

**Growth performance of young ostriches (*Struthio camelus*)  
and emus (*Dromaius novaehollandiae*)  
under Saudi conditions**

**By:**

**H. AGAB<sup>1\*</sup> and B. ABBAS<sup>2</sup>**

**(Hamid Agab and Babiker Abbas)**

**Key words:** *ostriches; emus; chicks; weight gain, growth rate; Saudi Arabia.*

*(Two tables and four figures)*

**1-Al-Thinayyan Agriculture Company, Al-Qassim, Saudi Arabia.**

**Current address: Associate Professor, College of Veterinary Medicine and Animal Production, Sudan University of Science and Technology. P O Box 204, Hillat Kuku, Khartoum North, Sudan.**

**E-mail: hamidagab@hotmail.com**

**2-Professor, Department of Veterinary Medicine, College of Agriculture and Veterinary Medicine, Al-Qassim University, P O Box 1482, Buraidah, Saudi Arabia.**

- Corresponding author.

**Growth performance of young ostriches (*Struthio camelus*) and emus (*Dromaius novaehollandiae*) under Saudi conditions**

**Abstract**

The growth performance of young ostriches and emus was studied in two ratite farms, A and B, in Saudi Arabia. Both ostrich and emu chicks showed little weight gain in the first few days of life compared to the following days which showed non-stable and non-consistent body weight gain. The fluctuation in weight gain in emu chicks was less remarkable compared to that in ostrich chicks. The growth rate of ostrich chicks in Farm B at the end of the first 14 weeks of life was better and faster than that of ostrich chicks in Farm A at the same age period. The growth rate of ostrich chicks hatched during the summer period was found to be faster, more stable and less fluctuating than that of the chicks hatched during the winter period which, also, had a net negative weight gain by the 10<sup>th</sup> week of the observation period.

# دراسة معدلات النمو لصغار طيور النعام والإيميو

## تحت ظروف المملكة العربية السعودية

----

حامد عقب محمد و بابكر عباس

\*\*\*\*\*

### ملخص الورقة

في هذه الدراسة تم رصد معدلات النمو لصغار طيور النعام والإيميو في مزرعتين لتربية الرواكض ( أ ) و ( ب ) بمنطقة القصيم بالمملكة العربية السعودية. تلاحظ حدوث زيادة بمعدلات قليلة في أوزان صغار كل من نوعي النعام والإيميو خلال الأيام الأولى من العمر مقارنة بالأيام التالية والتي شهدت معدلات زيادة غير ثابتة وغير مستقرة في أوزان صغار الطيور. كانت الزيادة غير الثابتة في أوزان صغار طيور النعام بصورة أوضح من الزيادة في صغار طيور الإيميو. كان معدل النمو في صيصان النعام في المزرعة ( ب ) بعد الأسبوع الرابع عشر من عمر الصيصان أفضل وأسرع من معدل النمو في صيصان النعام في المزرعة ( أ ) خلال نفس الفترة. كانت معدلات النمو في صيصان النعام المفقوسة في فصل الصيف أسرع ، أكثر ثباتاً وأقل تذبذباً مقارنة بمعدلات النمو في صيصان النعام المفقوسة خلال فصل الشتاء والتي شهدت معدل نمو سالب (نقصان في معدل الوزن) خلال الأسبوع العاشر من عمر صيصان النعام التي شملتها الدراسة.

# **Growth performance of young ostriches (*Struthio camelus*) and emus (*Dromaius novaehollandiae*) under Saudi conditions**

## **Introduction**

The ostrich (*Struthio camelus*) is the world largest bird that is well adapted to living in open arid lands. The natural habitat for the ostrich extends from the Arabian and Saharan deserts southward throughout Africa. The emu (*Dromaius novaehollandiae*), the second most important ratite species, is native to Australia and neighboring islands. Emus are more recent in domestication and commercial replication when compared to ostriches. Ostrich products include meat, leather, fat, oil and feather. The emu, in addition to its value as a meat animal, is distinguished by the pharmaceutical properties of its oils and fats (Huchzermeyer, 1998). The ability of any meat producing animal to grow faster and attain maximal growth rate at a shorter period has important practical implications and is considered as an important indicator for breeding quality (Guittin, 1987; Sabbioni *et al.*, 1999). Early growth rate of ostrich and emu chicks is essential in establishing the birds for subsequent growth up to slaughter mass. Growth pattern of young ostriches is characterized by immediate drop in body weight after hatching before a steady climb takes place

thereafter (Deeming and Ayres, 1994; Agab, 2005). However, there is considerable variability in individual chick mass during the first three months of age with some chicks often not attaining normal rates of growth (Deeming *et al.*, 1993). Factors affecting normal rates of growth of chicks include feed quality, social grouping, diseases, time of the year, management practices and genetics (Deeming *et al.*, 1993; Jarvis, 1998). In this paper we present empirical data on the growth performance of ostrich and emu chicks, as indicated by body weight gain, in two ratite farms in Al-Qassim region, Central Saudi Arabia.

