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Performance of Different Commercial Layer Feeds on Egg Production in Hens during Summer

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ABSTRACT

This study was conducted to evaluate the feeding performance of commercial feeds available in the market on egg production in hens during summer season for twelve weeks. All feeds were in mash form except one layer feed in crumbled form. There were also variations in crude protein, crude fat and crude fibre contents of the various feeds as analyzed. However, total number of eggs laid was significantly different among hens. The highest cost of producing a dozen eggs was recorded with the crumbled feed. It was concluded that Treatment 4 consisting of readymade concentrate (35%) mixed with energy rich ingredients such as maize (43%) and de-oiled rice bran (12%) found to be most economical amongst all other combinations. Hence, farmers must be advocated not to use readymade crumbled feed in order to harness maximum profit from egg production.

Key Words: Commercial layers feed, Egg weight, White leg horn hens.

INTRODUCTION

Poultry industry is growing @ 6% per annum in terms of egg production in India. Indian poultry farms are producing 73 billion eggs per year (2014-15). Although India ranks third in egg production, but due to high population density, per capita availability of egg is just 58 eggs/head/year which is much below the recommended requirement of 180 eggs/head/year, as recommended by World Health Organization (WHO). Poultry nutrition includes study of different nutrients which plays important role in maintenance, growth, breeding, health and egg production. Poultry feed industry is growing due to growth of poultry in the India. Poultry birds need rations which should be enriched with amino acids, vitamins, minerals and other nutrients. Poultry farming is becoming modernized day by day and more scientific from extensive ((Halima *et al*, 2007) to cage system so all the nutrients must be balanced within the feed to fulfill all the requirements of the birds.

Feed production ethics and quality control assurance is being implemented strictly in developed countries, this is not quite so in developing countries like India. In India, there is no defined system of evaluating the quality poultry feeds being sold to poultry farmers by feed manufacturers. Poor quality feeds results in high mortalities, low productivity, and low product quality which lead to losses in poultry industry. In overall poultry operations, feed alone comprises 70-80 per cent of total production cost, so the feed should be selected on the basis of performance.

As birds have a thick feather coat and have no sweat glands, so they can withstand cold conditions but are most sensitive to heat. During hot weather conditions, feed consumption decreases, egg production and egg size reduces and thin shelled eggs become a major concern. The ideal temperature for egg production is 55 to 85^{o} F. Every rise of 1^{o}F of environmental temperatures leads to reduction of 1 g feed/bird/day. Therefore, the nutrient dense poultry feed has to be provided to compensate lower feed consumption.

Unfortunately in India, there is a competition between humans and animals for high quality

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protein and energy ingredients. This factor makes it difficult to use high proportion of good ingredients to manufacture animal feeds so mainly leftover non- conventional feed ingredients are used for animal formulation. To compete in the market, most of the feed industries try to cut the cost, by using non- conventional feed ingredients and are not very particular about the nutrients in the feed that's why the present study was conducted. Poultry farmers get less value for their money while purchasing commercial feeds. As most of the poultry farmers in Punjab depend on commercial feeds. This study was conducted to evaluate the different commercial layer feeds commonly available in the market on the egg production in layers during summer.

MATERIALS AND METHODS

The experiment was conducted at the Krishi Vigyan Kendra (KVK), Langroya, District Shaheed Bhagat Singh Nagar during Summer Season (1st June to 31st August). Eighty white leg horn layers were selected with initial body weight ranging from 1.29 to 1.33 kg. There were a total of 40 cages which were divided into 10 cages each for four different treatments. Each cage measured 15" in length, 12" width having a total floor area of 180 square inches. Bottom of each cage was having a slope of 2 inches for rolling of eggs. Feeders and waterers were provided in form of long channels throughout the cage. So, overall there were 20 hens in 10 cages for single treatment. There were four treatments namely T1, T2, T3 and T4 for Godrej crum egg, De-Hues concentrate 25%, Godrej 40% and Godrej 35% , respectively (Table 1). All layers were fed commercial diets, which consisted of variations in CP contents as described in Table 3. Diets were analysed in duplicate for physical parameters (weight of bag, texture, foreign bodies, smell and flavour and moulds). Proximate parameters such as crude protein (CP), dry matter (DM), ether extract (EE), ash and crude fibre (CF) and macronutrients analysis {calcium, phosphorus) according to AOAC (1990)}and metabolizable energy (ME) was measured by using 25–30 atmospheres of oxygen in Bomb Calorimeter.

