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Observations of the incubation of imported ostrich (*Struthio camulus*) eggs in a farm

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Abstract

This study was conducted to investigate the hatchability and infertility of the ostrich eggs. Seven batches of ostrich eggs were imported from Australia into Korea in winter season under quarantine restrictions. Single stage incubation was carried out and the eggs were weighed before incubation. The weight of imported ostrich eggs was varied from 1,074 to over 1,650g and the average egg weights for batches were similar. The hatchability of all eggs batch was reached between 11 and 31 %. The infertility of seven batches was varied from 36 to 63%. The first batch of eggs showed relatively low infertility(39 %) and high hatchability (31 %). On the contrary, the last batch of eggs had low infertility(36 %), and it had the lowest hatchability(11 %). The result of this study suggests that hatchability of ostrich eggs imported in late laying season is significantly low because the number of infertile eggs is increased.

Key words : Ostrich egg, Import, Incubation, Infertility, Hatchability

Introduction

The ostrich has been domesticated for over 100 years. In the middle of the 19th century, South African farmers began to keep the birds for their feathers which were sold to the fashion industry[1]. More recently it has been expanded to North America, part of Europe and Asia[2,3]. Nowadays, the ostrich were raised in more than 80 countries. The primary products are meat and leather with the feather being no such an important consideration[1,4]. The ostrich is high protein red meat with very low cholesterol levels and leather is used for such as handbags, belts and shoes[3,5]. The fat, bone and even empty egg shells are mainly used in many ways[6].

Production of domesticated ostrich is well established in South Africa, Zimbabwe and Namibia[1,7]. During the decade of 1980s, the USA and Australia expanded ostrich

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farming[8] but there have not yet established stable production base of ostrich and not supported commercial market for ostrich meat products.

There are many obstacles to interfere ostrich industry progress. Despite a century of commercial production of ostriches, there have been a little progress in scientific research which deal with management practices, health care, nutrition and breeding. Most of the ostrich farmers have little knowledge and experience of production of ostrich egg and ostrich as well. Veterinarians also do not have experience in treating ostrich clinically and have no sufficient knowledge about ostrich physiology and disease control.

For the development of ostrich industries, ostrich farmers, veterinarians and scientists are cooperating to provide useful answers to existing and future problems. Recently, the number of published paper are increased for the information about ostriches, raising the standard of management conditions. It would provide owners and farm manager with background to enhance the management of ostrich.

The purpose of this study was to investigate hatchability, infertility, and to observe weight and size of imported ostrich eggs.

Materials and Methods

Quarantine

The ostrich eggs which had tested for export by Australian Quarantine and Inspection Service, were imported into Korea. They kept quarantine restrictions under the National Veterinary Research & Quarantine Service, Korea(NVRQS). During the quarantine period, 47 days after arriving, the any eggs which died during incubation had to be tested for Newcastle disease, *Salmonella pullorum*, *Salmonella gallinarum*, avian influenza, conducted at the Seoul regional office, the NVRQS.

Incubation

Seven batches of eggs, which were 840 in total, were imported in December 1998, January and February 1999. The ostrich eggs were air-freighted from commercial ostrich farms in Australia packed in strong cardboard boxes. Except one batch, six batches of eggs were originated from the same ostrich farm, which possessed three different breeding group. Arrived at the ostrich farm in Korea, the ostrich eggs were applied formaldehyde gas fumigation. The eggs were weighed on an electronic balance and their maximum length(L) and breadth (B) were measured in centimeter. The eggs were then set in an incubator(Sokoban, Canada) with a maximum capacity of 300 ostrich eggs, which was operated as single stage machine. The incubator consisted of 4 setters, and each setter was separated or assembled by the number of eggs. The incubator was set at the controlled temperature(36.8 ℃) and the relative humidity(25 %). The eggs were candled at 7, 15, and thereafter once a 10 days during the incubation. The eggs were candled for monitoring the pattern of embryonic development, by using a small, bright flashlight to illuminate the eggs in a darkened room. The eggs were removed from incubator when they had not shown any changes of angiogenesis for two weeks. The eggs were examined carefully around 40 days after incubation and transferred to the hatcher when the pipping was observed on the

eggshell. The act of hatching was naturally with as little assistance as possible.

Results

Quarantine

The laboratory data were negative for Newcastle disease, *Salmonella pullorum*, *Salmonella gallinarum*, avian influenza examined for any of the imported eggs. During the quarantine period, the procedures for all of the eggs were considered to have been successful. All waste materials were incinerated.

Measurement of the egg

The mean egg weights for seven batches were similar, but there was wide variable in each batch of eggs. The mean egg weight was 1,314 ± 96, 1,317 ± 86, 1,300 ± 132, 1,299 ± 87, 1,309 ± 89, 1,310 ± 88, 1,303 ± 70 g, respectively, which was shown in Table 1. Among the eggs observed, the difference of weight were reached from 375 to 579g. There were some small eggs more weighed than normal eggs, which may have excessively thick shells.

The mean breadth and length of eggs were similar but there were varied between 11.1~13.1cm in breadth and 13.1~17.5cm in length(Table 1). In general, the egg shape was ovoid even the ratio of breadth and length showed a little different range. The ratio of breadth and length was ranged between 1.077~1.452. The surface of eggs were normally smooth and lustrous, but there were some abnormal eggs with rough and rugged-textured surface, black spots, and chalkiness.

The infertility and the hatchability

The number of eggs from seven batches was summarized in Table 2. Each batch of eggs showed different hatchability and infertility(Fig 1). The infertility of each batch was varied from 36 to 63 %. The number of infertiled eggs were seemed to be increased as the imported late.