### **Materials and methods**

The study was conducted on two ratite farms (A and B) located in Al-Qassim, in the Central Region of Saudi Arabia. Farm A, established in 1997, was composed of 400 *Black-neck* ostriches (*Struthio camelus* var *domesticus*) and 400 emus (*Dromaius novaehollandiae*), both imported from a producer in France. The birds were kept in communal pens with dimensions of 100X200 m<sup>2</sup>. Each pen was supplied with satisfactory shaded areas, water drinkers and feeding troughs. The farm had a hatchery section with incubating and hatching machines of French origin (*Mayenne Ecllosion, St Jean Sur Mayenne, France*). The chick rearing section, in which the birds were kept for up to three months of age, was

composed of 24 rooms ranging from 9 to 32 m<sup>2</sup> each. Each room opened into an exercise area with dimensions ranging from 30 to 120 m<sup>2</sup>, one third of which was shaded. The floor area for the rooms and exercise areas was made of concrete. Rooms were supplied with air conditioners of dual purposes (heating and cooling). The grower birds section was composed of several pens of varying sizes ranging from 20X30 m<sup>2</sup> to 100X200 m<sup>2</sup> supplied with shade, water drinkers and feeding troughs.

Farm B was established in 1999 with an initial breeding stock of 500 *Black-neck* ostriches purchased from a local producer in Saudi Arabia. The Farm design was similar to Farm A, except for a few differences. The chick rearing section was composed of five rooms and an outside exercise area ranging from 90 to 120 m<sup>2</sup>. The floor was made of sand, without concrete. The grower birds section was composed of 12 pens of varying sizes, ranging from 320 to 6000 m<sup>2</sup> and was supplied with shaded areas, feeders and drinkers. The incubating and hatching machines were purchased from the United States of America (*NatureForm Inc., Jacksonville, Florida, USA*).

**Farm operation:** In both farms, batches of newly hatched chicks were delivered from the hatchery section to the chick rearing section once a week. Starter mash feed (Table 1) and water were

provided, *ad libitum*, to the chicks upon arrival to the rearing section. The initial immunization dose against Newcastle disease (NCD) was administered via aerosol spraying on the eyes and nostrils at one-day old using a live attenuated tissue culture vaccine (Twinvax-MR<sup>®</sup>, Schering Plough Animal Health, USA). The second and third booster vaccinal doses against NCD were injected subcutaneously at days 21 and 90, respectively, using an oil-adjuvant killed virus vaccine (Binewvax, Merial, Lyon, France). Birds were monitored daily for signs of deviation in health and vitality. An electronic balance (Bosch, PE 620, USA) was used for weighing birds up to 3 kilograms body weight whereas for heavier weights, an other weighing balance (Avery, Birmingham, England) was used.

**Daily body weight gain of ostriches:** Twelve, unsexed one-day old ostrich chicks were selected randomly for monitoring the daily body weight gain in young ostriches in Farm A. Each chick was identified with a plastic leg tag. The initial body weight of each chick was recorded at day one, upon arrival from the hatchery. Chicks were weighed on daily basis then after for a period of 10 days.

**Weekly body weight gain of emus and ostriches:** Twelve, unsexed one-day old emu chicks in Farm A were selected

randomly and identified by leg tags for monitoring their weekly body weight gain in emu chicks. Each chick was weighed at day one upon arrival from the hatchery. Chicks were weighed on weekly basis then after for a period of 14 weeks.

A similar experiment was performed on twelve unsexed ostrich chicks from each of the two Farms, A and B, for a period of 14 weeks.

**Effect of hatching season on body weight gain:** Two groups (I and II), each of ten newly hatched ostrich chicks, were selected randomly in Farm A for studying the effect of ambient temperature during the hatching season on the growth rate of young ostriches. Group I chicks were hatched in the summer (August; monthly mean temperature = 35.8 °C) while Group II chicks were hatched in the winter of the same year (November, monthly mean temperature = 21.3 °C). The birds were identified by leg tags, weighed at day one and on weekly basis then after for up to ten weeks of age.

