Evaluation of phytogenic feed additive on egg production performance in Hy-Line commercial brown layers

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Abstract
The current study was carried out to evaluate the effect of phytogenic feed additive (PFA) on egg production performance in Hy-Line brown layer birds. A flock size of 14190 birds was selected in commercial poultry farm which was maintained with standard management practices at Spain. The baseline data (T1) was recorded for 20 days, thereafter, birds were fed with PFA (500 g/ton) (T2) supplemented feed for 11 days. The parameters viz. number of eggs, hen day egg production (HDEP) and egg size were recorded. Results revealed that PFA supplementation improved the production parameters viz. no. of eggs/day (204 eggs/day) and HDEP (3%) when compared to baseline. Additionally, the gap between standard HDEP and actual HDEP was reduced (-11.75 Vs. -15.80) in Hy-Line brown layer birds. Also, PFA supplementation augmented the medium sized egg production as compared to baseline (4223 Vs. 3700; Diff. +523). In conclusion, PFA can be used to improve the egg production performance and egg quality traits in Hy-Line commercial layer birds.

Keywords: Phytogenic feed additive, Hy-Line brown layers, HDEP, Egg quality

1. Introduction
There is a resurgence to augment poultry production to meet the increasing demand for animal protein due to the increase in global human population [1]. However, modern poultry industry has been facing a wide variety of stressors viz. environmental, nutritional, and internal stressors which leads to diminished reproductive production performance and adversely impact the health status of poultry birds as well [2]. The types of environmental stressors are (i) heat stress [3], (ii) cold stress [4], (iii) feed restriction [5], and many more. Specifically, heat stress is a main pressing issue in present day poultry rearing, as its negative impact on egg production is very much perceived [6]. Previous studies revealed that stress, in various forms and in various species, would modulate the circulating prolactin and gonadotropins in turkey poults [7], laying hens [8], and turkey hens [9, 10]. These changes in reproductive hormone secretion due to heat stress would negatively impact the reproduction performances. Adaptogens are defined as metabolic regulators which increase the ability of an organism to adapt to environmental stressors and to avoid damage from such stressors [11, 12]. Our previous works on Phytogenic Feed Additive (PFA), Phytocee™, in rodent and avian models demonstrated that it possesses an antistress, adaptogenic and antioxidant properties [13-16]. With these viewpoints. Present study was undertaken to evaluate the effect of PFA on egg production performance parameters in Hy-Line brown commercial layer birds.

2. Materials and Methods
2.1 PFA
Phytocee™ is a proprietary PFA developed by Natural Remedies Private Limited, Bengaluru, India, containing mainly dried powder of W. somnifera stems, fruits of E. officinalis and whole plant of O. sanctum.
2.2 General Layer Birds Husbandry Practices
The standard Hy-Line brown layer bird management practices were followed during the experiment. The experimental birds were reared in the cage system and provided with the potable drinking water *ad libitum* throughout the study period. The birds were fed with mash diet as per the breeder manual instructions. Recommended standard Hy-Line layer bird’s vaccination schedule was followed.

2.3 Study Design
The study was conducted at commercial poultry farm, Spain. A flock size of 14190 Hy-Line brown layer birds were enrolled and the study design was as described in Table 1.

Table 1: Study design

<table>
<thead>
<tr>
<th>Group</th>
<th>Treatment</th>
<th>Duration of Treatment</th>
<th>Number of birds/groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 - Baseline</td>
<td>Standard commercial feed</td>
<td>20 days</td>
<td>14190</td>
</tr>
<tr>
<td>T2 – PFA</td>
<td>Standard commercial feed + PFA (500 g/ton)</td>
<td>11 days</td>
<td>14190</td>
</tr>
</tbody>
</table>

2.4 Assessment Parameters
Number of eggs, hen day egg production (HDEP) and egg size of baseline and post-supplementation with PFA were recorded daily.

2.5 Statistical Analysis
Data were expressed as mean (average value per day).

3. Results
The egg production performance parameters viz. no. of eggs/day and HDEP were found to be improved following supplementation of PFA at 500 g/ton. The number of eggs/day and HDEP was improved by 204 eggs/day and 3% respectively in PFA supplemented period (T2) as compared to baseline (T1) (Table 1). The difference between standard HDEP production of Hy-Line brown layer birds and actual HDEP in T1 and T2 was -15.80 and -11.75. These findings implied that PFA supplementation reduced the gap between standard and actual egg production percentage (Table 2 and Figure 1).

