Behavioral patterns during the grower period of captive red-necked ostrich (*Struthio camelus*)

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الملخص

اجريت هذه الدراسة لتقييم سلوكيات كتاكيت النعام النامي في الاسر، على عدد 15 من كتاكيت النعام ذو الرقبة الحمراء النامي في عمر شهرين، وتم اسكانها في مشروع الرجاء الزراعي والذي يبعد 75 كيلومتر جنوب الخرطوم. كانت ابعاد الحظيرة 9.5x5.5x3.5 متر بارضية خرسانية. كان مستوى التغذية 16.34% بروتين خام و10.11 ميجاجول طاقه ممثلة / كجم. تم رصد السلوكيات لمدة ثلاثة ايام متتابة من خلال ثلاث فترات نهائية متتابة 6:00 - 10:00 صباحاً، 10:00 صباحاً - 2:00 مساءً و 2:00 - 6:00 مساءً. تم مراقبة المشي والجلوس والوقوف والاكل والشرب والالتقاط من الارض واكل الروث والتبرز والتبول لمدة ثلاثة ايام متتالية. أظهر متوسط الموازنة الزمنية النهارية لأضرب السلوكيات المختلفة للكتاكيت النامية أن 70% من النشاط مكرس للأكل والشرب واكل الروث والتبرز. وقت الراحة كان 20% من النهار. التبرز كان قليلاً (0.136 ± 11.67 %) في الصباح واكل الروث عالياً (02.27 ± 07.36 %) في المساء.

Abstract

This study was conducted to evaluate captive grower ostrich chicks' behavioral patterns. Fifteen grower red-necked (*Struthio camelus*) chicks (2 months old) were stocked at Rajaa Agriculture Scheme 75km. south of Khartoum, White Nile Governate and accommodated in a pen of dimensions 9.5x5.5x3.5m. with a concrete floor. Feeding plane was at 16.34% crude protein and 10.11 MJ ME/ Kg. Behavior was observed during three consecutive days on grower chicks over three daylight periods, 6:00 -10:00 a.m., 10:00 a.m. - 2:00 p.m. and 2:00 – 6:00p.m. Walking, sitting, standing, feeding, drinking, pecking, coprophagy, urination and defecation for three consecutive days was observed. The mean daylight time budget of different behavioral attributes of grower ostrich chicks show that 70% of activity was devoted to feeding, drinking, coprophagy and defecation. Resting was 20% of time. Defecation was less (11.67± 0.136 %) in the morning and coprophagy was high (07.36 ±02.27%) in the evening.

Introduction

The ostrich (*Struthio camelus*), named after similarities with the camel in morphology and adaptations, is the world's largest living flightless bird belonging to a small order of birds known as ratites or the running birds. **Kreibich, and**

Sommer (1995) reported the subspecies *S.c.camelus* and *S. c. massaicus* belong to the red-necked ostriches. Compared to the African blacks these two subspecies are more difficult to keep due to their shorter history of domestication and their need for the higher fences. The subspecies *camelus* was the most common red-necked ostriches in the Sudan. Studies on behavior are important for the evaluation of the welfare of these birds. According to **Newberry *et al.* (2007)** in the wild, pecking is a natural behaviour that leads to the establishment of a pecking order in the group.

Degen *et al.* (1989) reported that for ostrich chicks 5-6 months kept in an outdoor enclosure on a packed ground without natural vegetation during the daylight hours, over 60% of the time was spent walking whereas sitting time formed the next largest part (20%) of the time – activity budget. Eating time was 6.6%, and drinking only spent 1% of the daylight time (sleeping is 12 hours). **Bubier *et al.* (1996)** observed 7- 14 day-old ostrich chicks fed on pelleted feed in troughs or scattered on the ground. Time observation was 200 minutes in total, of which 23.1 and 6.75% were spent walking and standing respectively.

Kreibich and Sommer (1995) showed that about 26% of the time ostrich spend on eating and in search of food. Summer observations revealed that feeding was carried out 7:00 – 9:00 a.m. and 18:00 – 20:00 p.m., whereas walking and running, rest and standing takes about 15, 27 and 18% of their time respectively. Most mobility was devoted to the search of food and social behavior. Coprophagy has been observed in both wild birds (**Holtzhausen and Kotze, 1990**) and captive chicks (**Kreibich and Sommer, 1995**).