**Statistical analysis:** Data were analyzed by computer using commercially available software (SP9.0, Maxel, U.K.) that featured descriptive statistics, analysis of variance and regression analysis.

## Results

The means of the total daily weight gain of the twelve ostrich chicks for the first ten days of life are shown in Fig. 1. Young ostrich chicks gained very little body weight in the first 2 to 3 days compared to the following days which showed higher and accelerated weight gain. The increase in weight gain was found to be non-stable, non-consistent and did not follow a specific pattern. The mean of the total daily body weight gain for the twelve chicks was negative (-12.7 gm) on the 8<sup>th</sup> day.

As in ostrich chicks, the body weight gain of emu chicks up to 14 weeks of age was also fluctuating and unstable (Fig. 2). The correlation coefficient between age and weight gain was 26.8. However, emu chicks had a positive balance of body weight gain and showed less fluctuation and more stability throughout the period of study when compared to ostrich chicks.

The means of the weekly body weight gain of ostrich chicks in Farm A and B during the first 14 weeks of life are presented in Fig. 3. It can be noticed that the mean weight gain of the twelve ostriches in Farm B was negative (-2 grams) at the end of the first week while it was 116 grams in Farm A at the same period. The mean weight gain of the twelve birds at week 14 was 520 grams in Farm A while it was 3670 grams in Farm B ( $P < 0.001$ ) indicating

far better and faster growth rate among Farm B ostrich chicks compared to Farm A ostrich chicks.

The growth rate of ostrich chicks hatched during the summer (Group I) was better ( $P < 0.001$ ), more stable and less fluctuating than that of the chicks hatched during the winter (Group II) (Fig. 4). Both groups of chicks had similar growth rates for the first six weeks, but started to manifest remarkably different growth rates from week 8 onwards. Winter hatched chicks (Group II) had a net negative weight gain by the 10<sup>th</sup> week when the experiment was terminated.

### **Discussion**

Body weight of the new ratite hatchlings is dependent on the initial egg weight from which the bird emerges (Deeming and Ar, 1999). Ratite chicks lose up to 20% of their mass within 5 – 7 days of hatching before beginning a steady climb in body mass (Guittin, 1987; Degen *et al.*, 1991; Deeming *et al.*, 1993). Poor or negative weight gain in young ostrich chicks during the first few days of life recorded in this study could be due to the loss of body fluids and the utilization of yolk material which usually takes place within the first one to three weeks post hatch (Smit, 1963; Jensen *et al.*, 1992). Deeming *et al.* (1993) also reported considerable variability in growth rate of ostrich chicks of the same batch that were sharing

the same room and feed. Some workers considered the wide variation in weight of ostrich chicks as common and must be accepted as a natural phenomenon occurring in ostrich management (Mushi *et al.*, 1998). The lack of consistency in weight gain of young ostrich chicks has been attributed to sub-clinical diseases, embryo weakness, feeding habits, gastric impaction and environmental influences (Deeming *et al.*, 1993; Deeming and Ayres, 1994; Huchzermeyer, 1998; Jarvis, 1998). As there were no significant differences in feed composition between the two farms (Table 1), the negative weight gain recorded in the first week of life of Farm B ostrich chicks (-10 grams) compared to the positive weight gain in Farm A ostrich chicks (580 grams) could be due to variations in genetic background or management and hatching efficiency (Deeming, 1995). The mean weekly weight gain of ostrich chicks in Botswana (1.3 kg) was higher than that recorded for Farm A ostrich chicks (0.71 kg) but lower than that recorded for Farm B ostrich chicks (2.2 kg) (Mushi *et al.*, 1998). The influence of ostrich breed on bird growth rate was remarkable to the extent that *Blue Neck* ostriches were often cross-bred with the African *Black Neck* ostriches to improve body size (Sabbioni *et al.*, 1999). However, as of yet, there are no standard ostrich breeds similar to those recognized in chicken. The designations *Black*,

*Blue* or *Red-necked* ostriches are broad categories of ostrich ecotypes that do not strictly correspond to breeds (Shanawany and Dingle 1999). The sex effect on mature weight was found to be less significant although adult males yielded heavier weights than females (Cilliers *et al.*, 1995).

