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EFFECTS OF HOUSING SYSTEMS ON PRODUCTIVE PERFORMANCE OF COMMERCIAL LAYERS FOLLOWING INDUCED MOLTING BY ALUMINIUM OXIDE SUPPLEMENTATION

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ABSTRACT

The project was carried out to compare the performance of molted layers by aluminium oxide supplementation in cages and on litter floor system. Seventy two Single Comb White Leghorn commercial layers (60 weeks old) were divided into six experimental units of 12 layers each. These experimental units were randomly divided into two groups, each consisting of three experimental units, one group was reared on litter floor and the other in cages. The layers were provided with 35 gm feed containing 4 gm aluminium oxide/kg of feed for first 14 days of molting period (66-67 weeks of age). The layers showed significant reduction in body weight following induced molting by aluminium oxide under both housing systems. Body weight loss was higher, while feed consumption was lower, in the cages as compared to litter floor system. The layers molted by aluminium oxide showed significantly higher egg production in the cages ($P \leq 0.05$) than in litter floor system ($P \leq 0.05$). The layers in the subsequent production cycle showed improvement in egg weight, egg shell thickness and Haugh Unit Score. The egg weight and egg shell thickness were higher in the birds kept on litter floor system than those kept in cages ($P \geq 0.05$). However, Haugh unit score was higher in the cage system. It was concluded that aluminium oxide can be effectively supplemented for better production performance and improved egg quality in the second production cycle preferably in the cages.

Kay words: Induced molting, aluminium oxide, egg production, egg quality.

INTRODUCTION

Egg production is relatively at low level towards the end of laying cycle when interior and exterior egg quality are also poor, particularly if the tail end coincides with hot weather. It has been observed that the egg weight and shell thickness increase alongwith marked improvement in the smoothness of the eggshells following induced molting (Berg and Brease, 1947). Various successful methods of induced molting have been used to recycle laying hens, the majority of which require an optimum weight loss of 25-30% to achieve maximum egg production during the post molt period. The most effective method creates least stress, produces a rapid molt and brings back the flock into production quickly (North and Bell, 1990).

Induced molting by mineral supplementation, such as the use of high levels of either aluminium salt (Hussein *et al.,* 1989) or dietary zinc (Hussein *et al.,* 1988) have been successfully practiced. In addition, supplementing low levels of dietary zinc combined with reduced calcium levels in the diet has also induced successful molting in laying hens (Breeding *et al*., 1992a). Feed deprivation is most widely used in the poultry production because it is simple, practicable and economical technique that can be used in combination with light and/or water restriction (Andrews *et al.,* 1987; Hussein, 1996).

Now-a-days, there is growing global concern for animal rights and welfare. In the United Kingdom "Welfare Battery Hens Regulation" made total feed withdrawal illegal. It seems that mineral supplementation molting methods would be given priority in the coming years. These methods have lower mortality rates in the hot climates as compared to the feed deprivation and feed restriction methods.

The objective of the present study was to observe effects of housing systems on productive performance of commercial layers following induced molting by aluminium oxide supplementation.

MATERIALS AND METHODS

Seventy two Single Comb White Leghorn commercial layers (60 weeks old) were randomly divided into six experimental units of 12 layers each. These experimental units were randomly divided into two groups, each consisting of three experimental units, one group was reared on litter floor and the other in cages. The experimental units were allotted at random to aluminium oxide supplementation (4 gm/kg of feed) during the molting stage (66-67 weeks of age) in such a way that each treatment received three experimental units. Body weight, feed consumption, mortality, egg production and egg quality characteristics were recorded on weekly basis. The data were analyzed statistically, using Paired t-test technique, as described by Snedecor and Cochran (1991). The schedule for induced molting is illustrated in the Table 1. The composition of feed offered during molting and production period is given in Table 2.

Table 1: Induced molting schedule

Age (weeks)	Stage	Medication/vaccination	Feed	Water	Light
65	Premolt	Deworming, antibiotic course, IB+ND vaccination	*Ad libitum*	*Ad libitum*	16 h
66-67	Molt	-	35 g/bird	*Ad libitum*	12 h
68-71	Rest period	ND live vaccine	45 g/bird	*Ad libitum*	12 h
72	Rest period	-	45 g/bird	*Ad libitum*	14 h
73-92	Production	NDV Lasota each month	110 g/bird	*Ad libitum*	16 h

IB= Infectious bronchitis
ND=Newcastle disease.

Table 2: Composition of feed offered at various stages of induced moulting

Nutrients	Stages of induced molting		
	Pre-molt	Molt	Post-molt
Crude protein (%)	17	14	17
Metabolizable energy (K cal/kg)	2700	2600	2700
Calcium (%)	3.00	0.9	3.00
Phosphorus (%)	0.5	0.27	0.5
Lysine (%)	0.65	0.41	0.65
Methionine (%)	0.3	0.18	0.3
Cystine + methionine (%)	0.55	0.38	0.55

RESULTS AND DISCUSSION

The weights of the layers in cage and litter floor system were 1498 and 1559g, respectively at the start of the experiment. The layers molted by aluminium oxide supplementation lost 22.71 percent of their body weight in cages against 20.65 percent on the litter floor system (Table 3). Significantly lower body weight loss was observed in aluminium oxide treated birds on the litter floor as compared to cage system. The body weight then increased attaining a maximum value of 1670g in the cage and 1730g in litter floor system at 92 weeks of age.