In this study, a total of eighty (80) white leg horn hens were selected and kept under similar environmental condition having slightly different body weights into four different groups and fed 4 different rations prepared after mixing different feed ingredients in the readymade layer concentrates commonly available in the market (Table 1). The layers were reared in a ventilated shed, with a daily photoperiod of 16 hr of light. The birds were kept in cages whereas feed and water were provided *ad libitum* throughout the experimental period. Records of feed intake, egg number and egg weight were taken daily for 3 months. Feeds used throughout the duration of the experiment were purchased in batches not more than one month in stock to minimize quality deterioration due to prolonged storage. Feed samples for analysis were collected from different stocks, for each commercial layer feed, Sampling was done from each bag bought at different times during period of study. The samples were pooled and properly mixed prior to chemical analysis.

Table 1. Composition of four treatment rations. (100 Kg)

Ingredient	T1 (kg)	T2 (kg)	T3 (kg)	T4 (kg)
Concentrate	100	25	40	35
Maize	-	50	40	43
Deoiled rice bran	-	15	10	12
Calcite powder	-	4	6	6
Stone Grit	-	6	4	4
Cost of feed (Rs/q)	2400	1765	1778	1832

Physical examination of feed

Every bag of feed for each brand was weighed and the actual weight was recorded. The type of feed bags used was also noted. Samples were examined for presence of insects and moulds. The texture of

Table 2. Physical evaluation of different commercial layer feeds.

Brand of feed	Weight on bag	Actual Weight	Texture	Foreign bodies	Mould	Smell and Flavour	Dustiness
	(kg)						
T1	50	49.8	Crumble	Absent	Absent	Fresh	Fresh
T2	50	50.3	Mash	Absent	Absent	Fresh	Fresh
T3	50	50.1	Mash	Absent	Absent	Fresh	Fresh
T4	50	49.6	Mash	Absent	Absent	Fresh	Fresh

the feed was noted whether it is in pellet, mash or crumbled form.

Proximate analysis of feed

The proximate analysis of feed was done using the method of AOAC (1990). Percentage Matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE) and ash were analyzed. Calcium (Ca) and Phosphorus (P) and content were determined. Metabolizable Energy (ME) was referred to as heat of combustion and measured in a Bomb Calorimeter.

Performance evaluation of feeds in hens

Different parameters like final body weight, feed intake, per cent egg layed, egg weight and feed per dozen egg were evaluated for all the four different feeds. The comparison between individual feed was recorded.

Statistical analysis

The Standard error (SE at 5% level) and least significance difference (LSD at 5% level) were calculated for replicate data.

RESULTS AND DISCUSSION

Physical evaluation of feed

The actual weight of different brands of feed *i.e.* Godrej crum egg, De-Hues concentrate 25%, Godrej 40% and Godrej 35%, namely T1, T2, T3 and T4, respectively was found slightly different from the weight mentioned on the bags. Godrej crum egg (T1) was crumble type feed while T2, T3 and T4 were mash type. None of the feeds showed the presence of either insects or mould. Assessment of feeds is necessary to meet the nutrients requirements of animals. The assessment of feed is based on their ability to support animal life, its growth and reproduction. Uchengu *et al* (2008) also reported slight variations in weight of feed bags while investigation of physical characteristics. It is also commendable that feeds without insects, moulds and any flavour must be ideal for feeding.

Proximate and macronutrients evaluation

The data (Table 3) show the proximate and macronutrient composition of different commercial feed T1, T2, T3 and T4. The crude protein ranged from 17.5 to 21.3 per cent and the dry matter between 88 to 90 per cent. The percent ether extract was very low in T2 (1.3%) as compared to other three feeds. The percent total ash varied between 12.2 (T4) to 14.1 (T3) per cent. In case of macronutrients composition, concentration of calcium was almost same in three feed i.e. 3.0 per cent in both T2 & T3 and 3.2 per cent in case of T4, while T1 have only 2.0 per cent. Similar trend has been observed in phosphorus concentration.

