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EFFECT OF GENOTYPE, AGE AND SEASON ON HATCHABILITY OF EGG

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Abstract

The study was conducted to study the effects of genotype and age of hen and hatching season on hatchability of egg. Hatching eggs were collected from hens having three genotypes viz. White Leghorn (WLH), Rhode Island Red (RIR) and Fayoumi covering three age groups (28 to 40, 41 to 60 and 61 weeks & above) at winter, monsoon and summer seasons. The study revealed that the highest ($P<0.05$) average hatchability was observed in winter (78.62%) followed by monsoon (76.70%) and summer (75.79%). Among different genotypes the highest ($P<0.001$) hatchability was found in Fayoumi (78.34%) followed by White Leghorn (76.48%) and Rhode Island Red (74.59%). Considering the age of hen, highest ($P<0.05$) hatchability was found in the age group between 41 to 60 weeks (77.99%) followed by 61 weeks and above (76.49%) and 28 to 40 weeks (75.71%) of age. From the findings it can be concluded that the winter season was suitable for hatching of eggs and the performance of Fayoumi hen was better in terms of hatchability of egg. On the other hand, the age of hen between 41 to 60 weeks was better for producing hatching eggs.

Key words : Season, Genotype, Age, Hatchability

Introduction

Fertility and hatchability are the most important determinant for producing more chicks from given number of breeding stock within a stipulated period. Fertility and hatchability performance of eggs depend on the number of factors like genetic, physiological, social and environmental (Jull, 1970). The principal objectives of the commercial hatchery are to secure the maximum number of quality day-old chicks out of the eggs set for hatching. Several researchers reported that genotype of breeder hen had significant effect on hatchability of egg (Jayaranjan, 1992; Islam *et al.*, 2002). In another study significantly ($P<0.05$) higher hatchability was found in Desi and RIR hens compared to Fayoumi (Farooq *et al.*, 2003). Significant effects of genotype and age of hen were also reported by Suarez *et al.* (1997). Das (1994) observed variation of hatchability in different age of breeder hens and reported maximum hatchability in the first laying year. Seasonal fluctuations could cause wide variability in hatchability. Higher hatchability of chicken eggs was reported in spring than in summer (Farooq *et al.*, 2003). North (1984); Farooq *et al.* (2000) also reported poor hatchability in summer hatches. Chowdhury *et al.* (2004) also reported highest hatchability of duck eggs in winter and lowest in summer. The study was undertaken to observe the effects of genotype, age of hen and season on hatchability of eggs.

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Materials and Methods

The study was conducted at Government Poultry Farm, Jessore. Hatching eggs were collected from breeder hens reared in the farm. Breeder hens belonged to three different genotypes viz. White Leghorn (WLH), Rhode Island Red (RIR) and Fayoumi. The breeder hens were categorized into three age groups such as age between 28 to 40, 41 to 60 and 61 weeks and above to investigate the effects of age on the hatchability of eggs. Three seasons such as summer (March to June), monsoon (July to October) and winter (November to February) were considered throughout the year.

Management of birds

Breeder hens were reared in deep litter system. Average floor space allowed for each bird was 1.5 sq. ft. Birds were vaccinated for Ranikhet Disease (BCRD), Gumboro, and Fowl Pox, Fowl Cholera diseases. One cock was maintained for every 10 breeder hens to obtain fertile eggs and one laying nest was provided for every 5 hens. All birds were fed *ad libitum* on diets containing 17% crude protein and 2800 Kcal ME/kg diet. The ingredients of ration are mentioned in Table 1.

Table 1. Ingredients of ration for breeder hen

Ingredients	Quantity (%)
Wheat	50.0
Protein concentrate	8.25
Soybean meal	18.0
Rice polish	17.0
Oyster shell	6.0
Common slat	0.50
Vitamin mineral premix (Rhodivit BR)[#]	0.25

[#] Source : Rampart Power, Dhaka, Bangladesh

Egg collection and storage

Hatching eggs were collected twice daily and kept separately according to the genotypes of hen and date of collection. Good shaped and sound shelled eggs were selected for hatching purpose. Cracked, odd colored and other abnormal eggs were excluded. Dirty eggs were made clean by clean cloths. Hatching eggs were stored at 10^{o}C and 75% of relative humidity for a period of 3 to7 days.

Incubation

Eggs were hatched by electric incubator having the capacity of 43,000 eggs for setter and 22,000 eggs for hatcher. Before introducing new batch of hatching eggs, the incubator was cleaned and fumigated to prevent pathogenic infection. Fumigation was done using formaldehyde and potassium permanganate at the ratio of 45 and 30 g, respectively for 100 cubic ft. area. Setting and hatching temperature were 99 and 98^{o}F, respectively. Setting and hatching humidity were 75 and 80%, respectively. The eggs were turned hourly automatically by programmed device. On the 7th and 14th days of incubation, the eggs were candled to identify and remove infertile eggs and eggs with dead embryos. The remaining eggs were transferred from setting trays to hatching trays on 19th day of incubation. On 21st day, hatched out chicks were collected and counted. Hatchability percentage was calculated by the number of chicks hatched divided by total number of eggs set and multiplied by 100.

Statistical analysis

Data were subjected to analysis of variance (ANOVA) with the help of a computer package program (SPSS, 1999). Least Significant Differences (LSD) test was performed to compare the significant differences among the means (Steel and Torrie, 1980).

