

Breeding Performance of a Captive Chukar Partridge (*Alectoris chukar*) Flock

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Abstract: In this study, chukar partridges (*Alectoris chukar*) were caught from mountains located in Ermenek province of Konya. The partridges, 4 males and 12 females, were placed in an indoor enclosure that was 15 m². The enclosure was designed to contain different types of substrate, rocks and bushes to resemble the natural habitat of the species. The birds were exposed to 16 h of light, 8 h of darkness. In the breeding season, a total of 150 hatching eggs were gathered and 125 chicks were ultimately hatched and reared. These chicks were put into 20 breeding cages that were 0.65×0.40×0.48 m Width×Depth×High (W×D×H). One male and 3 females were placed in each cage. The daily light period was increased from initially 12 h light and 12 h darkness to 16 h light and 8 h darkness. Egg production, overall fertility, overall hatchability and hatchability of the fertile eggs were measured over 2 years as 39 eggs female⁻¹, 68.22, 61.97, 89.95%, respectively in year one and 28.54 eggs female⁻¹, 68.84, 57.83 and 83.43%, respectively in 2 years. As a result of the study, it is clear that chukar partridge can be raised under intensive captive conditions when some management techniques are provided. Therefore, ecological balance can be recreated for chukar partridge population in natural habitat by way of rearing and releasing of chukar partridges.

Key words: Captivity chukar partridge, *Alectoris chukar*, breeding performance, rocks, bushes, Konya

INTRODUCTION

Many of the wild animal species on the world is about to be extinct because environmental pollution has recently reached to extreme levels in industrialised countries (McKinney and Lockwood, 1999; Thomas *et al.*, 2004). Thus, these animal species are being under conservation by various methods in the countries. One of these methods is that following breeding the animals in intensive conditions to set these animals free in natural habitat, which is under control (Buner and Schaub, 2008). The partridge species is an outstanding example of these animals that is bred and released.

Alectoris graeca is one of the most widely used species in intensive partridge production (Woodard and Morzenti, 1975; Kirikci *et al.*, 1999, 2003; Cetin *et al.*, 2002). Red-legged partridge (*Alectoris rufa*) is also raised under intensive conditions in many countries. In Spain, this species is widely raised in game farms for restocking purpose, being raised and released >3,000,000 per year (Gonzalez-Redondo, 2004). However, there are limited studies concerning on breeding ability of chukar partridges (*A. chukar*) in intensive breeding conditions (Vandepopuliere *et al.*, 1967; Woodard, 1982; Woodard *et al.*, 1986; Cetin *et al.*, 1997).

In Turkey, intensive breeding and releasing of rock partridge had a negative effect on chukar partridge population in natural habitat. Therefore, studies are required to increase chukar partridge population.

Turan (1990) and Woodard *et al.* (1993) reported that chukar partridge was one of the most wild partridge species and some management applications were needed when, they were bred in intensive conditions.

Partridges normally lay 8-16 eggs in natural habitat Turan (1990) and Robbins (1998). However, the number of eggs/hen of rock partridges varies between 45 and 58 in intensive breeding program (Kirikci *et al.*, 1999). It was well documented that overall fertility, overall hatchability and hatchability of fertile eggs of rock partridges were 74.60-96.90, 58.52-87.96 and 75.90-97.05%, respectively (Woodard and Morzenti, 1975; Kirikci *et al.*, 1999, 2003; Cetin *et al.*, 2002). Gaudioso *et al.* (2002) reported that laying capacity of the red-legged partridge under seminatural conditions is affected by the type of cage used and that providing an increased cage area as well as more nests or nesting places increases egg production. The procedure from captive to breeding of red legged partridges in intensive conditions took long period in Spain (Gonzalez-Redondo, 2004).

Woodard and Snyder (1976) and Woodard *et al.* (1993) stated that breeding of chukar partridges in

intensive conditions could be possible when some management applications such as beak trimming and proper housing conditions were provided. It was reported that eggs/hen obtained from chukar partridges varied between 11 and 75 in different housing conditions (Vandepopuliere *et al.*, 1967; Meyer and Millam, 1986; Woodard *et al.*, 1986; Cetin *et al.*, 1997). Overall fertility, overall hatchability and hatchability of fertile eggs of chukar partridges were 57.14-94.6, 53.57-90.7, 91.11-93.75% in different studies (Vandepopuliere *et al.*, 1967; Woodard, 1982; Woodard *et al.*, 1986; Cetin *et al.*, 1997).