The percent moisture content is very important parameters for shelf life of any feed. Less the moisture content more will be the shelf life of feed. The moisture content of any feed is inversely proportional to dry matter. However on analysis the moisture content, it ranged between 10-12 per cent, which was in the range of recommendations for proper storage. High moisture content causes fungal contamination in the feed when stored for too long (Vieira, 2003).

Table 3. Proximate and macronutrients evaluation of different commercial layer feeds.

Brand of feed	Proximate analysis (%)					Macronutrients		
	CP	DM	EE	Ash	CF	Ca(%)	P(%)	ME(Cal/Kg)
T1	18.0±0.54	89.0±1.06	2.8±0.56	13.5±0.66	6.0±0.37	2.0±0.21	0.58±0.08	2500
T2	17.5±0.45	88.0±0.82	1.3±0.38	12.9±0.48	6.2±0.51	3.0±0.28	0.67±0.11	2650
T3	21.2±0.44	89.0±0.99	2.2±0.41	14.1±0.57	5.9±0.43	3.0±0.19	0.66±0.09	2650
T4	21.3±0.25	90.0±0.67	2.7±0.32	12.2±0.71	5.4±0.33	3.2±0.20	0.69±0.06	2600
LSD	0.5	0.89	0.8	0.6	0.06	0.05	0.06	10

CP: crude protein, DM: dry matter, EE: ether extract, CF: crude fiber, Ca: calcium, P: phosphorus, ME: metabolizable energy; ± values indicate per cent standard error for triplicate data

Performance of different feeds

Body weight

The initial body weights were almost similar in all the different four groups whereas the final body weight were significantly different in all the four treatments with maximum body weight in T1 (1.45 kg) followed by T2 (1.40 kg) whereas T3 and T4 had almost similar final body weights (1.32 kg and 1.34 kg), respectively. The maximum final body weights of hens were observed in T1 feed while the lowest was observed in T3 and T4 ($P \leq 0.05$). Higher body weight in T1 group might have occurred due to more amount of EE (2.8%) and significantly more quantity of feed consumed (9.03kg) compared to other dietary treatments. Final body weight was reduced by 3.44 per cent in T2, whereas in T3 and T4 it was reduced by 8.96 and 7.59 per cent, respectively. Reduction in body weight was probably due to significantly low feed intake observed in treatments T4, T# and T2 compared to T1.

Feed intake

Maximum feed intake was observed in case of hens fed with T1 feed (9.03 kg/hen) while minimum intake was seen in hens fed with T3 and T4 feeds. The maximum egg laying percentage was significantly different in all the four groups with T4 (77.01%) followed by T3 (71.4%) then T2 (69.18%) and minimum egg laying percentage was recorded in T1 (66.14%). The group of hens feeding on T4 feed laid maximum number eggs per hen (70.84) followed by T3 (65.68) which was comparable to T2 (63.48) and minimum number of eggs laid per hen were observed in T1 (60.72). Energy and protein concentrations in the diet play an important role in livestock productivity and are critical in the evaluation of poultry performance (Dairo *et al,* 2010). It is generally accepted that the poultry diet should be formulated precisely to obtain an optimal performance (Li *et al,* 2011). The nutrient concentration is important both in the nutritional aspect and practical application in terms of its economics, thus, feed formulation with lower protein or energy concentration enables the decrease of feed cost (Kamran *et al,* 2011). Feed consumption in poultry is regulated by nutrient density in the diet and more specifically consume the feed to fulfill the requirement of energy and protein.

Egg weight

There was no significant difference observed in egg weight among all the four feeds. There was a significant difference in consumption of feed for producing a dozen eggs. Quantity of feed consumed for producing dozen eggs was minimum in T4 (1.45 kg) followed by T3 (1.57 kg) the T2 (1.63 kg) and

Table 4. Performance of hens fed various commercial feeds.

