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EFFECT OF AGE AND BODY WEIGHT AT MOLTING ON THE PERFORMANCE OF BROILER BREEDER HENS UNDER ENVIRONMENTAL CONTROL HOUSES IN PAKISTAN

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ABSTRACT

In the present study, 2700 broiler breeder hens of Arbor Acre strain were divided into 27 experimental units (100 each) and allotted to nine treatments randomly having three replications each. The birds were kept under uniform managemental conditions throughout the experimental period of 32 weeks post molt period. The birds were molted under conventional method at 50, 55 and 60 weeks of age having three different body weights i.e. 3000, 3500 and 4000 ± 50g under 3x3 factorial design. At the time of 5% production, data on production performance (weekly eggs/hen, hen day production, body weight and feed consumption) were recorded. Data collected was analyzed by analysis of variance technique under 3x3 factorial arrangement of treatment and the differences among the treatment means were analyzed by Duncan's Multiple Range test. Significant (P<0.05) differences due to body weight and age were noted for feed consumption, weekly eggs per hen, hen day production and hen house production. Broiler breeders having low age group (50 weeks) and medium body weight (3500g) resulted in maximum production performance/net profit.

Key words: Broiler breeder, moulting, egg production, body weight.

INTRODUCTION

Uptil 1964, poultry production was a cottage industry in Pakistan (Abedullah *et al*., 2007). Commercial poultry farming in Pakistan commenced during 1964 with the establishment of breeder farms, hatcheries, broiler and layer farms and feed mills in the private sector. The introduction of genetically improved hybrid strains of broilers and layers in combination with management of flocks on modern and scientific lines boosted poultry meat and egg production. This helped in bridging the gap between demand and supply of animal protein in the country to a great extent. The commercial poultry production took its start from 9.0 million eggs and 222 tons poultry meat production per annum in 1965 which has increased to as much as 5222 million eggs and 480000 metric tons poultry meat annually (Anonymous, 2007), indicating a satisfactory development of this component. However, the commercial poultry farming, in general, has not operated to its maximum potential mainly due to lack of technical expertise. Molt induction to rejuvenate the egg laying performance of laying flocks is an important practice in many parts of the world, often being necessary to make a flock profitable under certain market scenarios (Webster, 2003).

At present, the usual pattern of flock replacement for broiler breeders in Pakistan is to dispose off the stocks after completion of first production cycle at the age of 60-64 weeks and to replace it with new flocks (Akram, 1998). In developed countries like USA and UK, breeder farmers keep flocks for more than one production cycle, due to increasing expenditures incurred on rearing the new flocks. Decreasing prices of spent flocks and increasing cost of rearing flocks generated interest in methods by which the natural molt could be avoided and flocks can be kept for more than one year. Forced natural molting completely halted reproductive function and precipitated a loss of feathers. Egg production resumed and increased rapidly to a profitable rate following this artificial molt (Berry, 2003; Yousaf and Ahmad, 2006). Induced molting to initiate additional egg laying cycles in laying flocks is a practice that has been extensively documented, with studies beginning in the early 1900s (Bell, 2003). The present paper describes comparative evaluation of breeder flock having different age and body weight hens to improve the economical production performance of broiler breeder in environment control houses.

MATERIALS AND METHODS

This experiment was conducted at Sandal Bar Poultry Breeding Station, Jhang Road, Faisalabad, Pakistan. Broiler breeders of Arbor Acres strain of 50 weeks of age which were almost near to completion of the their first production cycle were already kept at that facility. Nine hundred birds were selected for each of three ages i.e. 50, 55 and 60 weeks. Three different weight groups were selected within each age i.e. 3000, 3500 and 4000g with 10% males. These 2700 broiler breeders females were divided into 27 experimental units (with 100 birds each) and allotted to nine treatments randomly having three replicates each, as illustrated in Table 1.

Birds were molted according to the schedule mentioned in Table 2. The birds were offered commercial pre-laying ration (No. 17), laying ration (No. 18) and male ration (No. 19). Nutrient composition of the rations used is given in Table 3.

