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Effect of egg weight on hatching characteristics of emu eggs

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ABSTRACT

The study was carried out to investigate the effects of egg weight on hatchability traits in emu (*Dromiceius novaehollandiae*) eggs. Emu eggs (393) that hatched from 3 different egg weight groups (below 500 g (G 1), 501 to 600 g (G 2) and above 601 g (G 3)) were used in the experiment. Hatching traits such as percentage of infertile eggs, early embryonic mortality, late embryonic mortality, dead-in-shell, chicks hatched out, total egg hatchability, fertile egg hatchability, fertility and chick livability were investigated. The mean±SE percentage of early embryonic mortality, late embryonic mortality, dead-in-shell, chicks hatched out, total egg hatchability, fertile egg hatchability, fertility and chick livability were statistically significant for different egg weight groups. The better hatching traits and livability of chicks were obtained from the medium emu eggs weighed between 501 and 600 g then the heavy (above 601 g) and small (below 500 g) egg weight groups.

Key words: Chick livability, Egg weight, Emu, Fertility, Hatchability

Emu (*Dromaius novaehollandiae*) is second largest bird of world belonging to order *Ratite*. The Australia's native birds are reared commercially in many parts of the world for their meat, oil, skin and feathers, which are of high economic value (Rajkamal *et al*. 2006). In India, emu farming was first started in Andhra Pradesh during the year 1996 and is commercially gaining popularity (Kumar *et al*. 2012). The number of studies on production and reproduction performance of emu birds under farming condition in India is scarce.

Several factors affect hatching process and post hatching performance in poultry and one of them is weight of hatching egg. The size of eggs influences the post embryonic development of birds. As early as in the embryonic age, different foetal growth intensities were observed as being dependent on egg weight (Segeeva 1983). The external quality characteristics of poultry egg, like egg weight affect hatchability of fertile eggs (Alttan *et al.* 1995, Ayasan, 2013) and chick death in the first few days (Skewes *et al.* 1988). Since scanty published literature is available on hatching performance of emu birds, the present study was carried out to determine effect of egg weight on hatching characteristics of emu eggs. For this purpose, traits taken into consideration were infertile eggs, early embryonic mortality, late embryonic mortality, dead in shell, chicks hatched out, total egg hatchability, fertile egg hatchability, fertility and chick livability.

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MATERIALS AND METHODS

The experiment was performed at emu research unit of Tamil Nadu Veterinary and Animal Sciences University – Regional Research Centre, Pudukkottai. Male and female birds aged between 3 and 5 years were maintained as 5 separate breeding pairs under semi-intensive breeding system. No lighting except day light was provided. The birds were offered with breeder mash (Table 1) with 20% crude protein, 2,640 Kcal metabolizable energy and water *ad lib.* The eggs were collected immediately after laying. Eggs were randomly selected, weighed and divided into 3 groups according to the weight group (groups 1–3). Three egg weight categories were selected for this experiment categories were: group 1 below 500 g, group 2 500 – 600 g and group 2 above 600 g. Groups 1 and 3 included eggs with weights outside the range. All eggs were individually numbered and weighed. The egg shell surface was cleaned by using a clean cotton swab and stored at room temperature for about 18 – 24 h before setting them into incubator.

The eggs were placed into 360 egg capacity standard forced draft type single stage chicken egg incubator modified to suit to emu eggs was used for incubation. The temperatures of 96.5 to 97.0° F dry bulb and 78 to 80° F wet bulb were set to incubate the emu eggs. All emu eggs set horizontally and turned every hour for 47 days and then transferred to a 50 egg capacity hatcher for the next 3 to 5 days. The eggs were monitored every 5 h and after hatching all chicks were removed from the hatcher. All healthy chicks were then counted. Unhatched eggs were broken open to

determine embryonic mortality and dead-in-shell. After the end of hatching process, the percentage of infertile eggs, early embryonic mortality, late embryonic mortality, dead in shell, chicks hatched out, total egg hatchability, fertile egg hatchability, fertility and chick livability were calculated.

The data generated from each experiment groups were analyzed statistically by following standard procedures (Snedecor and Cochran 1989) for comparing the means and to determine the effect of egg weight groups.

RESULTS AND DISCUSSION

Effects of 3 different egg weight groups on percentage of infertile eggs, early embryonic mortality, late embryonic mortality, dead in shell, chicks hatched out, total egg hatchability, fertile egg hatchability, fertility and chick livability are presented in Table 2. The highest infertile eggs were found in group 2 followed by groups 3 and 1. The difference between groups 2 and 3 did not differ significantly between them, but both groups found statistically significant (P<0.005) from group 1. The highest percentage of dead-in-shell were found in group 3 followed by groups 2 and 1. Dead-in-shell percentage of all 3 emu egg weight groups differ significantly (P<0.05) between them.

