Original Research Article

Effect of Protein Levels, Ascorbic Acid and their Interaction on Performance of Colour Hen during Pre and Post Summer Periods

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ABSTRACT

Introduction

Protein and energy are major dietary components of feed formulation. Its requirement and efficiency of utilization has been found to be influenced by genotype and environment. In tropical countries summer temperature varies from 32°C to 46°C. Higher temperature causes decrease performance of birds through reduced feed intake, nutrient utilization, high body temperature and disturbed physiology and metabolic process. Under heat stress excess plasma corticosterone hormones are released which adversely influence physiology and metabolic process in birds. Increase body temperature causes tissue damage and release of intracellular substances. Ascorbic acid (AA) has been found to limit rise in circulatory corticosterone concentration (Sahin et al.,

Dual type colour hens were evaluated for performance traits during pre summer (92.4°F to 100.3°F, average 95.3°F) and post summer (101.7°F to 106.3°F, average 104.6°F) periods, feeding P₁(15%.CP), P₂(16.5%.CP) and P₃(18%.CP) protein diet with ascorbic acid (250mg/kg) supplementation. Feed intake/hen/day and egg production/hen/period was significantly higher (P<0.05) in P₂ than P₁ and P₃ during both summer periods. Egg weight of P₂ and P₃ was non significant in pre summer whereas during post summer, P₂ egg weight was significantly higher than P₁ and P₃. Feed efficiency/kg egg mass in P₂ and P₃ was non significantly different and significantly better than P₁. During post summer feed efficiency (FE) improved significantly (P<0.05) with increasing protein levels. Feed Intake (FI), egg production (EP), egg weight was decreased in post summer than pre summer in the range of 13.64% to 23.28%, 5.28% to 12.81% and 2.71% to 6.25% respectively. An adverse effect on FI was higher, followed by egg production than egg weight. FE improved in the range of 3.78% to 9.17% shown higher improved in P₃ high protein diet. Ascorbic acid supplementation (250/mg/kg) significantly improved FI and EP in both summer period, Egg wt in pre summer and FE in Post summer period. Treatment P₂XC₁ has higher feed intake, egg production, egg weight and feed efficiency/ kg egg mass during pre and post summer period.

Keywords
Colour hens, Protein, Ascorbic acid, Interaction, Performance, etc.

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2002), body temperature (Pardue et al., 1985). Dietary supplementation of ascorbic acid (AA) improves performance of birds. Contradictory finding are also reported in literature (De faria et al., 2001). In view of this context, dual type Jabalpur colour hens were evaluated for performance traits under pre and post summer periods, feeding varying protein levels with ascorbic acid supplementation.

Materials and Methods

Fourty week age 108 dual type colour hens were randomly housed in individual cages in six dietary treatment groups. Each group had 18 birds in 3 replicates. Ration containing 15%, 16.5% and 18% crude protein with 2700 kcal ME/kg diet were prepared. All three ration were supplemented with ascorbic acid (250mg/kg diet) and its counter part without AA, making 6 dietary treatments. Experiment conducted for 84 days form 25 Feb to 19 May as pre summer and post summer periods, each one of 42 days duration. Daily egg production and egg weight was recorded and compiled weekly and 6 wk pre and post summer periods. Replicate wise egg mass in each week and in each 6 week period was estimated. Daily measured amount of feed was given to replicated group of birds to determine feed efficiency/Kg egg mass. Ambient shed temperature was recorded daily 3 times (10am, 2pm and 5pm) and its average calculated for weekly and periodically. Collected data was analyzed as per Snedecor and Cochran (1994) and means were tested for significance of difference.