At 50% production the light was increased to 17 hours and a further one-hour was increased i.e. 18 hours at peak production. The birds were kept under uniform managemental condition throughout the experimental period and the data was recorded on production parameters including body weight, feed consumption, weekly eggs per hen, hen day production and hen house production. Data collected was analyzed by analysis of variance technique under 3x3 factorial arrangement of treatment and the differences among the treatment means were analyzed by Duncan's Multiple Range test (Snedecor and Cochran, 1991).

RESULTS

The mean post moult body weights of the hens during the experiment were recorded. The statistical analysis showed significant differences ($P<0.05$) (Table 4). Maximum body weight of 4.24 ± 0.01 kg was attained by hens in the higher age group (65 weeks), while the weights were minimum (3.82 ± 0.01 kg) in the low age group (55 weeks). As expected based on body weight groups, the maximum body weight of 4.69 ± 0.01 kg was attained by the hens in the high weight group (4000g), while weight was the minimum (3.40 ± 0.01 kg) in the low weight group (3000g).

Table 1: Arrangement of the treatment

Treatments	Age of molting (weeks)	Weight at molting (g)	No. of birds per replicate		
			R_1	R_2	R_2
T1	50	3000 ± 50	100	100	100
T2	50	3500 ± 50	100	100	100
T3	50	4000 ± 50	100	100	100
T4	55	3000 ± 50	100	100	100
T5	55	3500 ± 50	100	100	100
T6	55	4000 ± 50	100	100	100
T7	60	3000 ± 50	100	100	100
T8	60	3500 ± 50	100	100	100
T9	60	4000 ± 50	100	100	100

Table 2: Molting schedule for experimental birds

Weeks	Stage	Medication/ vaccination	Feed	Water	light
0-4	Molt	Deworming, antibiotic course, IB+NDvaccine	Ad lib	Ad lib	16 h
0-4	Molt	-	No feed	Ad lib	No
5	Rested period	ND live vaccine	30 g/bird	Ad lib	No
6	Rested period	-	45 g/bird	Ad lib	No
7	Rested period	-	60 g/bird	Ad lib	No
8	Rested period	-	75 g/bird	Ad lib	No
9	Rested period	-	90 g/bird	Ad lib	No
10	Rested period	-	105 g/bird	Ad lib	No
11	Rested period	-	120 g/bird	Ad lib	8 h
12	Production	ND live vaccine repeated each month	135 g/bird	Ad lib	16 h

Table 3: Nutrient composition of rations

Nutrients	Pre-laying ration (No. 17)	Laying-ration (No. 18)	Male ration (No. 19)
Crude protein (%)	16	16.54	13
Metabolize energy (kcal/kg)	2700	2750	2700
Linoleic acid (%)	1.2	1.5	1.4
Calcium (%)	1.4	3	1
Available phosphorus (%)	0.38	0.38	0.35
Sodium (%)	0.16	0.16	0.16

Table 4: Mean values (± SE) for post moult weekly body weight, feed consumption, weekly eggs per hen, hen day production and hen house production of broiler breeders selected from different age groups having different body weights