The results of the present study showed that the birds molted by aluminium oxide in the cages lost more body weight as compared to litter floor system. The birds performed better with greater body weight loss in the cages. Similar results have been reported by Herremans (1988), Gonzalez (1988) and Brake (1993), who reported better post molt performance in the birds which lost 27-32 percent body weight during molting. The body weight loss in the molted hens seems to be due to decreased muscle mass, utilization of adipose tissue, decreased liver weight and involution of the reproductive organs (Berry and Brake, 1991).

The mean feed consumption per dozen of eggs of birds in cages and on litter floor systems are given in Table 3. Feed consumption was 1.75 kg for both the groups during the molting period, while it was 14.94 and 15.4 kg in the cages and on the litter floor system, respectively. The results exhibited significant ($P<0.05$) effect of housing systems on feed consumption. Lower feed was consumed in the aluminium oxide treated layers kept in cages as compared to litter floor system. Similarly, improved feed efficiency had been reported in the forced molted layers as compared to the control with lowest hen day production and poorest feed efficiency (Lee, 1982).

Table 3: Effect of housing system on body weight, feed consumption, mortality and egg production of molted layers in second production cycle

Parameters	Aluminum oxide	
	Cage System	Litter Floor System
Body weight (% reduction)	22.71^{A}	20.65^{B}
Feed consumption (kg)	1.96^{B}	2.02^{A}
Mortality (%)	0.00	4.33
Egg production (%)	74.44^{A}	71.59^{B}

Means with different letters within a row differ significantly ($P\leq0.05$).

The birds kept in cages produced more number of eggs (74.44%) against litter floor system (71.59%), as given in Table 3. High peak egg production was observed during 9 to 12 post molt weeks in layers kept in cages than those on litter floor system. Thereafter, egg production decreased but the caged layers maintained the higher values throughout the production period than their counterparts. Hussein *et al.* (1989), Dickerman and Bahr (1989), North and Bell (1990) and Bell (1991) reported that the molt induction increased the egg production in the post molt period.

In this study, higher mortality rate (4.33%) was observed on litter floor system whereas no mortality was observed in caged layers (Table 3). However, mortality rate in second production cycle following induced molting was significantly low against first production cycle. North and Bell (1990), Hussein *et al.* (1989), Yousaf (1996), Yousaf *et al.* (1998), Bell (1991), and Akram (1998) observed lower mortality rates in second production cycle as compared to the first production cycle.

The layers on the litter floor system produced eggs with an average weight of 64.82 gm against 63.23 in the cages (Table 4). North and Bell (1990), Rolon *et al.* (1993), Ahmad *et al.* (1995) and Akram (1998) reported that egg weight improved significantly in post molt production period. The increase in egg weight may be due to efficient utilization of feed by birds. However, the exact reason for this increase in egg weight is not known. Possible explanation may be the decreased shell gland efficiency towards the end of egg production cycle.

The layers on liter floor system showed non significantly higher shell thickness i.e. 35.72 mm against 35.11 in the cages (Table 4). Similar findings have been reported by North and Bell (1990), Berry and Brake (1991), Al-Batshan *et al.* (1994) and Sharma and Bhatti (1996). In old hens during the first production cycle decreased eggshell quality is related to the reduced shell gland efficiency (Joyner *et al.,* 1987). Thus, calcium binding protein Ca BP D_{28} K played an important role in shell formation (Nys *et al.,* 1986). The decreased ability to transfer calcium into the shell has been reported to be associated with the reduction of Ca BP D_{28} K content in the shell gland (Berry and Brake, 1991). The molt induction significantly improved eggshell thickness, which enabled the hen to produce more number of eggs with better shells by rejuvenating the reproductive system (Wilson *et al.,* 1979). The molted layers improved the process of calcification, resulting in significant decrease of uncollectable eggs (Roland and Bushong, 1978).

The birds in cages showed higher ($p \leq 0.05$) Haugh unit score values (88.30) as compared to 86.96 on litter floor system (Table 4). Haugh unit score were also improved by forced molt (Karunajeewa *et al.,* 1989). In this study, Haugh unit score decreased in the later part of second production cycle which was due to ageing of layers. These results are in line with the findings of Izat *et al.* (1986), who stated that Haugh unit decreased as age increased.

The net profit per laying bird was higher (Rs. 175.87/-) in the caged layers against Rs. 147.58/- on the litter floor system. Similar results have been reported by Afzali *et al.* (1996), Yousaf (1996) and Akram (1998). It is, therefore, recommended to molt the layers by aluminium oxide in cages for better production performance and reduced mortality in the birds during molting phase.

Table 4: Effect of housing system on egg quality of layers in second production cycle

Parameters	Cage system	Litter floor System
Egg weight (gm)	63.23 ± 4.10	64.82 ± 4.50
Egg shell thickness (mm)	35.11 ± 2.30	35.72 ± 2.60
Haugh unit score	88.30 ± 5.20^{A}	86.96 ± 5.80^{B}

Means with different letters differ significantly ($P \leq 0.05$).

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