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FLOCK STATISTICS AND EGG PRODUCTION TRAITS OF IN AND OUT-SEASON BROILER BREEDING CHICKENS

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ABSTRACT

A study was undertaken on 53 farms during the year 2002 to investigate flock size, egg production traits and various factors affecting egg production performance of broiler breeder chickens in Mansehra and Abbotabad, Pakistan. Farm location and system of rearing didn't effect egg production traits. Average number of day-old chicks started'at the farm (20989.60±1808.75) represented 18165.14±1562.22 and 2824.36±255.47 number of female and male broiler-breeding chickens, respectively. Mean number of hen-housed, male to female ratio in a laying house, sex error in both male and female chickens and proportion of eggs suitable for hatching was 16976.67±1460.43 birds, 1: 7.69±0.32:1 and 4.27±0.16%, 97.47±0.12%, respectively. Average age at point and peak-of-lay, peak percent lay, percent lay, hen-housed egg production and egg laying period was 159.02±0.85 days, 224.75±0.71 days, 82.25±0.32%, 56.86±0.36%, 168.27±1.10 eggs and 295.98+0.85 days, respectively. In-season flocks had smaller age at point and peak-of-lay but longer egg laying period and higher percent lay and hen-housed egg production as compared to out-season flocks. Arboracre chicken was found to have better hen-housed egg production, higher percent lay and longer egg laying period than Shaver chickens. Rearing of Arboracre strain of chicken and Pullet's development during in-season shall be encouraged for obtaining better productivity.

Key words: Broiler-breeder, egg-production, laying-period and season-of-development

INTRODUCTION

Broiler breeder production is one of the important poultry production activities that requires appropriate rearing environment and more technical/monetary investments than any other poultry production activity. However, maintaining a reasonable flock size, efficient utilization of the available resources and provision of standard hygiene would make broiler breeder production more profitable. Better-care of the flocks had been reported to ensure higher net profit per broiler breeding bird (Rs. 786±49.8; Farooq *et al*., 2001) as ' compared to net profit per broiler (Rs. 7 to Rs.15; Asghar *et al*., 2000) or egg type layers (Rs. 34 to Rs. 60; Farooq *et al*., 2002). The higher return from broiler breeding birds is a good indication for rapid promotion of this industry in Pakistan, m addition, higher rate of egg production and earlier age at sexual maturity has further popularized broiler breeder production in the past few decades. A broiler breeder hen reached the age of sexual maturity in 23-24 weeks and produced about 183 eggs suitable for hatching out of 199 total hen-housed egg production in 65 Weeks of growth and production periods (North, 1994). On the other hand Farooq *et al*. (2001) reported a smaller hen-housed egg production (188±0.56 eggs) and lower proportion of hatchable eggs (88±0.23%) than that reported by North (1984).

Egg production it self depends on feed consumption, mortality, season of pullet's development, age at point and peak-of-lay, peak percent lay, percent lay, egg laying period, rearing environment, health care and overall management of the flock. Season of the pullet development would influence production performance of the broiler breeder chicken. In-season flocks are expected to perform better than out-season flocks. North (1984) also reported better production performance of in than out-season flocks., However, pullet development in most of the countries would much more depend on the market demand and seasonal trends in consumption. Thus, care shall be taken to plan the production schedule keeping in view the limitations thereby increasing profitability. Appropriate age at sexual maturity, higher peak of lay and higher persistency of lay would be directly translated to higher egg production. Good persistent flocks were found to produce more number of eggs as compared to poor persistent flocks (North, 1984). Mortality is another important factor affecting egg production performance of broiler breeding chickens. Higher mortality in flocks have been reported to adversely affect egg production (North, 1984; Farooq *et al*., 2001, 2002). North (1984) also reported poor economic performance of breeders at mortality level of more than 10% and suggested keeping the mortality level below 10% for profitable production. Strain differences could be another possible cause of variability in egg production performance of broiler breeders. North (1984) also reported differences in production performance of broiler breeders with respect to strains. The present study would therefore be an effort to investigate flock statistics, egg production traits, study the effect of season of pullet's development and other factors on the performance of broiler breeder chickens and report effective strategies for future development of this industry.