![Fig 1: Effect of PFA on egg production parameters of Hy-Line brown commercial layer birds](image)

The results of effect of PFA on egg size of layer birds was as represented in Table 3. Results revealed that PFA supplementation at 500 g/ton (T2) improved the medium sized eggs production as compared to baseline group (T1) [4223 Vs. 3700; Diff. +523].

![PFA supplementation improved the egg production](image)

![PFA](image)

Table 2: Effect of PFA on egg production parameters of Hy-Line brown commercial layer birds

<table>
<thead>
<tr>
<th>Group</th>
<th>No. of Eggs/Day</th>
<th>Actual HDEP %</th>
<th>Difference No. of Eggs/Day HDEP (%)</th>
<th>Standard HDEP %</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 - Baseline</td>
<td>10771</td>
<td>77</td>
<td>-</td>
<td>92.80</td>
<td>-15.80</td>
</tr>
<tr>
<td>T2 – PFA (500 g/ton)</td>
<td>10975</td>
<td>80</td>
<td>+204</td>
<td>91.75</td>
<td>-11.75</td>
</tr>
</tbody>
</table>

Values are expressed as mean (average value/day)

Table 3: Effect of PFA on egg size of Hy-Line brown commercial layer birds

<table>
<thead>
<tr>
<th>Group</th>
<th>Egg Size (Nos.)</th>
<th>Jumbo (XXL)</th>
<th>Extra Large (XL)</th>
<th>Large (L)</th>
<th>Medium (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 - Baseline</td>
<td></td>
<td>193.80</td>
<td>1087.90</td>
<td>5630.30</td>
<td>3700.90</td>
</tr>
<tr>
<td>T2 – PFA (500 g/ton)</td>
<td></td>
<td>149.64</td>
<td>916.09</td>
<td>5452.27</td>
<td>4223.18</td>
</tr>
<tr>
<td>Difference</td>
<td></td>
<td>-44</td>
<td>-172</td>
<td>-178</td>
<td>+523</td>
</tr>
</tbody>
</table>

Values are expressed as mean (average value/day)

4. Discussion
To the best of our literature knowledge there are no reports available evidencing the conducive effects of medicinal herbs *viz.* *W. somnifera* stems, *E. officinalis* and *O. sanctum* neither individually nor synergistically on egg production performance and egg quality traits in Hy-line brown commercial laying birds. Hence, the present study was undertaken to evaluate the effect of PFA on egg production performance parameters and egg quality traits in Hy-Line commercial layer birds.

~ 88 ~
Our study results depicted that egg production parameters viz. no. of eggs/day and HDEP was improved by 204 eggs/day and 3% respectively after PFA supplementation in Hy-Line brown layer birds. Furthermore, the gap between standard HDEP production of Hy-Line brown layer birds and actual HDEP was reduced in PFA supplementation period as compared to baseline (-11.75 Vs. -15.80). Additionally, PFA supplementation augmented the medium sized egg production as compared to baseline (4223 Vs. 3700; Diff. +523). Moreover, the findings of egg production in our study are in accordance with the previous findings reported by Akdeimar et al., Radwan et al., Park et al., Damaziak et al., Abou-Elkhair et al., wherein addition of the different phytogenic feed additives in the layer bird’s diet significantly increased the HDEP [17-21]. Typically, commencement of lay is a prolonged stress factor in young layers which might alter their hormonal system thereby compromising the immunity and making them vulnerable to any infection [22]. However, the ability of birds to cope with the stress associated with initial production process can be improved by the addition of herbal adaptogens. Hence the conducive effects of PFA on egg production performance and egg quality traits could be ascribed to the synergistic effects of phyto-actives present in the individual herbal ingredients of Phytocee™ which was evidenced from literature reports that demonstrated the antistress, adaptogenic, and antioxidant potential [13-16]. Therefore, the augmentation of egg production performance and enhancement in medium sized eggs production effects in Hy-Line layer birds in the present study following supplementation of Phytocee™ at 500 g/ton could also be attributable to anti-stress, adaptogenic and antioxidant properties of synergistic effect of individual herbal ingredients.

5. Conclusions

In conclusion, the results of the present study demonstrated that the supplementation of PFA at 500 g/ton improved the egg production performance as well as enhanced the egg quality traits which can be related to the synergistic beneficial effects of phytoactives present in Phytocee™. Hence, Phytocee™ can be used to improve the egg production performance and egg quality traits of Hy-Line brown commercial layer birds.

6. References