The objectives of this study were to investigate breeding performance of a captive chukar partridge (*Alectoris chukar*) flock in different housing conditions. In parallel with the production increase, releasing of the bird to nature would also be made intensively. By this, generations of the partridges would be preserved strictly.

MATERIALS AND METHODS

Partridges: Chukar partridges (*Alectoris chukar*) originated from mountains located in Ermenek province of Konya, Turkey. Four males and 12 females were caught from the region and these partridges constituted the breeding flock in the study.

Indoor enclosure: An enrichment in the living area of the birds was made as follows; a 15 m² indoor enclosure was designed to contain different types of substrate, rocks and bushes (thicket, brushwood) to resemble the natural habitat of the species. Room floor is covered with large wood shavings. The partridges were initially exposed to an 11 h light: 13 h dark. The Light period (L) was increased 1 h every week until it was fixed at 16 h L: 8 h Dark (D) per day.

Incubator: A 1380 partridge egg capacity incubator composed of setting and hatching parts was used.

Battery brooder: Two types battery brooder were used. First, it consisted of multideck battery and dimensions of one deck battery were 180×70×27 cm. The second type was lower/upper deck battery. Its dimensions were 201×90×52 cm Width×Depth×High (W×D×H). The battery was used for chicks aged from 4-12 weeks.

Cage systems

Breeding cages: Five cages were used for breeding partridges. Each cage composed of wire-floor and its size was 250×205×140 cm (W×D×H). The cage was set up to 65 cm distance from floor.

Mating cages: These cages consisted of three floors and each floor had two compartments. Dimensions of each compartment were 65×40×48 cm (W×D×H). Totally, 7 cages (42 compartments) were used for breeding partridges.

Feeding: Two diets containing 240 g kg⁻¹, 2.800 kcal kg⁻¹ ME and 220 g kg⁻¹ crude protein, 2950 kcal kg⁻¹ ME were used for chicks and mating partridges, respectively. These diets were provided ad libitum at the breeding. Eggs were obtained from the birds at 32 weeks of ages.

Egg storage rooms: All of eggs were stored in a room, which was down physiological zero (20°C) and 60-75% relative humidity during 14 days.

Egg position: Each day the eggs were collected and then put in the storage room small-end down egg positions.

Application: After 14 days, all eggs were set into incubator, which was 37.8°C and had 68-70% relative humidity. At 21 days of incubation, the eggs were transferred to separate places. After hatching, all unhatched eggs were opened and examined macroscopically for evidence of fertility and stage of embryonic development (Mauldin and Buhr, 1997; Ernst *et al.*, 2004).

Experiment 1: Partridges (4 males and 12 females) obtained from natural habitat were put into indoor enclosure at the 8-12 weeks age. Partridges grow in this indoor enclosure. Partridges after the 16 weeks age constituted small groups gradually. Partridges, at the 30-32 weeks age laid eggs. At the same time, birds were exposed to 16 h of light, 8 h of darkness and fed with mating diet. They started to lay eggs in April just like in natural habitat. The eggs were gathered twice daily between at 3:00 and 5:00 pm and placed as small end down on egg flats. Prior to incubation, the eggs were stored throughout 14 days in another room, which had the temperature below to physiological zero. Then, stored eggs were placed in a disinfection chamber and fumigated for 20 min by mixing 20 g potassium permanganate into 40 mL 10% formalin solution per m³ of chamber (Meijerhof *et al.*, 1994). Totally, 150 eggs were set in incubator.

Experiment 2: Chicks (n = 125) obtained from experiment 1 were reared in multideck battery brooder. Later, the chicks were transferred into lower/upper deck battery and placed until age of 12 weeks. Partridges were taken to breeding cages until mating age (30-32 weeks age). Sixty

females and 20 males were selected from the breeding stock. These were placed as 1:3 male: females in each compartment. The daily light period was increased from initially 12 h light and 12 h darkness to 16 h light and 8 h darkness. These applications started at the end of the March increase to the middle of the April. The stages from egg collection to incubation stated in experiment 1 were the same in experiment 2. The chicks obtained from the stock constituted flock of next generation. The experiment lasted 2 years.

Statistical analysis: Data of two breeding season were analyzed by student t-test in SPSS pocket program (SPSS production facility release 11.0.0, SPSS Inc., 2001).

