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Seasonal Effects on Hatchability Performance of Ostrich (*Struthio camelus*) in Tropical Climate

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ABSTRACT: Study on months and seasonal influence on hatching performance of ostrich was carried out at the Post Graduate Research Institute in Animal Sciences, Tamil Nadu Veterinary and Animal Sciences University, Kattupakkam, Kanchipuram district, Tamil Nadu. To assess the hatching performance a total of 1439 ostrich eggs were used in this study. Hatching performance *viz.,* fertility, total hatchability, fertile hatchability and embryonic mortality were assessed. The result showed that month and season had a significant influence on fertility, total hatchability, fertile hatchability and embryonic mortality. Higher per centage of fertility (48.46) and total egg hatchability (16.04) were observed during November month. Season had a highly significant (P≤0.01) influence on fertility performance in ostrich and comparatively highest percentage of fertility were observed during northeast monsoon (33.77) and winter (31.39) season followed by summer (14.55) and southwest monsoon (10.28) season. Similarly, highest total hatchability percentage was observed during northeast monsoon (11.98) and winter (8.39). Comparatively higher percentage of embryonic mortality were observed during south west monsoon (81.94) and winter (72.85) than summer (64.81) and northeast monsoon (62.47). From the above study, it can be concluded that the hatching performances in ostrich relying on season since, better hatching performance observed during northeast monsoon and winter season.

Keywords: Hatchability performances, month and seasonal influence, Ostrich.

INTRODUCTION

Ostrich is native to Africa and ostrich farming originally commenced in South Africa during the early 1860's. Ostrich farms now began to spread to other countries, particularly Egypt, Australia, New Zealand, the United States and Argentina. Ostrich farming is more attractive for leather, meat, oil and feather (Malecki *et al.,* 2008) however in ostrich, the hatching performance is very limiting. In addition, Ostrich are seasonal dependent and breed between December and June in tropical climate. The annual egg production in farming ostrich vary between 30 and 50 eggs per hen (Deeming, 1999) or even less (More, 1996). Low egg production, poor fertility and hatchability, higher embryonic mortality, less chick survival is some of the major limiting factors in ostrich farming. Further, hatchability performance in ostrich is influenced by many factors such as breed, age, egg qualities, storage time and environmental conditions and very few studies are available. Hence, a study the effects of month and seasonal variations on hatching performance of ostrich have been carried out and this research will be use full to assess the breeding season, which will be important on ostrich breeding programme.

MATERIALS AND METHODS

The influence of months and season on hatching performance of ostrich was carried out at the Post Graduate Research Institute in Animal Sciences, Tamil Nadu Veterinary and Animal Sciences University, Kattupakkam, Kanchipuram district in Tamil Nadu. The research station is located approximately at 12.5°N latitude and 80° to 81°E longitudes and at the height of 48 meter above mean sea level having tropical monsoon climate. This station received its seasonal rainfall from the northeast monsoon i.e., during October to December. To study the seasonal effect, the year was divided in to four seasons namely, winter (January and February), summer (March, April and May), southwest monsoon (June, July, August and September) and northeast monsoon (October, November and December (Indian Metrological Department, Pune). A total of 1439 eggs were utilized for this study. The eggs were collected every day, graded, fumigated (3 X) and stored at 18°C with 80 per cent relative humidity for 7 days.

On the day of setting, the hatching was brought in to room temperature for one hour and incubated and provided optimum temperature (97.9°F) and humidity (30-40 per cent) in setter and hatcher. The eggs were turned once in four hours by automatic turner at 90° angle up to 38 days. The eggs were transferred to hatcher on the 39th day for hatching. After hatching, Unhatched eggs were breakout to get infertile and embryonic mortality data. The per cent fertility, total hatchability, fertile hatchability and embryonic mortality were worked out. Fertility was calculated after deducting infertile eggs from the total number of eggs set. Hatchability on total eggs set and on fertile eggs set was calculated. Embryonic mortalities were calculated based on fertile eggs set.

Statistical analysis: All the fertility parameters were expressed in percentage. The data were analyzed by standard statistical procedure (Duncan, 1955) after arc-sine transformation.