The highly good management requires knowledge about the behavioral patterns of ostrich chicks during the grower period and there has been little written on the behavioral patterns that need more observations and research. The aim of this study is to evaluate the behavioral patterns' time budget of grower ostrich chicks in captivity.

Materials and Methods

This study was run at Rajaa Agricultural Scheme, 75km. south of Khartoum, White Nile Governate. Thirty eight grower red-necked ostrich (*S. camelus*) chicks were used in this trial. The birds were at the age of two months. The grower chicks were lodged in a roofless pen of dimensions 9.5x5.5x3.5m. with a concrete floor.

Grower ostrich chick ration (**Table 1**) was introduced and fed *ad lib.* for 8 weeks. Clean water was provided *ad lib.* Chicks behavioral attributes of walking, sitting, standing, feeding, drinking, pecking, coprophagy, urination and defecation were observed for three consecutive days over three daylight periods, 6:00 -10:00 a.m., 10:00 a.m. - 2:00 p.m. and 2:00 – 6:00p.m.

Table 1. Percent composition (as fed basis) and analyzed chemical composition (dry matter basis) of grower ostrich chick ration.

Ingredient	Percentage	Component	Percentage
Sorghum	45.00	Dry matter	95.20
Groundnut meal	02.00	Crude protein	16.34
Fish meal	04.00	Crude fiber	16.44
Lucerne	25.00	Ether extract	02.94
Groundnut hulls	12.50	Nitrogen-free-extract	48.13
Bone meal	06.00	Ash	11.35
Vitamin/mineral	05.00	Ca	03.49
Common salt	00.50	P	01.17
Total	100.00	Energy(MJ ME/Kg)*	10.11

* Calculated according to **Lodhi et al. (1976)**.

Results and Discussion

The behavioral attributes of grower captive ostrich chicks in this study were monitored for three consecutive daylight each of 12 hours and deemed sufficient to give a fair day time budget for adapted ostriches to their premises for about four months.

Table 2 and **Figure1** both summaries time spent and its percentage share of the day time budget in figure and graphical representations for grower ostrich chicks. The time spent in walking (08.33 ± 03.92) was greater in the morning. Less walking ($06.11 \pm 03.73\%$), feeding ($26.53 \pm 09.88\%$), drinking ($08.89 \pm 02.08\%$), pecking ($03.33 \pm 01.18\%$), high standing ($11.11 \pm 03.87\%$) and sitting ($37.50 \pm 04.77\%$) was observed in noon time. Defecation is least ($11.67 \pm 01.36\%$) in the morning and coprophagy is high ($07.36 \pm 02.27\%$) in the evening. In the full daylight budget 70% of the activity is devoted to feeding, drinking, coprophagy and defecation. Pecking time among young ostriches in this study was low enough ($04.72 \pm 00.79\%$) to suggest that there is dominance or feeding order among this group of chicks. Resting lasts for 20% of the daytime.

Table 2. Average (mean $\pm$ s.d.) behavior attributes* of grower ostrich chicks.