Sr. No.	Parameter	T1	T2	T3	T4	LSD
1.	Initial Body Weight (Kg/hen)	1.31±0.08	1.33±0.11	1.29±0.09	1.32±0.10	NS
2.	Final Body Weight (Kg/hen)	1.45±0.10[a]	1.40±0.08[b] (3.44↓)	1.32±0.08[c] (8.96↓)	1.34±0.09[c] (7.59↓)	0.06
3.	Total feed Intake (Kg/hen)	9.03±0.12[a]	8.62±0.14[b] (4.54↓)	8.51±0.09[c] (5.75↓)	8.49±0.08[c] (5.98↓)	0.11
4.	Egg laying (%)	66.14±1.11[d]	69.18±1.34[c] (4.59↑)	71.4±1.07[b] (7.95↑)	77.01±1.13[a] (16.43↑)	2.01
5.	Total no. of eggs laid /hen	60.72±1.22[c]	63.48±1.42[b] (4.54↑)	65.68±1.18[b] (8.16↑)	70.84±1.02[a] (16.67↑)	2.11
6.	Average Egg weight (g)	55.12±1.02	54.43±1.00	54.85±1.03	54.21±1.12	NS
7.	Feed per dozen eggs (Kg)	1.79±0.06[a]	1.63±0.04[b] (8.93↓)	1.57±0.05[c] (12.29↓)	1.45±.004[d] (18.99↓)	0.06
8.	Feed cost per dozen egg N	42.96[a]	28.85[b] (32.84↓)	28.00[b] (34.82↓)	26.83[c] (37.54↓)	1.07

LSD: least significance difference at 5% level (P ≤ 0.05); NS: non-significant;

a, b, c and d: indicating means within row differed significantly;

± Values indicate per cent standard error for duplicate data

↑ &↓: indicating percentage increase or decrease as compared to Treatment T1

maximum in T1 (1.79 kg). The cost of feed per dozen eggs was maximum in case of T1 feed (Rs. 42.96/-) while it was minimum in case of T4 feed (Rs. 26.83 only) which was comparable in T2 (Rs. 28.85) and T3 (Rs. 28/-). It is well known that egg size usually increases as dietary protein increases; however, the protein intake needed to achieve maximum egg size is unclear.

Laying performance

The egg laying percentage was increased by 4.59 per cent in T2, 7.59 per cent in T3 and 16.43 per cent in T4 as compared to T1. Total number of eggs laid per hen was observed to be increased by 4.54 per cent in T2, 8.16 per cent in T3 and highest percentage increase of 16.67 per cent was observed in T4 as compared to T1. Rama Rao *et al* (2011) observed no significant effect on egg production, Feed intake and FCR in WLH layers by incorporating various levels of protein (15-18%) in diet. Quantity of feed consumed per hen for producing dozen eggs was decreased by 8.93 per cent in T2, 12.29 per cent in T3 and 18.99 per cent in T4 as compared to T1. Cost of feed for production of dozen eggs was observed to be decreased by 32.84 per cent in T2, 34.82 per cent in T3 and 37.54 per cent in T4 as compared to T1.

The laying performance of hens in terms of egg number was significantly increased in T4

feed as compared to T1 feed (control). However, no significant difference in egg weight among four feeds was observed. The difference in laying performance could be related to the nutritional parameters of all the four feeds. Whitehead (2002) reported that most lipids in egg yolk is formed in the liver suing fatty acids obtained from the diets or from de novo synthesis and that providing dietary fat decreases the need for hepatic fatty acid synthesis and thus increases yolk formation and hence increases the egg weight. Proteins also play an important role in production and various metabolic activities. If diet is deficient in proteins, it leads to inadequate supply of amino acids, especially Lysine and Methionine. The diet T3 and T4 have 21.2and 21.3 per cent crude protein. That's why the cost of production of eggs in these two treatments has been less as compared to T1.

CONCLUSION

On the basis of the findings it was concluded the farmers were not aware about the quality of the feeds available in the market. The results of present study revealed that T4 was the formulation with high density nutrients like amino acids, vitamins and minerals, which provided all the required nutrients for optimal egg production during hot summer conditions. The egg production was observed to be increased by 16.67 per cent in T4 as compared to T1. Although cost per bag was higher for T4, but it proved to be value for money in terms of cost of production/egg. Therefor, farmers were advised to use nutrient rich feeds especially during summer months for profitable poultry farming during hot weather.

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