Results and Discussion

Shed temperature measured 3 times daily was range between 92.4°F to 100.3°F (Av. 95.3°F) during pre summer and 101.7°F to 106.3°F (Av. 104.6°F) during post summer period. Increasing dietary protein from P2 to P3 level result in significant (P<0.05) decreased FI at level of 11.28g/hen/day during pre summer and 19.53g/hen/day during post summer. P1 and P3 were non significant during pre summer whereas during post summer P3 has significantly (P<0.05) lowest feed intake. Dhagir (1996) and Lin et al., (2006) reported decreased FI and performance of hens fed high protein diet under high environment temperature. The result was in agreement to these authors. Increased ambient shed temperature form 95.3°F (range 92.4°F to 100.3°F) to 104.6°F (range 101.7°F to 106.3°F) during post summer decreases FI of P1, P2, P3 protein diet at level of 13.9g (13.46%), 16.30g, (13.94) and 24.6g (23.28%) respectively, indicated higher decrease in high protein diet. Ebeid et al (2012) and Attia et al., (2016) Stated that bird consume less feed to decrease body heat increment associated with nutrient metabolism.

Egg no./hen/ period were significantly higher (P<0.05) in P2 than P1 and P3 protein levels during both summer period. P1 and P3 were non significant. Experiments conducted in summer climate revealed detrimental effect of high protein under high summer temperature. (Dhagir, 1996; Tyagi and Serajuddin, 2007; Sahin, et al., 2009) The present result supported these authors. The egg no./hen during post summer period were decreased by 1.44 egg (5.28%), 3.03 egg (10.60%) and 3.35 egg (12.81%) in P1,P2,P3 protein levels respectively with increased average shed temp from 95.3°F to 104.6°F. These values also shown higher decrease in high protein diet. Significantly lower egg production with increased ambient temperature was reported by Sahin et al (2009) and Attia et al (2016). As the environment temperature rises above 90 °F (32.2 °C), temperature regulatory mechanism not adequate to control body temperature near normal range resulting in heat stress. Release of excess corticosterone
in heat stressed bird, adversely affect physiological and metabolic process, resulting lower performance of birds (Pardue et al., 1985).

Egg weight of P2 was non significantly different from P3 during pre summer whereas significantly higher in post summer, indicated some lower sensitivity of egg weight than feed intake and egg production. P1 egg weight was significantly lower in both summer. In comparison to pre summer, egg weight in post summer was depressed by 1.44g (2.7%) 3.03g (5.54%) and 3.35g (6.24%) respectively in P1, P2, P3 protein diet. Depression in egg weight was recorded lower than feed intake and egg production. Similar finding was reported by Ebeid, et al (2012) and song, et al (2012). Feed efficiency/kg egg mass was improved with increasing protein level in diet with non significant difference between P2, P3 in pre summer and significant in post summer. Parson et al (1993) and Zou and Wu (2005) reported significantly better FE with increasing dietary protein level (Table 1).

**Table.1** Effect of protein and ascorbic acid on performance of colour dual type hens during pre and post summer periods

| Factors | Feed intake (g)/hen/day | Egg No./hen/period | Mean egg wt. (g) | Feed efficiency |
|---------|-------------------------|--------------------|------------------|-----------------|
|         | Pre sum | Post sum | Pre sum | Post sum | Pre sum | Post sum | Pre sum | Post sum |
| P1(15% cp) | 103.90a | 89.91b | 24.06b | 22.62b | 52.60a | 51.85b | 3.38b | 3.22c |
| P2(16.5% cp) | 116.83a | 100.50a | 28.58a | 25.55a | 54.65a | 53.75a | 3.17a | 3.05b |
| P3(18% cp) | 105.55b | 80.97b | 26.15b | 22.80b | 53.67a | 52.00b | 3.16a | 2.87a |
| Co (250mg/kg diet) | 114.43a | 93.64a | 27.77a | 24.63a | 54.80a | 53.26a | 3.16a | 3.00 |
| Co (without AA) | 102.54b | 86.43b | 24.70a | 22.68b | 52.70b | 51.66 | 3.31b | 3.10 |

Means within a column for each factor with different superscripts differ significantly (P<0.05)

