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Hatchability Performance of Emu Birds (*Dromaius novaehollandiae*) reared in an Organized Farm in Hilly Area

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ABSTRACT: A study was conducted to evaluate the hatchability performance of emu birds (*Dromaius novaehollandiae*) in an organized farm in one of the hilly region of Tamil Nadu, India. The Emu farm was located 2000 meter above the mean sea level at Kodaikanal taluk, Dinidigul district, Tamil Nadu, India. The maximum and minimum temperature ranges from 17 to 20ºC and 7 to 10ºC respectively. About 34 pairs of emu birds were selected for this study period of 90 days. They were reared in separate breeding pens (400 sq.ft floor space per breeding pair) under semi-intensive system of housing and provided standard emu breeder ration and *ad libitum* water. During the study period, a total of 650 eggs were laid, from that 100 eggs were selected to study the hatchability performance. The eggs were cleaned and set in incubator for 52 days with the optimum temperatures of 96.5°F to 97.0°F (dry bulb) and relative humidity of 45 to 50 per cent (wet bulb reading 82.0°F to 84.0°F). The egg moisture loss at the time of setting and at 14th day, 21st day, 28th day, 35th day, 42nd day and 49th day of incubation period and hatch weight were recorded. On 56th day the unhatched eggs were subjected to break open study for embryonic mortality and infertile eggs if any. The egg weight loss was higher in unhatched eggs than hatched eggs. Weight loss of emu eggs during incubation (1-49 days) ranged from 11.15 ± 0.25 to 14.54 ± 78 per cent with an overall mean of 12.84 per cent in eggs that were incubated. The mean emu chick weight was recorded as 389.83g and chick weight as per cent of egg weight was recorded as 69.28 ± 0.33 per cent. The hatching performance analysis indicated that the percent fertility, dead embryo, dead in shell, hatchability on total eggs and fertile eggs were 100, 9, 12, 79 and 79 respectively. The bigger eggs had better hatchability per cent than smaller and medium size eggs. This study concluded that, better hatchability in emu birds may be obtained even in hilly regions with standard managemental condition provided proper incubation environment.

Keywords: Emu, hatchability, hilly area, production cost.

INTRODUCTION

The Emu (*Dromaius novaehollandiae*) is one of the ancient group of birds belonging to the order of flightless birds called ratites. The adult emu birds weigh around 40 to 55 kg. The emu farming is well established in Australia and is gaining popularity in the United States, Europe and China. The United States has the largest population followed by Europe, Canada, China and New Zealand. Emu farms are being established in many Asian countries present. Emus are very hardy birds and adapted to varied agro climatic conditions. The anatomical and physiological features of Emu facilitate its adaptation to varied climatic conditions such as temperate and tropical areas. There are no known common diseases to this species. They can thrive in environments ranging from the hot desert (56°C) to very chill climatic regions (0°C). The feather pattern and nostrils make it resistant to extreme climatic conditions. One of the main reasons that impede the development of emu farming is the fact that hatchability of the species is poor in natural incuabtion compared to other poultry species. The female emu lay a clutch size of 10 eggs, then brood the eggs and stop lay eggs until hatch. Due to that the no.of chicks output is low compare to other species (TNAU, 2015). Further, the incubation technique for the emu has not been fully developed. Hatchability depends on appropriate incubation conditions. Artificial incubation of emu eggs needs to aim at creating conditions such as humidity,

temperature and proper turning to simulate the natural condition. Previously some authors have studied the hatching performance of emu in tropical climate, however, the present work was under taken to study the hatching performance of emu breeder birds reared in organized commercial emu farm in hilly area.

MATERIALS AND METHODS

A commercial emu farm located (2000 meter above mean sea level) at Kumbaraiyur, Kodaikanal Taluk, Dindigul District, Tamil Nadu, India was chosen for this study. This was an organized commercial emu farm situated on the western part of Tamil Nadu in Palani hills which is an extension of Western ghat at 10.15 N latitude and 77.30 E longitudes. The climate is almost cold throughout the year. The maximum temperature ranges from 17°C to 20°C and the minimum temperature from 7°C to 10°C. The average annual rainfall in the area is 1650 mm and the maximum rain fall occurs during the North East monsoon season (October to December).

Breeder pairs. A total of 34 emu breeder birds (Fig. 1) were selected and each pair was housed in separate breeding pens under semi intensive system of management and provided with 400 sq. ft. floor space per breeding pair. The birds were provided only the natural day light and no artificial light was provided. They were fed on emu breeder mash and water was provided *adlibitum.*

Breeding season

The breeding period starts in the late September and ends on March every year. The first egg was laid in first year October and the last egg was laid in the followed year March (Fig. 2).

