Research Journal of Poultry Sciences 2 (1): 5-8, 2008
ISSN: 1993-5285

The Effects of Season on Hatchability and Fertility of Egg-type Parent Stock (Bovans) in Sudan

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Abstract: Hatching records of egg-type parent stock (Bovans) owned by Coral Chick and Feed Production Farms in Khartoum were used to study the effect of seasons (summer and winter)during the period 1998-1999. These records include the number of total eggs, the number of fertile eggs, the number of eggs set and the number of hatched chicks. Results showed no significant effect of different seasons on the percentage of hatchability of total eggs, percentage of hatchability of fertile eggs, fertility percentage and percentage of dead embryo in shell. The values of the percentage of hatchability of total eggs, percentage of hatchability of fertile eggs, percentage of fertility and percentage of dead embryo in shell in summer and winter of 1998 were (78.55±7.24 and 77.7±11.35), (88.2±4.67 and 87.25±6.72), (88.65±3.56 and 88.65±6.99) and (11.8±4.67 and 12.8±6.7), respectively. Similarly, values in summer and winter of 1999 were (75.7±11.6 and 72.1±14.06), (86.95±7.13 and 86.1±9.28), (85.05±8.69 and 82.1±10.38) and (11.25±9.4 and 12.75±9.5), respectively. The data showed that the difference between seasons was not great so hatching operation can be carried out without ill effects throughout the year when egg-type parents are maintained on deep litter system in open houses and exposed to good management.

Key words: Fertility, hatchability, season, year, parent stock, egg-type

INTRODUCTION

In the last two decades, there has been a continuous growing dem and for poultry products in many towns of the Sudan, especially in the capital Khartoum. This was caused by the increased nutritional awareness of poultry products and the sharp rise in the urbanization and city life which is characterized by outdoor meals and fast food restaurants. Availability of day-old chicks is a prerequisite for any anticipated expansion of poultry industry. Ideally, production of chicks should take place in environmentally controlled poultry houses to ensure optimum conditions for high productivity, since fertility and hatchability are known to be adversely affected by high temperature. Boone and Huston (1963) showed that when cocks exposed to heat stress, it showed reduction in semen volume, sperm concentration and number of sperm per ejaculate but not significantly, however sperm motility was affected significantly; spermatogenesis was affected, with reduction in the fertility of hens. Optimum photoperiod for normal semen production is 12 h day^{-1} (Lofts and Lam, 1973) 14 h caused an earlier onset of semen production in white leghorn (Ingkasuwan and Ogasawra, 1966). Semen production is negatively affected by age (De Reviers, 1986; Elagib, 1998). The hatchability of fertile eggs was depressed as the age of hatching eggs was increased (Byng and Nash, 1962). They also reported that culled chickens and dead in shell increased as time of storage increased. Hatchability for all eggs set and fertile eggs was highest during the cold season (Jayarajan, 1993).

The Sudan is characterized by long hot summer season and mild winter season. Keeping breeding hens in opened poultry house normally result in poor fertility and hatchability. Many local poultry breeders utilize opened houses to raise their flocks because they can not offer to construct exp poultry house. This study was taken to evaluate the performance of egg-type breeders kept under opened poultry houses and how it is affected by summer and winter seasons.

MATERIALS AND METHODS

This study is based on data collected during 1998-1999. These figures were obtained from the hatching records of Coral Chicks and Feed Production Farms, hartoum which is located near Soba village about 20 Km south of Khartoum. The farm capacity is 3000 parent

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Table 1: Nutrient composition of layer diet fed to parents

Metabolizable energy	11.92
Crude protein	16.93
Lysine	0.76
Methionine	0.38
Methionine	0.65
Calcium	3.75
Available phosphorous	0.35
Linolenic acid	1.10

breeders. The birds were housed on deep litter system in several open sided houses, 10×14 meters and are situated on East-West direction facing South and North wind. Parent egg-type breeder is used for chick production (Bovans) from Hendrix breeders in the Netherl and Standard manual tube feeders are used. Water is offered through automatic drinkers. Nests used were earthen jars (one jar per 5 birds) made locally. The feed and water were provided ad libitum. The birds received st andard breeder ration. The ingredient and chemical composition of the diet is given in (Table 1). The type of incubation machine is Petersime. It is made in Belgium. Petersime capacity is about 33600 eggs in three machines. The incubators were operated at temperature 37.7°C and relative humidity is 53%. The system of incubator setting is a single stage system. The duration of the incubation is 18 days. The type of hatching machine is Pasreforn, with a capacity of 16800 eggs and with single stage system. The flock was vaccinated against Marek's, Gomboro, New Castle and Fowl Pox diseases. The hatching records obtained include egg set; fertile, infertile, culled, dead embryos (early embryonic death), dead embryos in shell (late embryonic mortality) and hatched chicks are recorded.

Hatching records for 1998-1999 from Coral hatcheries and Feed production Farms were used in this study. The data were calculated on percentage basis, transformation was performed prior to the statistical analysis. The factorial complete r andomized design (2×2) was used to analyze the data according to Snedecor and Cochran (1968).

RESULTS AND DISCUSSION

The temperature during summer of 1998 ranged between 26.60-39.90 and that of 1999 ranged between 25.97-39.18. For the winter in 1998 the data was 18.4-33.86 and 26.14-35.42 for 1999. These data was obtained form Sudan metrological department. The hatchery records obtained from Coral company is presented in Table 2.