**Table.2** Effect of protein x ascorbic acid interaction on performance of colour dual hens during pre and post summer periods

| Factors | Feed intake (g)/hen/day | Egg No./hen/period | Mean egg wt. (g) | Feed efficiency |
|---------|-------------------------|--------------------|------------------|-----------------|
|         | Pre sum | Post sum | Pre sum | Post sum | Pre sum | Post sum | Pre sum | Post sum |
| P1xC1 | 105.1bc | 93.5a | 24.07cd | 23.2bc | 53.0c | 52.0bc | 3.37c | 3.25b |
| P2xC1 | 120.8a | 100.2a | 30.6a | 26.6a | 55.3a | 54.5a | 3.00a | 2.90a |
| P3xC1 | 114.4b | 86.7b | 28.0b | 24.0bc | 55.0ab | 53.3ab | 3.12b | 2.85a |
| P1xC0 | 99.6cd | 85.0bc | 23.4d | 22.0cd | 52.6c | 50.7c | 3.40c | 3.20b |
| P2xC0 | 113.2b | 98.6a | 26.5bc | 24.4b | 53.5bc | 53.0ab | 3.35c | 3.20b |
| P3xC0 | 100.8d | 76.5c | 24.3d | 21.6d | 52.3c | 51.3c | 3.20b | 2.90a |

Means within column with at least one common superscripts are non significantly different (P<0.05)
The present result was in agreement during post summer of high ambient temperature and partially supported in pre summer of lower ambient temperature. Feed efficiency/kg egg mass was recorded superior in post summer than pre summer of comparatively lower environment temperature.

Ascorbic acid (AA) supplementation @ 250 mg/kg significantly improved FI/hen during pre and post summer periods. The result collaborated with the finding of Sahota and Gillani (1995), Cheng et al. (1990). Mean egg no./hen/period was significantly better in ascorbic acid (AA) supplemented diet during pre and post summer whereas mean egg weight shown significantly different during pre summer of lowers ambient shed temperature. Panda, et al. (2007) reported significantly improved egg production and non significant effect on egg weight of hens, supplemented 250 mg/kg ascorbic acid (AA) in diet. Whereas, Ciftsi, et al., (2005) reported significantly higher egg weight and egg production of hens supplemented 250 mg/kg ascorbic acid (AA) in diet. The present experiment conducted in two summer temperature regimes, shown beneficial effect of ascorbic acid (AA) on egg weight during pre summer having comparatively lower temperature than post summer. Feed efficiency/kg egg mass was significantly improved during pre summer where as non significant difference observed during post summer period of high ambient temperature. Significantly improved FCR with ascorbic acid (AA) supplementation during summer (31-45°C) was reported by (Abd-Ellah, 1995, Sahota and Gillani 1995 and Panda et al., 2007). The present study result supported above authors during pre summer but having contrary finding in post summer of high ambient temperature.

Protein × AA interaction result (Table 2) shown significantly higher FI/hen/day and egg production/hen/ period in P2 × C1 treatment during both summer period. Mean egg weight was also found higher in P2 × C1 with non significant difference from P3 × C1 and significant from all other P × C combinations. Feed efficiency/ kg egg mass during pre summer was significantly superior in P2C1 where as during post summer P2C1, P3C1 and P2C0 were non significant different and significantly better than other P × C combinations.

The results concluded that P2 dietary protein improve feed intake, egg production, egg weight and feed efficiency during both summer period. Feed intake and egg production traits were found sensitive to P3 higher protein diet in both pre and post summer temperature range whereas egg weight influenced adversely in post summer of high shed temperature. Increased temperature in post summer result in higher percent decrease in feed intake followed by egg production than egg weight. AA 250 mg/kg improved FI and egg production significantly during pre and post summer whereas egg weight and feed efficiency/kg egg mass improved significantly during pre summer. Interaction result shown that P2 × C1 treatment improved feed intake, egg production, egg weight, with better feed efficiency during both summer periods compared to other P × C combinations.

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