The lower growth rate of young ostriches in cold weather compared to warmer weather could be due to the energy expenditure for keeping warmth for the birds during winter and also due to the cold stress exerted upon the chicks resulting in depressed feed intake (Mushi *et al.*, 1998). The better growth rate during warmer weather could also be attributed to the increased number of feeding hours in the summer longer day hours compared to the winter short-day hours (Jarvis, 1998). In this study, the maximal rate of growth in Farm B ostriches was found to be between 77 and 98 days of life (week 11 and week 14) which is similar to the age reported by Angel (1996) in ostrich chicks in Indiana Farms (Indiana, USA). Although the fluctuation in growth rate of emu chicks was less than that in ostrich chicks, this study shows that ratite chicks, particularly ostriches, are delicate and their growth can be easily affected by many factors (Huchzermeyer, 2002). Correlation analysis showed that age and weight gain of emu and ostrich chicks are not correlated. It can be

recommended that regular monitoring and weighing of ratite chicks followed by their isolation and segregation into weight groups could have a role in the improvement of artificial rearing of ostrich chicks.

## References

- Agab, H.** (2005). Practical Aspects and Constraints in the Commercial Production of Ostriches (*Struthio camelus*) and Emus (*Dromaius novaehollandiae*) in Saudi Arabia. Ph.D. Thesis. Sudan University of Science and Technology. Pp. 172.
- Angel, C. R.** (1996). Serum chemistries and vitamin D metabolites in ostriches, emus, rheas and cassowaries. Proceedings of an International Conference: Improving our Understanding of Ratites in a Farming Environment. Oxfordshire, UK. 122 – 124.
- Cilliers, S. C.; du Preez, J. J.; Maritz, J. S. and Hayes, J. P.** (1995). Growth curves of ostriches (*Struthio camelus*) from Oudtshoorn in South Africa. *Animal Science*. **61**: 161 – 164.
- Degen, A. A.; Kam, M.; Rosenstrauch, A. and Plavnik, I.** (1991). Growth rate, total body water volume, dry matter intake and water consumption of domesticated ostriches (*Struthio camelus*). *Animal Prod.* **52**: 225 – 232.
- Deeming, D. C.; Ayres, L. and Ayres, F. J.** (1993). Observation on the Commercial production of ostrich (*Struthio camelus*) in the United Kingdom : Incubation. *Veterinary*

Record. **132**: 602 – 607.

**Deeming, D. C. and Ayres, L.** (1994). Factors affecting the rate of growth of Ostrich (*Struthio camelus*) chicks in captivity.

Veterinary Record. **135**: 617 – 622.

**Deeming, D. C.** (1995). The hatching sequence of ostrich (*Struthio camelus*) embryos with notes on development as observed by candling. Br. Poult. Sci. **36** (1): 67 – 78.

**Deeming, D. C. and Ar, A.** (1999). Factors affecting the success of commercial incubation. In: Deeming, D. C. (Eds.) The Ostrich : Biology, Production and Health. CABI Publishing, Wallingford, Oxon, UK.

**Guittin, P.** (1987). Croissance de l'autruche en parc zoologique. Canadian Journal of Zoology. **65**: 3056 – 3061.

**Huchzermeyer, F. W.** (1998). Diseases of Ostriches and Other Ratites. Agricultural Research Council Onderstepoort Veterinary Institute. Republic of South Africa. pp. 296.

**Huchzermeyer, W. F.** (2002). Diseases of farmed crocodiles and ostriches. Rev. Sci. Tech. **21** (2): 265 - 276.

**Jarvis, M. J. F.** (1998). The subspecies and races of ostriches and their present status in the world. Proceedings of the 2<sup>nd</sup> International Ratite Congress. Oudtshoorn, South Africa. pp. 4 – 8.

**Jensen, J. M.; Harvey, J. and Weiner, S. T.** (1992). Husbandry and medical management of ostriches, emus and rheas.

Texas, USA, Wildlife and Exotic Animal Teleconsultants.

**Mushi, E. Z.; Isa, J. F.; Chabo, R. G. and Segaise, T. T.** (1998).

Growth rate of ostrich (*Struthio camelus*) chicks under intensive management in Botswana. Trop. Anim. Health.

Prod. **30** (3): 197 – 203.

**Sabbioni, A.; Superchi, P.; Bonomi, A.; Summer, A. and Boidi,**

**G.** (1999). Growth curves of intensively reared ostriches

(*Struthio camelus*) in northern Italy. 50<sup>th</sup> EAAP Congress,

Zurich, 22 – 26 August, 1999.