Results and Discussion

Effects of season

Among different hatching seasons, the highest average hatchability (%) was observed in winter (78.62%) followed by monsoon (76.70%) and summer (75.79%) and the mean difference was significant (P<0.05) (Table 2). Significant effect of season on hatchability was also observed by Chowdhury *et al.* (2004). They found the highest hatchability of duck eggs in winter (57.676%) followed by summer (54.135%) and monsoon (49.134%) respectively. In another study, seasons of the year had a significant effect on hatchability of chicken eggs, being higher in spring than in summer (Farooq *et al.*, 2003). North (1984); Farooq *et al.* (2000) also reported poor hatchability in summer hatches. The higher hatchability during winter season in the present study could be attributed to favorable environment for egg storage and availability of more fresh eggs for hatching than in other seasons of the year. The decline in hatchability performance in summer may perhaps be attributed to pre-incubation development and weakening of the embryos before the eggs were received at the hatchery and with inactive breeding stock in hot weather. Jayaranjan (1992) also observed a significant effect of hatching season on hatchability. He found highest hatchability percentage in winter (68.09±4.83) and lowest in summer (66.81±4.04).

Table 2. Effects of hatching season on the hatchability of egg

Parameters	Seasons	No. of batch	Mean ± SE	Level of significance
No. of eggs set in each batch	Monsoon	28	3774.39±299.17	NS
	Winter	27	4030.74±279.10	
	Summer	31	3704.03±279.06	
	Overall	86	3829.51±163.93	
Infertile eggs (%)	Monsoon	28	23.30^{a}±2.79	*
	Winter	27	21.38^{b}±1.90	
	Summer	31	24.21^{a}±4.13	
	Overall	86	23.02±3.32	
Hatchability (%)	Monsoon	28	76.70^{b}±0.53	*
	Winter	27	78.62^{a}±0.37	
	Summer	31	75.79^{b}±0.74	
	Overall	86	76.97±0.36	

^{NS} Non significant, * Significant (P<0.05)

^{ab} Means with uncommon superscripts for each parameter differ significantly (P<0.05)

Effects of genotype

The effects of genotypes on the hatchability of eggs is shown in Table 3. The highest mean hatchability was found in Fayoumi (78.34%) followed by WLH (76.48%) and RIR (74.59%) respectively. The effects of genotypes on the hatchability was found significant (P<0.001). Significant effect of genotypes on hatchability was also observed by Islam *et al.* (2002). They found that hatchability of total eggs set as 91.28, 86.08, 79.57 and 84.95% for Barred Plymouth Rock, WLH, RIR and White Rock, respectively. Farooq *et al.* (2000) and Murad *et al.* (2001) reported higher hatchability in Fayoumi chicken which is consistent with the present findings. However, Farooq *et al.* (2001) found that similar hatchability between of Fayoumi and Desi chicken of Pakistan. Significantly (P<0.05) higher hatchability was found in Desi and RIR hens compared to Fayoumi by Farooq *et al.* (2003) which corresponds well with the present findings. Jayaranjan (1992) found significant variation (P<0.05) in hatchability among genotypes. In his study the mean hatchability of White Rock, RIR and WLH were 68.89, 63.69 and 57.93% respectively. The findings of the present study did not agree with that of Chaudhry and Alvi (1967) who found no significant difference in hatchability of fertile eggs between RIR and New Hampshire (P>0.05). However, Reddy *et al.* (1965) found higher hatchability of eggs from WLH (66.80%) than those of RIR (59.60) and White Rock (44.10%) on total set eggs.

Table 3. Effects of genotypes of hen on the hatchability of egg

Parameters	Genotypes	No. of batch	Mean ± SE	Level of significance
No. of eggs set in each batch	Fayoumi	37	4404.54^{a}±214.63	**
	WLH	35	4013.43^{a}±225.50	
	RIR	14	1850.00^{b}±185.92	
	Overall	86	3829.51±163.93	
Infertile eggs (%)	Fayoumi	37	21.66^{b}±3.55	**
	WLH	35	23.51^{a}±2.39	
	RIR	14	25.40^{a}±3.16	
	Overall	86	23.02±3.32	
Hatchability (%)	Fayoumi	37	78.34^{a}±0.58	**
	WLH	35	76.48^{b}±0.40	
	RIR	14	74.59^{b}±0.85	
	Overall	86	76.97±0.36	

** Significant (P<0.01)

[ab] Means with uncommon superscripts for each parameter differ significantly (P<0.05)

Effects of age of hen

Table 4 shows the effects of hen age on hatchability. Among three different age groups of breeder hen, the highest (P<0.05) hatchability was found in 41 to 60 weeks (77.99%) and lowest in 28 to 40 weeks. Similarly, Das (1994) stated that age of breeder hen affects the hatchability. He reported that maximum hatchability has been observed in the eggs produced in the first laying year. Suarez *et al.* (1997) observed significant effect of age of hen at lay on hatchability, which is consistent with the present findings.

Table 4. Effects of age of hen on the hatchability of egg

Parameters	Age of hen (weeks)	No. of batch	Mean ± SE	Level of significance
No. of eggs set in each batch	28 to 40	16	3614.38±401.18	NS
	41 to 60	36	3939.67±252.94	
	61 and above	34	3814.12±260.29	
	Overall	86	3829.52±163.93	
Infertile eggs (%)	28 to 40	16	24.29^{a}±4.62	*
	41 to 60	36	22.01^{b}±2.20	
	61 and above	34	23.50^{ab}±3.37	
	Overall	86	23.02±3.32	
Hatchability (%)	28 to 40	16	75.71^{b}±1.15	*
	41 to 60	36	77.99^{a}±0.37	
	61 and above	34	76.49^{ab}±0.58	
	Overall	86	76.97±0.36	

^{NS} Non significant, * Significant (P<0.05)

^{ab} Means with uncommon superscripts for each parameter differ significantly (P<0.05)

Conclusion

The results revealed that the winter season was the best time for higher hatchability under Bangladesh condition. Eggs from Fayoumi hens were found better for hatching purpose. On the other hand, age between 41 to 60 weeks was suitable for the production of hatching eggs.

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