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MATERIALS AND METHODS

A study was undertaken by collecting data from 53 farms to investigate flock size, egg production traits and effect of season of pullet's development and other factors on the performance of broiler breeding chickens during the year 2002 in Mansehra and Abbotabad, Pakistan. In order to make a better comparison of the season of pullet's development on the performance of broiler breeder chickens, a 65 weeks of growth and production period was kept as the standard and flocks reared for less than this period were not included in the study. Similarly, data above 65 weeks of broiler breeder's age were not considered for the study. Information on farm location, flock size (number of male and female-chickens), system of rearing, strain of the chicken, season of pullet's development, feed consumption, mortality including culls and death losses, date of culling of the flock and egg production traits namely, age at point and peak-of-lay, peak and percent lay, hen-housed egg production, total number of eggs suitable for hatching, number of culled eggs and egg laying period were collected for the study. Season of pullet's development was defined on the basis of day-length during growth period. Chicks hatched and pullets developed during increasing and or decreasing day-length were termed as in and out-season flocks, respectively. Date of first egg laid and maximum egg production by the flock on any particular date was considered as age at point and age at peak-of-lay, respectively. Percent lay or percent hen-day egg production on daily basis was calculated using the following formula given by North (1994).

$$\text{Percent lay} \frac{\text{Total \# of eggs produced on a particular day}}{\text{Number of birds in the shed on that day}} \text{ x100.}$$

Average of the percent lay for the whole production period was worked out by dividing the percent hen-day egg production on the egg laying period. Egg laying period was the difference between the date of termination of the flock and date of onset of lay. Maximum lay on any date was termed as peak percent lay. Hen-housed egg production was worked out by dividing total number of eggs produced by a flock over total number of birds housed in egg laying house. Eggs produced at each farm were graded in to two main groups namely, eggs suitable for hatching and culled eggs.

The data were analyzed, using relevant statistical techniques of data analysis, namely, univariate analysis and generalized linear model (GLM) procedure. To study the effect of farm location, strain of chicken, system of rearing and season of pullet's development on age at point-of-lay, following statistical model was constructed adopting the procedure of Steel and Torrie (1981);

$Y_{ijklm} = \mu + a_i + b_j + c_k + d_l + e_{ijklm}$

Where;

Y_{ijklm}= the n-th observation on age at point-of-lay of a female-chicken of i-th strain, developed in j-th season and maintained in k-th location under 1-th system of rearing,
μ = population constant common to all observations,
a_i = the effect of i-th strain of chicken; i= Arboracre, Hubbard and Shaver,
b_j = the effect of j-th season of pullet's development; j= in-season and out-season,
c_k = the effect of k-th farm location; k= Abbotabad and Mansehra,
d_l = the effect of 1-th system of rearing; 1= brood+grow and brood, and grow separate,
e_{ijklm} = the residual term associated with each Y_{ijklm}, normally, independently and identically distributed with mean zero and variance 1.

A similar model was used to study the effect of farm location, strain of chicken, system of rearing and season of pullet's development on age at peak-of-lay, peak percent lay, percent lay and egg laying period.

RESULTS AND DISCUSSION

Finding pertaining to flock statistics, egg production traits and various factors affecting production performance of broiler breeder chickens are given and discussed as follows;

a. Flock statistics

Average number of day-old chicks started at the farm (20989.60±1808.75) represented 18165.14±1562.22 and

2824.36±255.47 number of female and male broiler-breeding chickens, respectively (Table 1). Mean number of hens housed in a laying house was 16976.67±1460.43 birds while female to male ratio in a flock was 7.69±0.32:1. Farooq *et al*. (2001) reported larger (26245 birds) while Murad *et al*. (2003) smaller flock size (19076.29 birds) than the present finding. North (1984) and Farooq *et al*. (2001) reported a similar female to male ratio. In addition, the female to male ratio in the present study was within the same range reported by North (1984; one-male for 8-10 females) for assuring higher fertility in a flock. Male and female chickens are usually supplied in separate boxes from the parent flocks on demand for various farms, thus sex determination in broiler breeding chickens is carried out when the chickens are day-old. For economical egg production, correct sex determination would be a pre-requisite for maintaining appropriate number of male and female chickens at the farm. Despite, sex is carefully determined, still chances of sex error could be found, as there may be some males in the female stock and female chickens in the male stock. However, the sex error shouldn't exceed the limit of 5% at any standard, as increased rate of sex error would result in poor production. Total sex error in the present study was 4.27±0.16%, representing 3.18±0.16 and 1.09±0.01% sex error in male and female broiler breeding chickens, respectively (Table 1). Strain of the chicken had no effect on sex error.