Egg laying and pre- incubation storage of hatching eggs. The hatching eggs from breeder flock were collected around 5.00 pm to 7.00 pm daily. Soon after collection, the eggs without any physical defects were fumigated with formaldehyde gas for 20 min at '2X' concentration according to the per manganetrix method of North and Bell (1990). A total of 650 emu eggs were collected during breeding season, out of which 100 eggs were selected for the hatchability study. These eggs were stored at 65°F with 70±5 per cent relative humidity, for a period of 4 days prior to setting, in horizontal position. The hatching eggs were allowed to sweat and dry prior to setting.

Incubation of eggs. The standard forced draft type emu incubator was used for artificial incubation. The good and non-defective eggs were cleaned by using cotton dipped in 1% Virkon-S disinfectant solution and then the eggs were set in the incubator. The optimum temperatures of 96.5°F to 97.0°F (dry bulb) and relative humidity of 45 to 50 per cent (wet bulb reading 82.0°F to 84.0°F) was provided for 52 days. The egg weight before cold storage, at the time of setting and on 14th day, 21st day, 28th day, 35th day, 42nd day and 49th day of incubation period were recorded. All eggs were set horizontally (Fig. 3) and turned at 45 degree angle once in a hour up to 49th day. On 50th day of incubation, the eggs were transferred to the hatching trays in the same incubator for next 3 to 5 days. The chicks started pipping out from 52 days onwards, then the hatched chicks were transferred to the brooding sections (Fig. 4).

Post hatch egg break open study. After taking out all the hatched out emu chicks from the hatcher trays, the unhatched eggs were subjected to break open study on 56th day of post setting under bright sun light. The broke open eggs were examined macroscopically to identify the late embryonic mortality and dead-in-shell if any. A fully developed embryo which had failed to hatch out was classified as dead-in-shell (Fig. 5) and the remaining dead embryos were classified as late embryonic mortality (Fig. 6).

RESULTS AND DISCUSSION

Weight loss in hatching eggs. The data on weight loss in emu hatching eggs during incubation (1-49 days) are presented in Table. 1. During the entire days of incubation, weight loss was lower in hatched eggs than unhatched eggs. The mean per cent weight loss in emu eggs during incubation was 11.15 ± 0.25 per cent for hatched eggs and 14.54 ± 78 per cent for unhatched egg. The egg weight loss was approximately 1.16g to 1.5g per day during incubation, which in accordance with Warale *et.al.* 2014, they noted 1.2g to 1.5g egg weight loss per day during incubation. Minnaar and Minnaar (1993); Danczak and Majewska (1999); Szczerbinska *et al*. (1999); Jeffery (2001) have recorded a range of 10-20 per cent loss in egg weight loss during incubation of emu eggs, which is also in agreement with the present results. The egg weight loss is much lower than avian eggs, where the avian birds lose more than 25 to 30 per cent. However, Buttermer *et al*. (1988) reported that the naturally incubated emu egg lost only about 10 per cent of their initial weight during their entre artificial incubation period.

Table 1: Per cent weight loss in emu eggs during incubation (Mean ± SE).

No. of days of incubation	Per cent weight loss	
	Hatched eggs (79)	Unhatched eggs (21)
1-14	3.07 ± 0.06	4.14 ± 0.19
15-21	1.55 ± 0.04	2.03 ± 0.09
22-28	1.66 ± 0.04	2.17 ± 0.10
29-35	1.56 ± 0.03	1.77 ± 0.16
36-42	1.67 ± 0.04	2.26 ± 0.10
43-49	1.64 ± 0.04	2.17 ± 0.14
Mean per cent weight loss (1-49)	11.15 ± 0.25	14.54 ± 0.78

(Figures in parentheses indicate number of egg)

Egg weight. The egg weight measured are presented in Table 2. The weight of emu eggs ere ranged from 440 to 700g, the average egg weight was 562.81g ± 3.86, which is in agreement with the finding of Jagatheesan *et al.* (2010); Boopathi *et al.* (2012); Gnanaraj *et al.* (2013), they noticed the average egg weight between 573 to 584g in emu breeder reared in tropical climate. However, Walarle *et al.* (2014) observed egg weight range of 526 to 470g, which is lesser than this study.