Hatchability from seven batches decreased gradually. The first batch showed 31 %, but in the last batch reached only 11 %. These appearance resulted from increasing infertiled eggs and died eggs during the incubation. The relationship of hatchability and infertility was showed in Fig 1. Hatchability of fertiled

Table 1. The mean weight, breadth and length of ostrich eggs imported from Australia

Batch	Number of eggs*	Mean weight(g)	Breadth(cm)	Length(cm)	Ratio of breadth and length**
A	104	1,314 ± 96	11.9 ± 0.33	14.6 ± 0.55	1.228 ± 0.047
B	120	1,317 ± 86	11.9 ± 0.31	14.6 ± 0.49	1.223 ± 0.048
C	96 (120)	1,300 ± 132	11.9 ± 0.38	14.7 ± 0.46	1.239 ± 0.056
D	120	1,299 ± 87	11.9 ± 0.31	14.6 ± 0.46	1.22 ± 0.045
E	128	1,309 ± 89	12.0 ± 0.3	14.5 ± 0.51	1.21 ± 0.045
F	50 (128)	1,310 ± 88	11.9 ± 0.34	14.5 ± 0.57	1.222 ± 0.057
G	56 (120)	1,303 ± 70	11.8 ± 0.29	14.2 ± 0.41	1.208 ± 0.038

*The values in parenthesis indicated the number of imported eggs.

**The ratio was measured as length divided by breadth.

Table 2. The summary of the incubation result from seven batches of eggs imported from Australia

Batch	A	B	C	D	E	F	G
Infertiled	41	60	58	62	64	121	65
Died during incubation	31	24	34	26	36	37	95
Hatched	32	36	28	32	28	34	20
Total	104	120	120	120	128	192	180

eggs was reached from 44 to 60%, but the last batch of eggs was just 18% which was lowest hatchability, meanwhile infertility was 36%. This result were seemed to be caused by the late laying season.

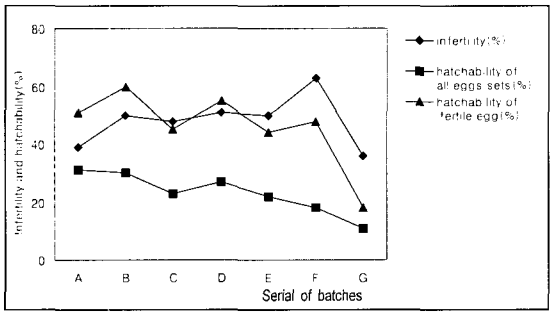

Fig 1. The comparison of hatchability and infertility of the seven batches of eggs imported from Australia

Discussion

In Korea, the ostrich and ostrich eggs were imported from Australia, United State, Canada, China and Japan, since the late 1997. Since then, the ostrich import has been increased continuously. There are about 10,000 imported ostrich and the imported ostrich eggs number was reached 7,000.

The egg weight is affected by species characteristics, season, the parents' genetic factors[10,11]. In poultry species, as for the relationship of egg weight and the season, egg weight in summer is lower than that in winter[11]. The mean egg weights and sizes in this study were within the normal range reported for ostrich eggs[9]. Egg weights from seven batches varied between 1,074~1,653g. The mean egg weights for seven batches had less variability. But there was wide variability in the egg weight of each batch of eggs. The difference of weight varied from 375 to 579g.

The mean egg weight was 1,464 g and the difference of egg weight reached 300~400g, which examined ostrich eggs during the 12 months[4]. In Korea, Narm recently reported that the mean egg weight was 1,655 g in February and 1,569 g in June[12]. These data of egg weights were heavier than those of ours.

Successful artificial incubation of ostrich eggs requires basic information of incubation temperature, humidity, gas concentration, ventilation, position and turning of eggs.[13] Constant temperature is very important because temperature fluctuation results in low hatchability and reduces viability of chicks[9]. The optimum incubation temperature for ostriche eggs has not been determined, but most managers operate the incubator's setting temperature between 35~36.9℃[3]. In 'single stage' incubator, the machine contains eggs all of the same age and temperature and humidity set point to be matched to the needs of the embryos. In this report, the incubator was maintained the temperature at 36.8℃.

The humidity has to be controlled during

incubation because it affects to the weight loss from the egg[16]. Low water losses indicate low permeability of the eggshell to water vapour and other gases. If the permeability is very low then additional problems can be occured, which affects the survival of embryos later in development[7].

In this report, infertility from seven batches of eggs varied from 36 to 63%. Infertility was relatively higher than those of previous reports. On average, 30~40% of ostrich eggs were infertile in the United States[17]. Average infertility of three batches imported eggs from South Africa and Europe were 13.3%[14]. High infertility in this study is supposed to be resulted from lateness of the laying season in Australia and shipping stress. Also, breeder ostriches were not laying many eggs in late laying season and the eggs were stored for long time to get sufficient eggs to be imported.

Hatchability of ostrich eggs in this study (average 23%) was relatively low compared with other result, in which the imported eggs hatchability was 37.2% from Zimbabwe[13]. In South Africa, hatching success was very variable between farms, raging from about 35~90%[19]. In Korea, Narm recently reported that the hatchability of the ostrich eggs which were imported from U.S. was 53.3%[12]. Therefore, the hachability was influenced by egg condition in original farms, shipping and incubation conditions.

Most mortality of artificially incubated eggs takes place in the last 7-14 days before hatching[2]. High incidence of microbial contamination is a significant problem[14]. But we did not study about microbial contamination during the incubation. For the improving of hatchability in artificial incubation, the followings should be more studied and investigated ; infertility, disease, poor handling, hygiene of preincubation and incubation period.

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