Table 1. Flock statistics and egg production performance of broiler breeding chickens.

	Means± SE	CV (%)
Total chicks arrived at he farm (#)	20989.60±1808.75	62.14
Number of female chicks started	18165.14±1562.22	62.02
Number of male chicks started	2824.36±255.47	65.23
Females' to male ratio in a laying flock excluding 5 % reserved males	7.69±0.32	30.37
Sex error amongst male chickens (%)	3.18±0.16	34.93
Sex error amongst female chickens (%)	1.09±0.01	41.61
Total sex error (%)	4.27±0.16	28.15
Hens housed (#)	16976.37±1460.43	62.03
Age at point-of-lay (days)	159.02±0.85	3.88
Age at peak-of-lay (days)	224.75±0.71	2.29
Peak percent lay (%)	82.25±0.32	2.83
Percent lay (%)	56.86±0.36	4.56
Hen-housed egg production (#)	168.27±1.10	4.61
Total hatchable eggs (#)	164.03±1.09	4.78
Total eggs not suitable for hatching eggs (#)	4.24±0.21	35.15
Hatchable eggs (%)	97.47±0.12	1.19
Un-hatchable eggs (%)	2.52±0.12	35.17
Egg laying period (days)	295.98±0.85	2.08

Table 2. Egg production traits of various starins of broiler breeding chickens.

Strain of the chicken	Age at point of lay (days)	Age at peak of lay (days)	Peak % lay (%)	% lay (%)	Hen-housed egg production (#)	Total hatchable eggs (#)
Arboracre	158.11	225.91	83.21a	57.70a	171.27a	167.17a
Hubbard	160.38	223.88	82.32a	57.92a	170.65a	166.53a
Shaver	159.06	223.07	79.34b	52.44b	155.11b	150.22b

Means with different subscripts across the rows for each column separately were significantly different at $\alpha = 0.05$

b. Egg production performance

Egg production performance of broiler breeding chicken included age at point and peak of lay, peak and percent lay, hen-housed egg production, egg laying period, total number of eggs suitable for hatching and number of culled eggs. All these variables are discussed one by one as follows;

1. Age at point and peak-of-lay

Average age at point and peak-of-lay was 159.02±0.85 and 224.75±0.71 days, respectively, (Table 1). Murad *et al*. (2003) reported higher age at point (164.67 days) and age at peak-of-lay (232.83 days) than the present findings.

North (1984) also reported higher age at point and peak-of-lay in broiler breeders. The smaller age at point and peak of lay in the present study could be due to better care of the flock and interest of the farmers to get their flocks in production at an earlier age. System of rearing and strain of chicken of the chicken had no effect on age at point and peak of lay while season of pullet's development had a significant (P0.05) influence on the aforementioned traits. In-season flocks had a relatively earlier age at sexual maturity and lower age at peak-of-lay as compared to out-season flocks (Table 3). Pullets developed during in-season usually receive a longer day-length and are expected to perform better than those in out-season. This could be due to ample available day length that stimulates growth and reproductive hormones enabling the pullets to get sexually mature at a relatively earlier age. North (1984) also reported significant influence of light on sexual maturity of broiler breeding pullets.

Table 3. Egg production traits of broiler breeding chickens during different seasons of pullet's development.

Season of hatch	Age at point of lay (days)	Age at peak of lay (days)	Peak % lay (%)	% lay (%)	Hen-housed egg production (#)	Total hatchable eggs (#)
Arboracre	155.40b	222.49b	82.85a	56.72	169.91a	165.48a
Shaver	165.30a	228.68a	81.20b	57.11	165.42b	161.49b

Means with different subscripts across the rows for each column separately were significantly different at $\alpha = 0.05$

Table 4. Egg laying period during different seasons of pullet development and or of various strains of broiler breeder chickens.