**Shanawany, M. M. and Dingle, J.** (1999). Ostrich Production

Systems. FAO Animal Production and Health Paper 144.

Rome. 256 p.

**Smit, D. J.** (1963). Ostrich farming in the Little Karoo. RSA,

Dept. of Agricultural Technical Services. Bulletin No.

358.

**Table 1. Proximate analysis of starter feeds used in Farms A and B.**

Farm	Moisture (%)	Dry matter (%)	Crude protein (%)	Crude fat (%)	Ether extract (%)	Ash (%)	Nitrogen	
							free extract (%)	Phosphorus (%)
<b>A</b>	4.30	95.70	24.26	14.80	4.90	9.40	42.34	1.40
<b>B</b>	4.00	96.00	23.18	15.50	4.70	16.5	36.12	1.30

**Table 2. Body weight gain in ostrich chicks in different hatching seasons.**

Particular	Weights (grams)	
	Group I	Group II
Total initial weight of the ten chicks	8625	8475
Total weight of the ten chicks after 10 weeks	74375	44150
Total weight gain of the ten chicks	65750	35675
Mean weekly gain per chick	657.5	356.8

Fig. 1. Mean daily body weight gain in juvenile ostriches in Farm A.

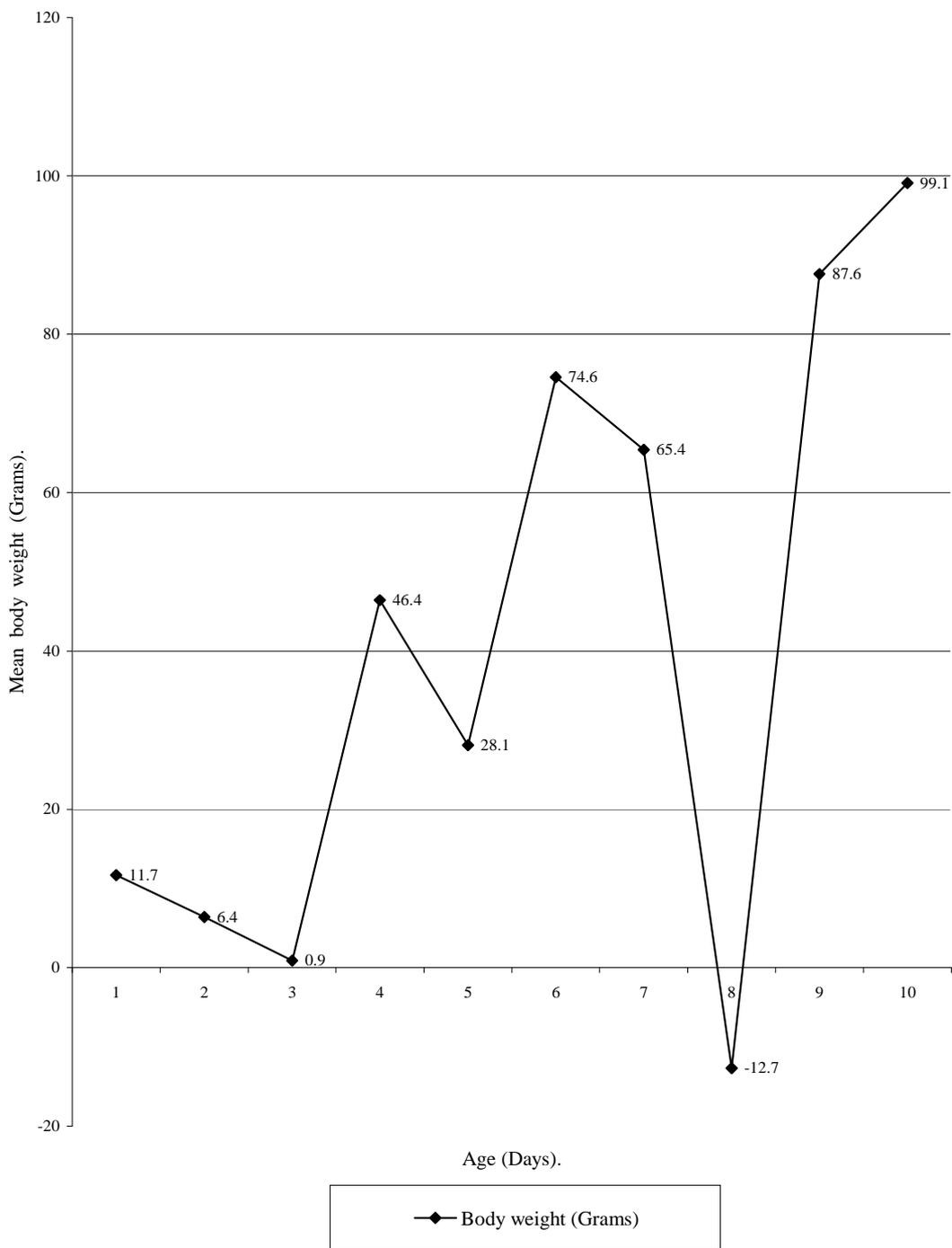


Fig. 2. Mean weekly weight gain in ostrich and emu chicks - Farm A.

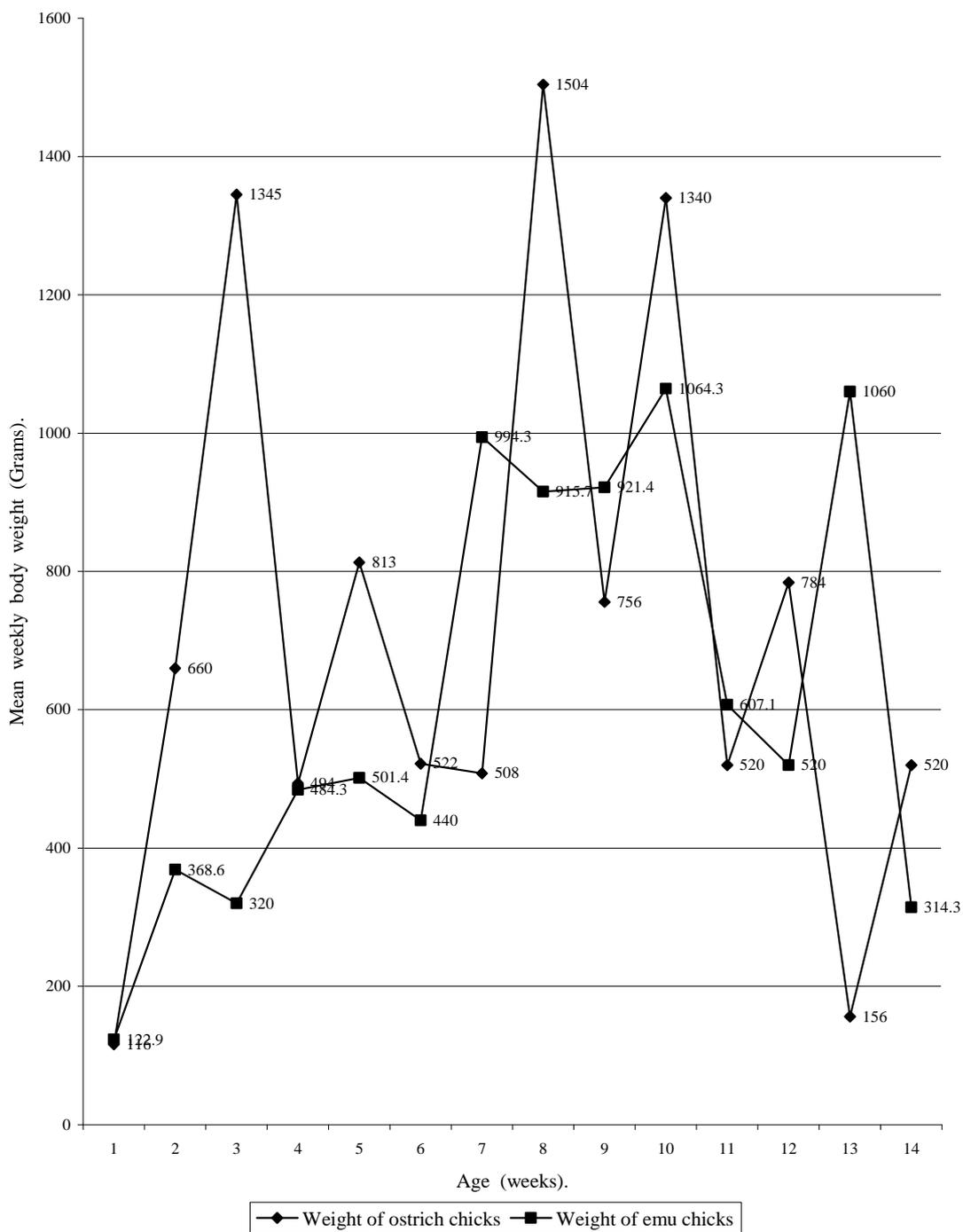


Fig. 3. Mean weekly weight gain in Farm A and B ostrich chicks.