RESULTS

In experiment 1, partridges started to lay egg 22 days later from the start of lighting period. Laying period continued 128 days. Totally, 267 eggs were obtained from birds. However, it was occasionally observed that females could peck and damage some eggs. Therefore, 150 hatching eggs were set in incubator. Egg production and hatching characteristics are shown in Table 1.

When Table 2 is reviewed, it is shows that first egg was obtained 23 and 21 days later from the beginning of the lighting period in cages. Laying period lasted 121 and 119 days in 1st and 2nd years, respectively. It is also,

Table 1: Egg production and hatching characteristics in experiment 1

Characteristics	Values
Females (n)	12
First egg	22 days
Laying period	128 days
Egg/hen (included lost/damaged eggs)	22.25
Hatching egg/hen	12.5
Chick/hen	10.42
Overall fertility (%)	86
Overall hatchability (%)	96.89
Hatchability of all egg (%)	83.33
Total embryo deads (%)	3.2

Table 2: Egg production and hatching characteristics in experiment 2

Characteristics	Years		Significance
	First	Second	
Females (n)	60	108	
First egg	23 day	21 days	
Laying period	121 day	119 days	
Egg/hen (included lost/damaged eggs)	41	31.02	***
Hatching egg/hen	39.00	28.54	***
Chick/hen	24.30	16.64	***
	$\bar{x} \pm S\bar{x}$	$\bar{x} \pm S\bar{x}$	
Overall fertility (%)	68.22±2.43	68.84±2.62	-
Overall hatchability (%)	61.97± 2.58	57.83±3.27	-
Hatchability of fertile eggs (%)	89.95±1.02 ^a	83.43±2.14 ^b	***
Total embryo deads (%)	9.32±1.00 ^b	16.57±2.14 ^a	***

***p<0.05

seen that egg/hen and chick/hen productions increased when it was compared to production characteristics of experiment 1. However, while hatchability of fertile eggs decreased, total embryo dead increased in 2nd year (p<0.05).

DISCUSSION

Experiment 1 was mainly used to constitute breeding stock of intensive breeding system. An indoor enclosure was designed for this aim. Some difficulties were seen to obtain hatching eggs. It was observed that some territorial behavior and some groups developed. These were alpha male and alpha female. Sometime female partridges pecked and damaged eggs. This can be attributed to limited area in indoor enclosure. In a study conducted by Cetin *et al.* (1997), 5 male and 5 female chukar partridges were placed in an indoor enclosure, egg production was 38.40 egg hen⁻¹. This was higher than egg production of present study. The difference can be resulted from sex ratio and size of indoor enclosure.

Chicks obtained from experiment 1 formed breeding stock of 1st year in experiment 2. The stock was completely bred in intensive conditions. Egg production and hatching characteristics of partridges were observed throughout consecutive 2 years. When compared egg production and hatching characteristics of 2 experiments, it was seen that egg production increased in the 1st year. However, hatching characteristics decreased in 1st and 2nd year (p<0.05). Egg/hen and hatchability of all egg in 2nd years decreased when based on first year. However, total embryo dead increased in 2nd year (p<0.05). This can be resulted from differences carried out in experiment 1 and 2. It can result from increased inbreeding depression in 2nd year. Partridges captured (5 male and female) from mountains were put into cages and 11.20 egg hen⁻¹ was obtained in study of Cetin *et al.* (1997). The egg production was lower than that of cages breeding in the present study. It may not be logical to put a partridge to cage without domestic phases of breeding (Woodard *et al.*, 1993; Robbins, 1998).

In this study, egg production and hatching results were in line with different studies for *Alectoris chukar* and *Alectoris graeca* in intensive conditions (Vandepopuliere *et al.*, 1967; Woodard and Morzenti, 1975; Woodard, 1982; Woodard *et al.*, 1986; Cetin *et al.*, 1997, 2002; Kirikci *et al.*, 1999, 2003).

CONCLUSION

As a result of the study, it can be concluded that chukar partridge can be reared under intensive captive

conditions when some management applications are provided. It is also stated that various cage systems can be used to increase fertility of chukar partridges when they are reared in cage system. Our principal aim was to release the birds that were supposed to be familiar with the wild habitat. To select the birds on the selection criteria of egg production or live weight would decrease the birds' potential living in the wild nature. Addition of some birds (male or female partridges) from the wild into intensive breeding flock would be made use of to prevent inbreeding depression.

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