Table 3 shows the ANOVA of the parent stock performance in Coral farm, Khartoum, Sudan.

Table 4 shows no significant effect in percent of hatchability of total eggs during both seasons in the two years examined. The low difference between years may be due to the similar climatic conditions prevalent during 1998-1999. The percentage of hatchability of total eggs in 1999 was lower than that reported in 1998 and this difference may be attributed to the difference in the age of the flock. Eljack and Lake (1966) and Lorenz (1975) reported that in male and female fowl the influence of aging on gamete has been proven. The differences in percentage of hatchability of total eggs between seasons (summer and winter) in all years were small and that might be due to the moderate summer. This result is in agreement with Clark and Sarakoon (1967) and Nayak and Misra (1991), who showed high ambient temperature, decreased the semen quality.

During 1998-1999 the difference in the temperature between the two seasons was small so the expected impact of temperature on hatchability was not observed.

Table 6 shows that there was no significant difference in the percentage of fertility neither between seasons and the years. Eggs, which were classified as infertile in this study might have been fertilized, but embryos died during the very early embryonic life. Fertility in 1998 was better than 1999, but the difference is insignificant. Boone and Huston (1963) showed that when male was exposed to heat stress, its semen volume, sperm concentration and number of sperm per ejaculate were decreased slightly; however, sperm motility was increased significantly. Also Clark and Sarakoon (1967) revealed that high temperature was the most harmful effect on spermatogenesis. Chung *et al.* (1990) showed that semen quality was better in cold season than hot ones. These results were in contrary to Parker and McSpordan (1943) and Cardson *et al.* (1955), who found that semen production is depressed during summer. The findings in this study are not in agreement with other repots due to small difference in temperature between seasons as shown in Table 5.

Table 6 revealed no significant difference in the percentage of dead embryo in shell neither between 1998 or 1999 and nor between summer and winter.

Hatchability of fertile eggs declined with length of storage period in both experiments with the most obvious effect observed in eggs (Elibol *et al.*, 2002). There was an increase in percentages of early and late embryonic mortality with length of storage period in both experiments. Hatchability of fertile eggs was increased by turning 4 or 24 times per day during storage. There was no storage time x turning in storage interactions. A significant interaction of flock age x turning in storage for hatchability of fertile eggs suggested that eggs from an older broiler breeder flock that exhibit reduced fertility benefited more from turning during storage than did eggs from a young broiler breeder flock (Elibol *et al.*, 2002).

Mean egg weight loss was greater from eggs of the longest storage period group (>15 < 24 d) at 21 or 38 d when compared with eggs of the shorter storage periods,

Table 2: Hatchery records of Bovans during 1998-1999 from Coral Farms

	Summer		Winter	
Parameters	1998	1999	1998	1999
Total egg set	451374	7955598	470815	548430
Dead in shell(%)	0.77	10	8	17
Number of male (%)	40	40	39	22
Number of female (%)	59.23	50	53	61

Table 3: Analysis of variance (ANOVA) for the parent stock performance

Source of variation	Degree of freedom	Hatchability of fertile eggs	Hatchability of total eggs	Fertility	Dead embryo in shell
Years	1	0.011^{NS}	0.151^{NS}	0.151^{NS}	0.005^{NS}
Season	1	0.011^{NS}	0.031^{NS}	0.011^{NS}	0.080^{NS}
Years x Seasons interactions	1	0.002^{NS}	0.112^{NS}	0.012^{NS}	0.001^{NS}
Error	4	0.054	0.151		0.262
C.V.%		2.48	4.45	1.98	14.52

N.S = Non significant

Table 4: Effects of Season on Percentage of Hatchability of Total Eggs and fertile eggs-type parent stock (Bovans) obtained during 1998 and 1999 (means±SD)

	Year	Summers	Winter	Mean
Total Eggs	1998	78.55±7.24	77.70±11.35	78.12
	1999	75.70±11.60	72.10±14.06	73.9
	Mean	77.13	74.90	-
Fertile Eggs	1998	88.20±4.67	87.25±6.27	87.72
	1999	86.95±7.13	86.10±9.28	86.53
	Mean	87.58	86.68	-

Summer = April to October (Season 1); winter = November to March (Season 2), N.S = Non significant

Table 5: Effects of season on the percentage of fertility of egg-type parent stock

Year	Summer	Winter	Mean
1998	88.65^{NS}±3.56	88.65^{NS} ±6.99	88.65
1999	85.05^{NS}±8.69	82.10^{NS} ±10.38	83.58
Mean	86.58	85.38	-

N.S = Non significant

Table 6: Effects of season on the percentage of dead embryo in shell

Year	Summer	Winter	Mean
1998	11.8^{NS}±4.67	12.8^{NS} ±6.7	12.3
1999	11.25^{NS}±9.4	12.7 $d5^{NS}$ ±9.5	12.0
Mean	11.53	12.78	-

N.S = Non significant

but there were no differences at 7, 14, or 28 d (Hassan *et al*., 2005). The storage period and egg weight affected egg weight loss. The most effective storage period was less than 15 d to maintain hatchability for ostrich eggs when incubated at 36.5-7.0^{0}C with 25% RH. Fertile hatchability was better at 37 and 41 week of age than at 59 and 63 week of age due primarily to increase early (Elibol and Brake, 2003).

Under proper managemental conditions, hatching operation can be carried out in Sudan throughout the year. Due to changes in climate every ten year, re-investigation of summer and winter effects on hatching records is recommendable.

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