Lowest percentage of early embryonic mortality was found in group 2 and highest percentage in group 1 followed by group 3. The difference between groups 1 and 3 did not differ significantly between them, but both groups were statistically significantly different (P<0.05) from group 2. Lowest percentage of late embryonic mortality was found in group 2. The highest percentage of late embryonic mortality were found group 1 followed by group 3. Late embryonic mortality percentage of all 3 emu egg weight groups differ significantly (P<0.05) between them. The percentage of dead germs decreased as the weight of egg increased in all emu weight groups and dead germs percentage of all egg weight groups differ significantly between them. These results are in agreement with the findings of Sachdev *et al.* (1985) and Altan *et al.* (1995). They found that embryonic mortality rate decreased as the egg weight increases. This might be due to the fact that heavy eggs have sufficient nutrients substances to support embryos compare to those of light weight eggs. These results are in agreement with the findings of Kucukyilmaz *et al.* (2001) and Sekar *et al.* (2004). They found that highest early and late embryonic mortality rate was in the lightest weight group and lowest mortality rate was found in middle weight group of Japanese quail eggs.

The highest total egg hatchability, fertile egg hatchability and fertility percentage were found in group 2 followed by groups 3 and 1. Total egg hatchability, fertile egg hatchability and fertility percentage of all 3 emu egg weight groups differ significantly (P<0.005) between them. Deeming (1997) studied the effect of egg size on the hatchability and found that the hatchability of ostrich eggs decreased by increasing the egg size. Larger eggs failed to hatch and contain late dead embryos. Simon and More (1997) reported that egg size and weight had a significant effect on hatching rate which was due to lower hatchability in large and small eggs. Wilson (1984) postulated that small eggs and large eggs reduced hatchability. The effect of egg size on hatchability was explained by Deeming (1997) who stated that the effect of egg size on hatchability was due to a reduction in the surface area to volume ratio with increasing egg size making the gas heat exchange more

Table 1. Ingredients and nutrient contents of emu layer mash

Ingredients	Inclusion level (%)
Maize	50.00
Deoiled rice bran	15.70
Soybean meal	25.00
Di-calcium phosphate	01.50
Calcite powder	01.50
Shell grit	06.00
Salt	03.00
Total	100.00
Chemical composition	
ME (KCal/kg)	2640
Calcium (%)	3.3
Phosphorus (%)	0.42
Lysine (%)	1.0
Methionine (%)	0.30

Table 2. Effect of different egg weight groups on hatching characteristics of emu eggs (mean±SE)

Parameters	Emu egg weight groups		
	G 1 (below 500 g) (n=34)	G 2 (501–600 g) (n=178)	G 3 (above 601 g) (n=181)
Infertile eggs (%)	21.00±0.22[a]	54.00±0.26[b]	51.00±0.22[b]
Dead-in-shell (%)	2.94±0.16[a]	3.93±0.47[b]	11.60±0.71[c]
Early embryonic mortality (%)	5.88±0.21[b]	1.68±0.22[a]	5.62±0.42[b]
Late embryonic mortality (%)	5.88±0.81[c]	1.68±0.22[a]	2.76±0.30[b]
No. of chicks hatched out (%)	23.52±1.80[a]	62.35±1.91[b]	51.93±1.36[c]
Total egg hatchability (%)	23.52±1.87[a]	62.35±0.39[b]	51.93±1.34[c]
Fertile egg hatchability (%)	61.53±1.31[a]	89.51±1.21[b]	72.30±1.23[c]
Fertility (%)	38.23±2.03[a]	69.66±1.66[b]	71.82±1.63[c]
Emu chicks livability (%)	12.50±1.92[a]	52.25±8.10[b]	28.72±4.16[c]

Means bearing same superscripts row-wise do not differ significantly (P<0.05).

difficult. The present findings were also in conformity with above findings.

The highest percentage of emu chicks livability were found in group 2 followed by groups 3 and 1. Emu chicks livability of all 3 emu egg weight groups differ significantly ($P<0.05$) between them.

From these results it can be concluded that, emu egg weight had a very significant effect on hatching characteristics with better hatching traits and livability of chicks were obtained from the medium emu eggs weighed between 501 and 600 g followed by heavy emu eggs weighed above 601 g and small sized emu eggs weighed below 500 g.

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