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**Research Article**

# EFFECT OF GARLIC AND ONION POWDER SUPPLEMENTATION ON PRODUCTION PERFORMANCE OF LAYING HENS

ROHIT WALIA*, SAJJAN SIHAG, GUNJAN and SANDEEP KUMAR
Department of Animal Nutrition,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar-125004, India

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## ABSTRACT

An experiment was conducted to evaluate the effect of supplementation of different levels of Garlic powder (GP) and Onion powder (OP) in the laying hens' diet on their production performance and egg quality parameters for a period of 16 weeks. A total of 126 white leghorn laying hens at 22 weeks of age were randomly selected and distributed into seven experimental groups having three replicates of six birds each. The first group was kept as a control ($T_1$) and given the basal diet without antibiotics, while in treatment groups $T_2$, $T_3$, $T_4$, basal diet was supplemented with GP at levels of 10g, 20g and 30g /kg feed, respectively, while in $T_5$, $T_6$ and $T_7$, 10g, 20g and 30g/kg feed of OP was supplemented, respectively. Results revealed that the feed intake was significantly ($P<0.05$) improved by supplementation of 20g GP in feed of layers. Egg mass and hen day egg production were numerically higher in group $T_3$ (2% GP) and $T_5$ (1% OP) as compared to group $T_1$ (control). Feed Conversion Ratio (FCR) and egg weight was not significantly affected by supplementation of GP and OP in diets.Thus, the dietary supplementation of garlic and onion powder leads to improvement in the production performance.

**Keywords:** Egg weight, Garlic, Layer, Onion, Production performance

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The poultry sector is continuously searching for new feed additives to improve the feed efficiency with minimum deleterious effects on bird health. Herbal plants are a new class of growth promoters and in recent years, these feed additives have gained extensive attention in the feed industry. Realizing this, a number of herbs have been identified for their use as feed additive including garlic and onion, which in turn may improve the performance of layers.

The garlic contains important organic sulfurous compounds aliin, allicin, ajoene and allylpropyldisulphide and diallyltrisulphide, sallilcisteine, and others (Freeman and Kodera, 1995; Kemper, 2000; Mansoub, 2011). Reuter *et al*. (1996) reported garlic as a plant possessing antibiotic, anticancer, antioxidant, immune modulator, antiinflammatory, hypoglycemic and cardiovascular protecting effects.

Onion (*Alliium cepa* L.) which belongs to the family Liliaceae is extensively used as food and the common medicinal plant. Onion bulbs possess numerous organic sulfur compounds including trans-S-(1-propenyl) cysteine sulfoxide, S-methyl-cysteine sulfoxide, spropylcycteine sulfoxides, and cycloallicin, flavinoids, phenolic acids, sterols including cholesterol, stigma sterol, b-sitosterol, saponins, sugars, and a trace of volatile oil compounds mainly of sulfur compounds (Melvin *et al.*, 2009). Most of the plant parts contain compounds with proven antibacterial, antiviral, antiparasitic, and anti-fungal properties and have antihypertensive, hypoglycemic, antithrombotic, antihyperlipidemic, anti-inflammatory, and antioxidant activities (Lampe, 1999).

*Corresponding author: rohitahluwalia48@gmail.com

## MATERIALS AND METHODS

The study was carried out at poultry farm, Department of Animal Genetics & Breeding, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar. A total of one hundred and twenty six (126) single comb hens of Synthetic White Leghorn strain of 22 weeks of age, in first phase of their production were randomly divided into seven treatment groups i.e. i.e. $T_1$ (control), $T_2$ (10g GP/Kg feed), $T_3$ (20g GP/kg feed), $T_4$ (30g GP/kg feed), $T_5$ (10g OP/kg feed), $T_6$ (20g OP/kg feed), $T_7$ (30g/kg feed OP) having three replications with six birds in each replication. Hens were fed the experimental diet for sixteen weeks of experimental period beginning at 22 weeks of age and continued up to 38 weeks of age. The basal diet of laying hens was formulated as per BIS (2007) standards. The ingredient composition and chemical composition of the layers' control ration ($T_1$), has been given in Table 1. For each replicate, group wise feed consumption per bird was taken fortnightly for 8 experimental periods where egg production was recorded daily. The eggs were randomly selected from each replicate at the interval of each 2 week for measurement of egg weight and egg mass production. Feed conversion ratio as a measure of feed efficiency was calculated in terms of feed required to produce a dozen of eggs and one kg egg mass by each group for the 8 period of 2 week each.

The data were statistically analysed according to the procedure laid down by Snedecor and Chochran (1994).

## RESULTS AND DISCUSSION

The results of study revealed that the feed intake was significantly (P<0.05) improved by supplementation of 20g GP in feed of layers. However, feed consumption was not affected by the diets supplemented with 10g and 30g GP(P>0.05) and (10, 20, 30g) OP as compared to control group (Table 2). Omer *et al.* (2019) reported that incorporating 1% GP, 1% OP powder and the mixture of them in laying hen's diet had no significant effect on feed consumption/hen/day throughout the three stages of egg collection. The results of the study revealed that the mean value of percent hen day egg production (Table 3) was numerically higher in group $T_3$ (20g GP) and $T_5$ (10g OP) as compared to group $T_1$ (control). On the other hand, Canogullari *et al.* (2009) reported that egg production increased significantly by adding 1% garlic powder in the feed of laying hen. The results had shown that egg mass production was numerically increased in laying hens fed diets supplemented with 20g GP and 10g OP as compared to laying hens fed control diet (Table 4). In contrast with

**Table 1**

**Ingredient and chemical composition of ration for layers of control group (n=18)**

| Feed ingredients | Percentage |
|---|---|
| Maize | 56.0 |
| Groundnut cake | 12.0 |
| Soybean Meal | 19.5 |
| Fish Meal | 6.0 |
| Mineral Mixture | 2.5 |
| Salt | 0.5 |
| Shell Grit | 3.5 |
| **Chemical composition** | **%DM basis** |
| CP | 18.67 |
| CF | 4.23 |
| EE | 3.84 |
| NFE | 64.55 |
| Ash | 8.71 |
| Metabolizable energy (Kcal/Kg) | 2695.12 |

Feed additive included Intermix regular-10g, Intermix-BE-10g per 100 Kg of ration.