Age/weight group	Body weight (kg)	Feed consumption (kg)	Weekly eggs/hen	Hen day production (%)	Hen house production (%)
Age groups					
Low (55 weeks)	3.82 ± 0.01c	1.23 + 0.53c	4.83 ± 0.01a	69.22 ± 0.12a	69.45 ± 0.48a
Medium (60 weeks)	4.03 ± 0.01b	1.23 ± 0.46b	4.80 ± 0.01a	67.61 ± 0.59b	66.68 ± 0.41b
High (65 weeks)	4.24 ± 0.01a	1.24 ± 0.32a	4.52 ± 0.01b	64.62 ± 0.24c	64.59 ± 0.37c
Body weight groups					
Low (3000g ± 50)	3.40 ± 0.01c	1.22 ± 0.65c	4.62 ± 0.01c	66.54 ± 0.99b	66.01 ± 0.34b
Medium (3500g ± 50)	4.01 ± 0.01b	1.23 ± 0.42b	4.82 ± 0.01a	69.17 ± 0.33a	69.08 ± 0.54a
High (4000g ± 50)	4.69 ± 0.01a	1.25 ± 0.24a	4.71 ± 0.01b	64.71 ± 0.01c	66.62 ± 0.37b
Interactions					
Low weight x low age	3.30 ± 0.01	1.22 ± 0.73	4.77 ± 0.20	69.93 ± 0.03	69.02 ± 0.19
Medium weight x low age	3.84 ± 0.02	1.23 ± 0.53	5.01 ± 0.01	70.72 ± 0.21	71.12 ± 0.72
High weight x low age	4.34 ± 0.01	1.24 ± 0.33	4.73 ± 0.01	67.03 ± 0.11	68.21 ± 0.54
Low weight x medium age	3.39 ± 0.01	1.22 ± 0.70	4.61 ± 0.01	67.23 ± 1.20	67.01 ± 0.23
Medium weight x medium age	3.98 ± 0.01	1.23 ± 0.46	4.92 ± 0.02	69.50 ± 0.34	69.13 ± 0.63
High weight x medium age	4.72 ± 0.01	1.25 ± 0.22	4.88 ± 0.01	66.11 ± 0.25	66.89 ± 0.37
Low weight x high age	3.52 ± 0.01	1.23 ± 0.52	4.50 ± 0.02	62.45 ± 1.74	62.01 ± 0.62
Medium weight x high age	4.21 ± 0.00	1.24 ± 0.27	4.54 ± 0.01	67.29 ± 0.46	67.01 ± 0.28
High weight x high age	5.01 ± 0.01	2.51 ± 0.16	4.52 ± 0.02	60.07 ± 0.36	64.77 ± 0.21

Different alphabets on means within a column show significane difference (p<0.05).

It is natural phenomena that the weight increases with the age of bird, so the interaction between age and weight was significant. The mean post molt weekly feed consumption of the hens during the experiment showed significant differences at P<0.05 (Table 4). Maximum weekly feed consumption of 1.24 ± 0.32 kg was attained by hens in the higher age group (65 weeks), while the feed consumption was the minimum (1.23 ± 0.53 kg) in low age group (55 weeks). In addition, the maximum weekly feed consumption of 1.25 ± 0.24 kg was attained by the hens in high weight groups (4000g), while it was the minimum (1.22 ± 0.65 kg) in low weight group (3000g). It is natural phenomena that the weekly feed consumption increases with the age of bird, so the interaction between age and weight was significant.

The mean post molt weekly eggs per hen of the hens during the experiment showed significant differences at P<0.05 (Table 4). Maximum weekly eggs per hen of 4.83 ± 0.01 was attained by hens in lower age group (55 weeks), while the weekly eggs per hen was the minimum (4.52 ± 0.01) in higher age group (65 weeks). The maximum weekly eggs per hen of 4.82 ± 0.01 was attained by the hens in medium weight groups (3500g) while it was the minimum (4.62 ± 0.01) in low weight group (3000g). The interaction between weight and age groups was found to be significant (Table 4). Maximum eggs per hen were 5.01 ± 0.01 in hens belonging to medium body weight and low age group, whereas the minimum weekly eggs per hen of 4.50 ± 0.02 was observed in hens in lower weight (3000g) and higher age groups (65 weeks).

The statistical analysis for hen day production (%) showed significant differences at P<0.05 (Table 4). Maximum hen day production of 69.22 ± 0.12% was attained by hens in lower age group (55 weeks), while the hen day production was the minimum (64.62 ± 0.24%) in higher age group (65 weeks). The maximum hen day production of 69.17 ± 0.33% was attained by the hens in medium weight groups (3500g), while it was the minimum (64.71 ± 0.01%) in higher weight group (4000g). The difference in body weights and ages had significant interaction. Maximum hen day production was 70.72 ± 0.21% in hens of the medium body weight and lower age group whereas the minimum hen day production of 60.07 ± 0.36% was observed in hens in higher weight and higher age group.