Behavior Attributes		Morning (6:00-10:00 a.m.)	Noon (10:00 a.m. - 2:00 p.m.)	Evening (2:00 - 6:00 p.m.)	Full daylight (12 Hours)
Walking	(min.)	20.00 $\pm$ 04.71	14.66 $\pm$ 04.48	17.00 $\pm$ 02.86	51.66 $\pm$ 02.32
	(%)	08.33 $\pm$ 03.92	06.11 $\pm$ 03.73	07.08 $\pm$ 02.38	07.18 $\pm$ 00.65
Sitting	(min.)	52.34 $\pm$ 14.76	90.00 $\pm$ 05.72	14.50 $\pm$ 00.75	152.00 $\pm$ 15.69
	(%)	21.81 $\pm$ 12.32	37.50 $\pm$ 04.77	06.05 $\pm$ 00.63	21.11 $\pm$ 04.36
Standing	(min.)	22.00 $\pm$ 04.32	26.66 $\pm$ 04.64	16.34 $\pm$ 02.78	65.00 $\pm$ 05.93
	(%)	09.17 $\pm$ 03.60	11.11 $\pm$ 03.87	06.80 $\pm$ 02.32	09.03 $\pm$ 01.65
Feeding	(min.)	84.00 $\pm$ 05.10	63.66 $\pm$ 11.85	127.34 $\pm$ 12.81	275.00 $\pm$ 17.03
	(%)	35.00 $\pm$ 04.25	26.53 $\pm$ 09.88	53.05 $\pm$ 10.68	31.62 $\pm$ 03.71
Drinking	(min.)	24.38 $\pm$ 06.25	21.34 $\pm$ 02.49	36.66 $\pm$ 01.89	82.28 $\pm$ 07.68
	(%)	10.14 $\pm$ 05.21	08.89 $\pm$ 02.08	15.28 $\pm$ 01.57	11.43 $\pm$ 02.13
Pecking	(min.)	13.00 $\pm$ 02.86	08.00 $\pm$ 01.41	13.00 $\pm$ 01.47	34.00 $\pm$ 02.86
	(%)	05.42 $\pm$ 02.38	03.33 $\pm$ 01.18	05.42 $\pm$ 01.22	04.72 $\pm$ 00.79
Coprophagy	(min.)	16.34 $\pm$ 03.17	09.34 $\pm$ 02.49	17.66 $\pm$ 02.72	43.34 $\pm$ 04.37
	(%)	05.97 $\pm$ 03.16	03.89 $\pm$ 02.08	07.36 $\pm$ 02.27	06.02 $\pm$ 01.21
Defecation	(no.)	28.00 $\pm$ 01.63	36.00 $\pm$ 02.83	48.00 $\pm$ 01.41	112.00 $\pm$ 03.56
	(%)	11.67 $\pm$ 01.36	15.00 $\pm$ 02.36	20.00 $\pm$ 01.78	15.56 $\pm$ 00.99

* Observed for three consecutive daylights, each of 12 hours.

Behavioral patterns were seen to devote much time in the morning and evening sessions to walking feeding and drinking, as was observed in the wild behavior (**Degen *et al.*, 1989**), but coprophagy is more practiced in the evening to be utilizing both morning and evening defecations. Noon is the resting time of the day for about one third of the time budget.

Observation throughout the study period shows birds to have no activity at night, sleeping in a circle with their heads to the center and their backs to the circumference of the circle. Similar observation was recorded by **Elobeid (2007)** and **Stewart (1994)** on the sleeping organization of adult captive red-necked ostriches at night.

Most ostrich activities related to their life maintenance occurred during daylight as the birds rest fully at night for 12 hours with no activity. The ostriches walk more in the morning than in the mid-day, while standing was more in the noontime. The lowest frequency of feeding and pecking were during mid-day.

* observed for three consecutive daylight periods of 12 hours each.

During the study period, there was a higher consumption of feed in the early hours of the day and during the evening, which coincides with the hours of least temperature, as well as the time when food is offered. **Samraus (1994) and Deeming (1998)** found higher consumption of food during the morning when the food was supplied. Also this agrees with the results **McKeegan and Deeming (1997)**, who observed a peak in the consumption of feed in the morning. Our result was similar to **Faki (2001)** on day feeding time (32.12%) for captive adult ostriches being of the highest share. **Deeming (1998)** found no diurnal variation in the frequency of feeding behavior during the winter in captive ostriches. Similar results were found by **Ross and Deeming (1998)**, who studied the behavior of ostriches during summer. In this study, the birds were moving more in the early hours of the day and at the evening which is in accordance with the results found by **McKeegan and Deeming (1997)**, who reported greater expression of walking behavior in the morning and the end afternoon in captive male ostriches.

Conclusion

Daytime budget for growing captive ostrich chicks revealed similar patterns derived for other subspecies or adult birds regardless of the season. About 70% of the time budget was devoted to feeding beside drinking and defecations. Resting at noon was of least time (20%). Coprophagy was mostly an evening activity and defecations were less.

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