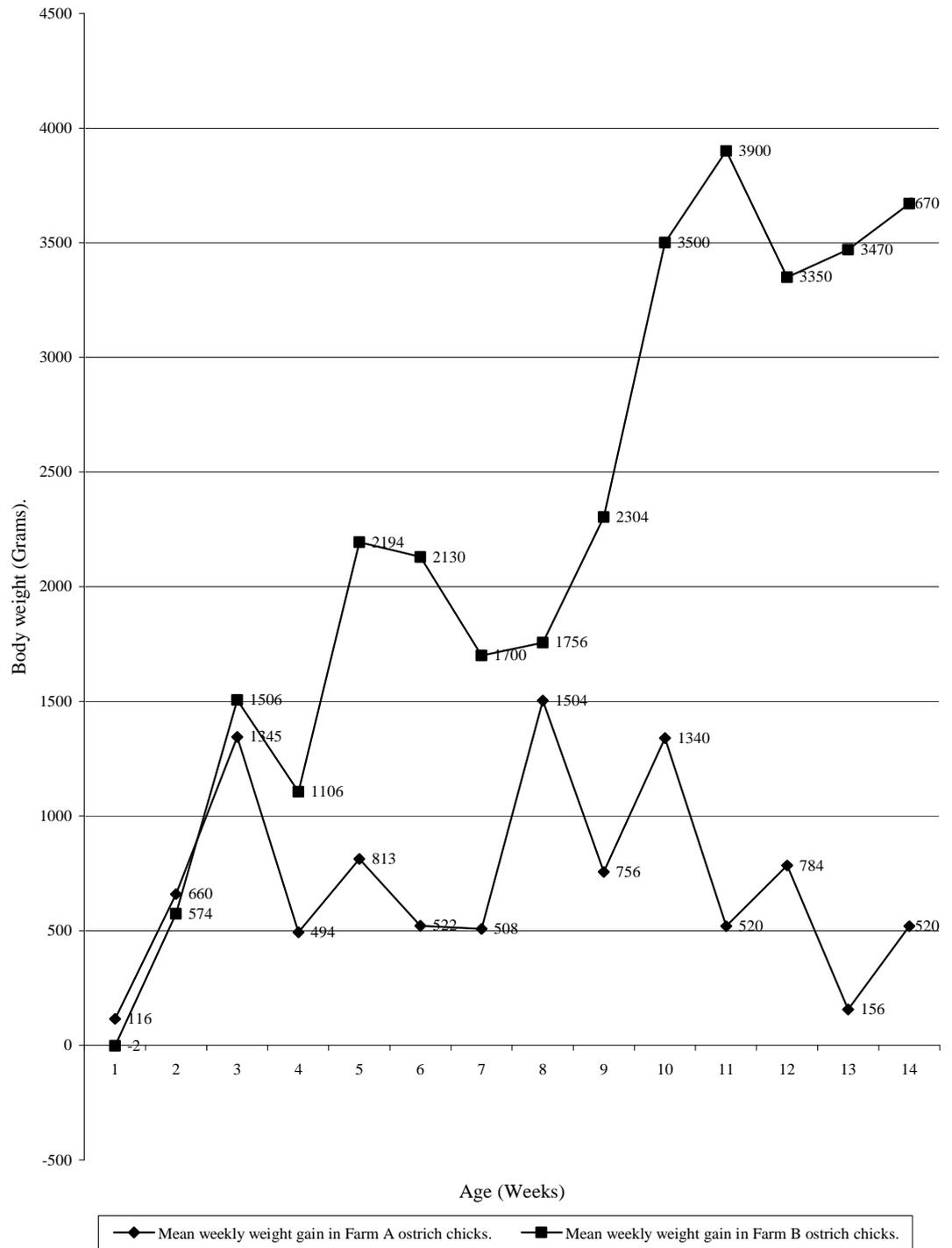


Fig. 4. Mean weekly weight gain in summer and winter hatched ostrich chicks.