The statistical analysis for hen house production (%) showed significant differences at P<0.05 (Table 4). Maximum hen house production of 69.45 ± 0.48% was attained by hens in lower age group (55 weeks), while the hen housed production was the minimum (64.59 ±

0.37%) in high age group (65 weeks). Among the body weight groups, the maximum hen house production of 69.08 ± 0.54% was attained by the hens in medium weight group (3500g), while the minimum production (66.01 ± 0.34%) was found in low weight group (3000g). The interaction between weight and age groups was significant. Maximum hen house production was 71.12 ± 0.72% in hens of the medium body weight and low age group, whereas the minimum hen house production of 62.01 ± 0.62% was observed in hens in lower weight and higher age group.

DISCUSSION

The previous work conducted on this subject by Haq (1995) observed significant gains in body weight at the onset of lay under certain treatment. However, the differences in body weight of 36 weeks of egg production became non-significant. These birds showed significant gain at start of production which became non-significant at 56 weeks of age. However, Dunn and Sharp (1992) and Charles *et al.* (1992) reported that rearing periods had no effect on the final body weight. These differences were possibly be due to differences in the methods of statistical analysis. The results of this study are supported by Wakeling (1977), who reported no difference in post molting feed consumption among flocks of different ages and weights molted by different methods. However, it has been reported that zinc induced moluting did not affect post molting feed consumption (Shippee *et al.,* 1979). Watkins *et al.* (1973) and Kashiwagi *et al.* (1981) also observed less feed intake in hens reared on restricted feeding than those reared on full feeding throughout the laying period.

The probable explanation may be that birds on restricted feed allowance during their growth had fixed their metabolism on the lower amount of feed. Later small portion of their total feed was used for maintenance and rest of it was utilized for egg production throughout the second production cycle. Rearing period feed restrictions of birds of different strains and ages showed no carryover effect on subsequent feed consumption (Ringrose, 1958; Hollands and Gowe, 1964).

On the other hand, Watson (1975), Sang *et al.* (1980) and Sodhi and Sharma (1992) reported that the birds of different ages reared under feed restriction subsequently consumed somewhat more feed possibly for compensatory growth. Kashiwagi *et al.* (1981) also found that body weights of hens, reared on restricted feeding, were lower than those reared on full feeding throughout the laying period. Muir and Gerry (1978) and Aleandri *et al.* (1987) found that level of feeding during the rearing period had little influence on body weights of the birds during laying period. Controlled feeding which markedly reduced growth in the middle of rearing period made compensatory growth in the later stage (Belyavin, 1986). Final body weights of birds at the end of the laying period ultimately reflected non-significant difference (Muir and Gerry, 1978; Belyavin, 1986). In the present study, more feed consumption of higher age and weight group may be due to more maintenance requirement of their body.

The results of production performance are supported by Brake and McDaniel (1981), who reported improvements in post molt egg production when breeder hens were force molted. They also reported that body weight significantly affected post molt egg production, egg weight and egg shell quality. Significant differences in the egg production may be due to reproductive organ regression, followed by ovarian and oviduct regrowth which was often induced in older hens as a means of improving egg quality and the level of egg production (Attia *et al.*, 1994).

Similarly, Bell (2003) reported that induced molting to rejuvenate additional laying cycles in laying flocks is a practice that has been extensively documented with studies since in the early 1990s. Body weight reduction and length of rest period (Hazan and Yalcin, 1989) are important factors for optimum post molt egg production, egg size, shell quality and chick production.

However, contrary to this observation in an other experiment Brake and McDaniel (1981) reported that broiler breeder hens having a body weight of 3.2 kg or less exhibited significantly higher egg production than breeder hens with a body weight of 3.3 kg or greater. Breeder hens with a body weight of 2.8 kg or less produced eggs at a significantly higher level than breeder hens with a body weight of 2.9 kg or higher. Ottinger (1991) also reported that aging in broiler breeder hens is accompanied by a gradual decline in egg production. Hocking (2004) reported that follicle numbers were lower after molting than at the onset of lay. Broiler breeders having low age (50 weeks) and medium body weight (3500g) resulted maximum production performance/net profit.

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