RESULTS AND DISCUSSION

Influence of month and season on hatching performance of ostrich are presented in Table 1 and 2 respectively.

Table 1: Month effects on hatching performance of ostrich eggs (Mean ± SE).

Parameters	Fertility **	Hatchability		Dead germ**	Dead in shell *	Total embryonic mortality*
		Total egg set**	Fertile egg set**			
January (n= 123)	35.51^{a} ± 6.34	10.11^{a} ± 1.59	29.16^{ab} ± 2.80	37.88^{cd} ± 4.79	32.95^{a} ± 5.09	70.83^{ab} ± 2.80
February (n= 152)	27.27^{ab} ± 3.37	6.68^{bc} ± 0.91	25.13^{bc} ± 2.30	35.78^{cd} ± 2.19	39.08^{a} ± 2.61	74.86^{a} ± 2.30
March (n= 134)	17.75^{bc} ± 1.83	6.54^{bc} ± 0.55	38.88^{a} ± 4.60	38.05^{bcd} ± 3.39	23.05^{ab} ± 5.61	61.11^{bc} ± 4.60
April (n= 100)	12.82^{bc} ± 2.10	4.93^{cd} ± 1.00	37.50^{a} ± 8.53	54.16^{ab} ± 8.03	8.33^{bc} ± 6.32	62.50^{bc} ± 8.53
May (n= 113)	13.09^{bc} ± 1.91	3.91de ± 1.34	29.16^{ab} ± 9.03	54.16^{ab} ± 7.25	16.66^{b} ± 8.33	70.83^{a} ± 9.59
June (n= 159)	10.67^{bcd} ±2.56	0.39^{e} ± 0.39	8.33 ± 8.53	62.50^{a} ± 9.50	29.16^{a} ± 9.85	83.33^{a} ± 9.45
July (n= 111)	12.96^{bc} ± 2.64	3.70^{de} ± 1.23	22.22^{bc} ± 7.02	61.11^{a} ± 8.37	16.66^{b} ± 7.45	77.77^{a} ± 8.58
August (n= 98)	8.11^{cd} ± 1.14	1.55^{de} ± 1.70	16.66^{cd} ± 8.25	66.66^{a} ± 9.34	16.66^{b}± 9.85	83.33^{a} ± 9.51
September (n= 85)	9.36^{cd} ± 0.33	1.62^{de} ± 1.20	16.66^{cd} ± 9.54	66.66^{a} ± 8.53	16.25^{b} ± 7.88	83.33^{a} ± 8.83
October (n= 68)	24.25^{ab} ± 3.65	9.84^{ab} ± 3.33	41.66^{a} ± 9.37	52.77^{ab} ± 9.92	5.55^{bc} ± 5.34	58.33^{c} ± 9.37
November (n= 108)	48.46^{a} ± 9.33	16.04^{a}± 2.14	35.71^{a} ± 4.51	41.07^{bc} ± 8.13	23.21^{ab} ± 3.38	64.28^{ab} ± 4.51
December (n= 183)	28.59^{ab} ± 3.22	10.05^{a} ± 1.53	35.20^{a}± 3.53	36.81^{cd} ± 7.89	27.99^{ab} ± 4.98	64.79^{ab} ± 3.53
Overall mean (N=1439)	**20.74 ± 2.12**	**6.28 ± 0.79**	**28.03 ± 2.45**	**50.64 ± 4.25**	**22.33± 3.14**	**71.28 ± 2.38**
F value	24.69	22.70	6.09	26.34	7.41	2.83

n=No. of egg set / Month; N=total egg set; Means bearing different superscripts within the same column differ significantly; **Highly significant (P≤ 0.01); *Significant (P≤ 0.05);

Fertility (%). The months and season had a highly significant (P≤0.01) effect on fertility in ostrich. Highest percentage of fertility was observed during November month (48.46) and lowest during August (8.11) month. In season, highest percentage of fertility was observed during northeast monsoon (33.77) and winter (31.39) than summer (14.55) and southwest monsoon (10.28). The mean per cent fertility observed in this study (22.07) is comparable with Hariharan (2013); Pandian *et al.* (2017) in seven-year-old and nine-year-old ostrich respectively. Similarly, Ipek and Umran (2006); Dzama (2009); Dzama (2010); Elobied *et al.* (2010); Kontecka *et al.* (2011) observed a wide range of 50 to 80 per cent fertility in ostrich. Further, Pandian *et al* (2017) studied the effect of season on fertility parameter in ostrich and found highest fertility rate during northeast monsoon and winter than summer and southeast monsoon. Similarly, in other avian species like ducks (Pruthi and Aggarwal 1987); Japanese quail (Prabhakaran *et al.,* 1992), broiler breeder (Hossain *et al.* 2002) and turkeys (Mahiye *et al.* 2005) observed good fertility in monsoon and winter season than summer season.