Season of pullet	means±SE	CV (%)	Strain of the chicken	Means±SE	CV (%)
In-season	299.60a±0.74	141	Arboracre	296.89±1.06	1.82
Out-season	289.70b±0.73	1.10	Hubbard	294.62±1.62	2.27
			Shaver	295.94±2.48	2.51

Means with different subscripts across the rows were significantly different at $\alpha = 0.05$

2. Peak and percent lay or percent hen-day lay

Mean peak percent lay and percent lay in broiler breeders was 82.25±0.32 and 56.86±0.36%, respectively (Table 1). Murad *et al*. (2003) reported lower while North (1984) higher rate of lay in broiler breeders than the present findings. The smaller percent lay in the present study could be due to relatively poor adaptability of the flocks and variation in management conditions. Strain of the chicken and season of pullet's development had a significant ($P<0.05$) effect on peak and percent lay. Arboracre **was** more persistent in lay as compared Shaver strain of the chicken (Table 2). Similarly, pullets developed during in-season had better lay than those in out-season (Table 3). North (1984) also reported seasonal influence on laying performance of broiler breeding chickens. The better laying performance of Arboracre could be due to its better egg production potentials or better adaptability to the local conditions of the study area.

3. Hen-housed egg production

Mean hen-housed egg production was 168.27±1.10 (Table 1). North (1984) reported higher while Murad *et al*. (2003) lower hen-housed egg production than the present, findings. Out of the total hen-house egg production, proportion of. eggs suitable for hatching and culled eggs was 97.47±0.12% and 2.52±0.12%, respectively (Table 1). Farooq *et al*. (2001) reported smaller proportion of hatchable eggs in broiler breeding chickens than the present findings. Variation in proportion of eggs suitable for hatching in various reports could be due to variation in management conditions.

Strain of the chicken and season of pullet's development had a significant ($P<0.01$) effect on hen-housed egg production. Arboracre chicken was found to have better hen-housed egg production than Shaver chicken (Table 2). Similarly, in-season flocks had higher hen-housed egg production as compared to out-season flocks (Table 3). The higher hen-housed egg production of Arboracre chickens and in-season flocks suggested could be due to the influence of increasing day-length and ability of the Arboracre strain of broiler breeding chickens to produce more eggs under the climatic conditions of the study area.

4. Egg laying period

Average egg laying period was 295.98±0.85 days (Table 1). The smaller coefficient of variation (2.08%) in egg

lying period in the present study suggested that almost all the flocks were kept for a uniform egg laying period and had a similar onset of lay. Broiler breeding chickens are usually maintained for a standard egg laying period as these birds are not native to Pakistan and can't be culled before the birds spend a reasonable period at the farm.

Farm location and system of rearing had no effect whereas, strain of the chicken and season of pullet's development significantly effected ($P<0.01$) egg laying period. Arboracre strain had a longer egg laying period than Shaver (Table 4). Pullets developed during in-season had significantly ($P<0.05$) longer egg laying period than those developed in out-season (Table 4). The extended egg laying period of in-season flocks could be due to better egg production performance of in-season flocks providing incentives for the flock owners to extend egg laying period.

REFERENCES

Asghar, A., Farooq, M., M. A. Mian, Perveez, and A. Khurshid (2000). Economics of broiler-production in Mardan Division. J. Rural Development & Administration. 32: 56-64.

Farooq, M., M. A. Mian, S. Faisal, F. R. Durrani, M. Arshad, and A. Khurshid (2001). Status of broiler breeder stocks in Abbotabad and Mansehra. *Sarhad J. Agric*., 17: 489-495.

Murad, Ali., M. Farooq, F. R. Dun-am, N. Chand, K. Sarbiland and A. Riaz (2003). Egg production performance and prediction of standard limits for traits of economic importance in broiler breeders. *Int. J. of Poultry Sci*., 2: 275-279.

North, M. 0., (1984). Breeder Management, In: *Commercial chicken production manual*. The Avi. Publishing Company, me. Westport, Connecticut. 240-243, 298-321. pp.

Steel, R. G. D, and J. H. Torrie (1981). *Principles and procedures of statistics; A biometrical approach*. 2nd Ed. McGraw-Hill, Singapore.

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