Chick weight as per cent of egg weight. The chick weight as per cent of egg weight was measured and presented in Table 2. The weight of emu chick at hatch ranged from 367.16g ± 3.90 to 412.5g ± 4.31 with a mean weight of 389.83g ± 4.10. The mean emu chick weight as per cent of egg weight recorded was 69.28 ± 0.33 per cent. The weight of emu chick increased significantly with increase in egg weight, though mean chick weight as per cent of egg weight did not differ much. These findings are concord with Reddy *et al.* (2004), they noted that emu chicks weight ranges from 370-450 g (about 67% of egg weight) depending on the size of egg. However, Menezes *et al.* (2001) reported lesser day old emu chick weight of 347g and mean emu chick weight as per cent of egg weight was 66.80 per cent.

Table 2: Egg weight, chick weight and chick weight as per cent of egg weight (Mean ± S.E).

Egg size	Mean egg weight (g)	Mean chick weight at hatch (g)	Mean chick weight as per cent of egg weight
440-570 g	527.44 ± 4.55 (60)	367.16 ± 3.90 (48)	69.61 ± 0.85
571-700 g	598.18 ± 3.17 (39)	412.5 ± 4.31 (31)	68.95 ± 1.11
Mean	562.81 ± 3.86	389.83 ± 4.10	69.28 ± 0.98

(Figures in parentheses indicate number of eggs and number of chicks respectively)

Hatchability performance. The hatching performance of emu eggs are presented in Table 3. The results depicts that the percent fertility, dead embryo, dead in shell, hatchability on total eggs and fertile eggs were 100, 9, 12, 79 and 79 respectively. A similar 100 per cent fertility was noted by Boopathi *et al.* (2012). The per cent fertility in this study was not in concurrence with Suganya *et al.* (2017), they recorded fertility per cent values between 80.44 to 83.50 in different years. However, Suganya *et al.* (2017) had recorded a range of 73 to 80 per cent hatchability on total eggs and 90.5 to 98.3 per cent hatchability on fertile eggs in different years, which in accordance with this study. Similarly the hatchability performance recorded by Jagatheesan *et al.* (2012); Paramasivam *et al.* (2012) in emu birds also in agreement with this study. However, Majewska (2001) recorded 68.3 per cent hatchability on total eggs, which is lesser than the results obtain in present study.

Effect of egg weight on hatchability. Effect of egg weight on hatchability is presented in Table 4. The total no. of eggs taken for the present study was categorized as small (300 – 440 g), medium (441- 570 g) and large (571-700 g) based on egg weight. Out of the total 100 eggs taken for the study 60 eggs came under the medium size with the hatchability of 80% and 39 eggs fell under the large size with maximum hatchability of 84.21%. Only one fell under small size which was not hatched out.

Table 3: Hatching performance of emu eggs.

Number of eggs incubated	Dead embryo	Dead- in- shell	Per cent Hatchability	
			Total eggs	Fertile eggs
100	9	12	79	79

Table 4: Effect of egg weight on hatchability.

Egg weight	Number of eggs	Hatchability per cent
Small (300 – 440 g)	1	0.00
Medium (441- 570 g)	60	80.00
Large (571-700 g)	39	84.21

Post hatch break open study. In the present study the fertility observed 79 per cent hatchability on total and fertile eggs. The per cent dead in shell and dead embryos were 9 and 12. Whish shows better fertility and lower embryonic mortality. The dead in shell values are in agreement with Boopathi (2009), the author recorded 9.1 per cent dead in shell. However, the dead embryos per cent was not in concord with Boopathi (2009); Majewska (2001), both the authors had found more than 21 to 22 per cent dead in embryo, which showed the present study had lesser dead embryos due to good management practices.

Fig. 1. Emu breeder birds.

Fig. 3. Emu incubator.

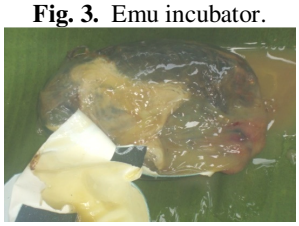

Fig. 5. Dead in shell.

Fig. 2. Emerald greem colour emu egg.

Fig. 4. Day old chick with leg band to avoid sprawling.

Fig. 6. Late embryonic mortality.

CONCLUSIONS

This study revealed that, emu birds can be reared in temperate hilly areas and will get good egg production under standard managemental condition. More the day old emu chicks may be hatched out in artificial incubation provided with proper incubation environment conditions. Due to artificial incubation, continuous egg laying and hatching is possible without pause. Further, as the number of chick's increases, the return on investment also increases.

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Conflict of Interest. None.

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