Table 2: Seasonal effects on hatching performance of ostrich eggs (Mean ± SE).

Parameters	Fertility **	Hatchability		Dead germ**	Dead in shell *	Total embryonic mortality**
		Total egg set**	Fertile egg set**			
Winter (Jan-Feb) (n= 275)	31.39^{a} ± 3.64	8.39^{a} ± 1.01	27.14^{a} ± 1.83	36.83^{a} ± 2.53	36.02^{a} ± 2.88	72.85^{a} ± 1.83
Summer (March-May) (n= 352)	14.55^{b} ± 1.19	5.13^{b} ± 0.61	35.18^{a} ± 4.49	48.79^{a} ± 4.92	16.01^{b} ± 4.34	64.81^{b} ± 4.49
Southwest monsoon (June-Sep) (n= 453)	10.28^{b} ± 0.95	1.81^{b} ± 0.51	15.97^{b} ± 4.42	64.23^{b} ± 8.17	19.79^{b} ± 4.67	81.94^{a} ± 4.58
Northeast monsoon (Oct-Dec) (n= 359)	33.77^{a} ± 4.17	11.98^{a}± 1.50	37.52^{a} ± 3.51	43.55^{a} ± 4.34	18.91^{b} ± 3.47	62.47^{b} ± 3.51
F value	13.58	17.87	6.13	4.17	2.73	15.24

n=No. of egg set / season; Means bearing different superscripts within the same column differ significantly; **Highly significant (P≤ 0.01); *Significant (P≤ 0.05).

Hatchability (%). The effect of months and season on per cent total and fertile hatchability varied significantly (P≤0.01) with an overall mean value of total and fertile hatchability of 6.28 % and 28.03 % respectively. Significantly (P≤0.01) highest total and fertile hatchability percentage was observed during November month (16.04) and October month (41.66) respectively. Among season, highest total and fertile hatchability percentage was observed in northeast monsoon (11.98 and 37.52) and lowest in southwest monsoon (1.81 and 15.97) respectively. Earlier study on influence of season on total and fertile hatchability was comparable with Pandian *et al.* (2017) in ostrich and Sundaresan (2014) in emu. However, higher percentage of fertile hatchability than our present study was also reported by Malecki *et al.* (1995) in emu, Hariharan (2013); Dzama (2010) in ostrich and observed wide range of hatchability percentage (30-70 %) in ostrich.

Embryonic mortality (%). The per cent dead germ, dead in shell and total embryonic mortality of ostrich hatching eggs among different month and seasons showed significant difference. The overall mean per cent dead germ, dead in shell and total embryonic mortality among different months were 50.64, 22.33 and 71.28 respectively. Among seasons, lowest total embryonic mortality was observed during northeast monsoon (62.47) followed by summer (64.81) and winter (72.85) and highest during southwest monsoon (81.94). Comparatively lower percentage of embryonic mortality were reported by Majewska (2001); Sahan (2003); Kontecka *et al.* (2011) in ostrich. However, Brand *et al.* (2007); Hariharan (2013) have observed higher embryonic mortality in ostrich. From the above results, it becomes clearly evident that the hatchability performances, *viz.,* fertility, hatchability and embryonic mortality are seasonal dependent in ostrich and it might be due to hormonal effects.

CONCLUSIONS

The above study concluded that months and different season showed significant influence on fertility and hatchability performance in ostrich and considered as a seasonal breeder in tropical climate, which is evident from that significantly better fertility and hatchability were observed during northeast monsoon and winter than summer and southeast monsoon seasons.

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Conflict of Interest. None.

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