005).

Table 1: Duck behaviour pattern

Behaviour	Wet system	Dry system
Panting	-	✓✓
Foraging	-	-
Preening	✓✓✓	✓
Bathing	✓✓✓	✓
Swimming	✓✓✓	-

- : None
✓ : less than 35%
✓✓ : 36-70%
✓✓✓ : more than 70%

Table 2a: Average duck density and flock size

Farm condition	Wet system	Dry system
Duck density (per m^2)	0.7	2.9
Flock size	213	279

Table 2b: Average nutrient content of feed during the study

Nutrient	Wet system	Dry system
Protein (%)	24.60	26.50
ME (Kcal/kg)	3.009	3.000
Ca (%)	2.30	2.52
P (%)	0.98	1.60

Table 3: Environmental condition

Environmental condition	Wet system	Dry system
Temperature (°C)	29.90	28.24
Humidity (%)	86.14	90.94
Litter condition	Moist	Moist
Ranch condition	Moist	Dry

Ambient temperature and humidify: Environmental condition is presented in Table 3.

Table 3 indicates that environmental temperature of the study site was higher than the maximum temperature needed by the poultry. Thermo-neutral zone for poultry is between 18 to 25°C and the most efficient temperature for ducks ranges between 23 to 25°C (El-Badry *et al*., 2009). Study site which was coastal region of Cirebon Regency is considerably suffer from climate change. Controlling the ducks' environment, particularly temperature, humidity, litter moisture and ammonia is crucial to duck welfare (Jones and Dawkins, 2010). If the ambient temperature is higher than the thermoneutral zone, panting would increase ten times (Ahmad and Sarwar, 2005). Figure 1 presents the variation of average daily ambient temperature and humidity.

Figure 1 shows that highest temperature was reached at noon and then decreased. At 3 pm, however, ambient temperature was higher in dry system, during which panting was mostly found. At the same time humidity was also higher in dry system. Higher temperature and humidity in dry system most probably brought about some heat stress indication of the ducks.

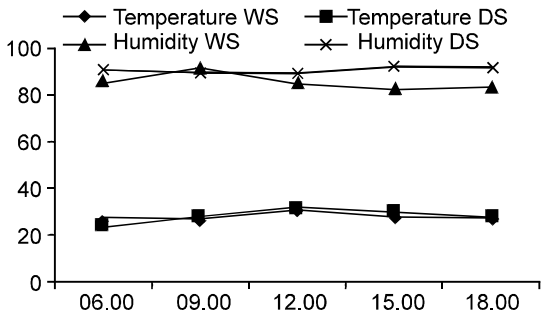

Fig. 1: Variation of average daily ambient temperature and humidity

Body temperature: Rectal temperature were 40.4±0.93 and 41.7±0.63°C for ducks under wet and dry systems respectively. These temperatures were in normal range which is 38-42°C (Smith, 1976). Statistical analyses indicated that the data were very significantly ($p<0.01$) different. Ducks kept in wet system had lower rectal temperature compared to those in dry system. This may be relating to ambient temperature. Ducks kept in higher ambient temperature would have higher rectal temperature (Sturkie, 1986).

Behaviour: Behaviour of the ducks were summarized in Table 1.

Table 1 shows that ducks kept in dry system indicated suffering from heat stress. Almost 70% ducks in this system were found panting. While in wet system behaviour was dominated by preening and swimming. Visual observation and scoring data proved that under wet system ducks were cleaner and more comfort during the day.

Body and plumage condition score: Average body and plumage score in wet system was 1.57±1.1, while in dry system it was 2.02±0.8. Statistical analyses showed that ducks in dry system had significantly ($p<0.05$) higher score than those in wet system. It indicated that with swimming access duck in wet system had cleaner body and plumage which leaded to have more hygiene condition.

Egg production: Hen day production was 56.22±12.8% in wet system and 56.31±9.4% in dry system. These egg production were similar to the findings of Suswoyo and Ismoyowati (2010) who stated that under intensive system egg production of local ducks was between 43.46 to 63.40%. Statistical analyses indicated that the production was not significantly different ($p>0.05$). This could be due to the age and feed of ducks were similar. This study involved ducks at 8-16 months old, which was productive period, at both systems. Feed stuffs used were mainly fishery by-products with small portions of rice bran and broken rice. The average nutrient content of the feed is presented in Table 2.

Table 2 shows that the feed has fulfilled the requirement. Local ducks at productive age require 17% protein, 2, 700 kcal/kg ME, 2.3% Ca and 0.60% P (Ketaren, 2002).

Conclusion: On commercial level, swimming access helps local ducks to have natural behaviour, better condition of body and plumage and reduces heat stress effect; although egg production between the two systems were not significantly different.

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