**Table 2**

**Mean values of feed consumption (g/hen/day) during progressive age (weeks) under different dietary treatments**

| Weeks/ Treatment | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ | $T_7$ |
|---|---|---|---|---|---|---|---|
| 22 – 24 | 115.67±1.45 | 114.00±1.52 | 116.67±1.76 | 115.33±1.20 | 116.33 ±2.18 | 116.67 ±1.76 | 116.33 ±1.76 |
| 24 – 26 | $115.33^{ab}$±1.45 | $110.67^{a}$ ±0.88 | $120.67^{b}$±1.20 | $116.33^{ab}$±1.45 | $115.67^{ab}$±2.96 | $116.00^{ab}$±2.64 | $115.67^{ab}$±1.45 |
| 26 – 28 | $118.67^{b}$±1.76 | $117.31^{b}$ ±0.88 | $119.00^{b}$ ±1.00 | $117.00^{b}$ ±2.08 | $114.67^{ab}$±0.88 | $114.67^{ab}$±1.45 | $111.67^{a}$±1.20 |
| 28 – 30 | 114.67±1.20 | 119.00±0.57 | 120.33 ±2.02 | 119.00 ±2.08 | 120.33 ±1.20 | 117.00 ±3.46 | 117.00 ±2.88 |
| 30 – 32 | $117.33^{bc}$±0.88 | $117.67^{bc}$±1.76 | $121.33^{c}$±0.88 | $118.33^{bc}$ ±0.66 | $116.67^{b}$ ±0.88 | $119.00^{bc}$±2.51 | $112.00^{a}$ ±0.57 |
| 32 – 34 | 117.00 ±0.57 | 119.67 ±2.84 | 121.67 ±2.02 | 120.33±0.33 | 118.67 ±2.40 | 121.33 ±2.33 | 118.67 ±2.18 |
| 34 – 36 | $121.33^{c}$ ±1.20 | $120.67^{bc}$±0.88 | $126.00^{d}$±1.15 | $120.67^{bc}$±1.20 | $116.33^{ab}$±2.40 | $115.67^{a}$ ±0.88 | $114.33^{a}$ ±2.18 |
| 36 – 38 | 118.00±2.08 | 119.67±3.18 | 120.67±4.37 | 122.00±1.15 | 118.67±1.20 | 117.33±3.18 | 118.33±2.72 |
| Mean | $117.25^{ab}$±0.75 | $117.33^{ab}$±1.19 | $120.79^{c}$± 0.93 | $118.62^{bc}$± 0.81 | $117.20^{ab}$±0.65 | $117.20^{ab}$±0.74 | $115.04^{a}$± 1.03 |

The mean values in same row with different superscripts differ significantly (P< 0.05)

**Table 3**

**Mean values of percent hen day egg production during progressive age (weeks) under different dietary treatments**

| Weeks/ Treatment | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ | $T_7$ |
|---|---|---|---|---|---|---|---|
| 22 – 24 | 72.61±2.06 | 71.81±1.43 | 73.80±1.19 | 70.23±1.37 | 72.78±1.37 | 69.83±1.04 | 71.42±2.06 |
| 24 – 26 | $78.96^{b}$±1.043 | $69.83^{a}$±4.42 | $80.29^{b}$ ±0.57 | $70.23^{a}$±.68 | $79.25^{b}$ ±0.08 | $74.20^{ab}$ ±4.57 | $71.02^{a}$ ±.37 |
| 26 – 28 | $82.14^{b}$±1.37 | $78.96^{b}$±3.78 | $84.43^{b}$±0.09 | $69.83^{a}$±5.55 | $84.52^{b}$±1.81 | $81.74^{b}$±2.20 | $78.57^{b}$ ±1.19 |
| 28 – 30 | $86.10^{b}$±1.43 | $80.15^{ab}$±3.38 | $87.06^{b}$ ±0.53 | $74.20^{a}$±5.20 | $86.78^{b}$ ±0.65 | $80.15^{ab}$ ±3.78 | $82.93^{ab}$±1.04 |
| 30 – 32 | $77.38^{ab}$±1.19 | $76.58^{a}$±1.04 | $80.29^{ab}$±2.20 | $75.79^{a}$±3.46 | $83.72^{b}$±1.43 | $79.36^{ab}$±2.20 | $77.77^{ab}$±2.10 |
| 32 – 34 | $71.42^{a}$±.68 | $73.40^{ab}$±1.05 | $78.17^{b}$±0.39 | $71.82^{a}$±2.86 | $74.99^{ab}$±0.68 | $76.18^{ab}$ ±1.81 | $77.38^{b}$±1.81 |
| 34 – 36 | 74.99±1.82 | 73.01±2.21 | 75.13±1.05 | 73.01±1.05 | 77.38±.68 | 74.60±.40 | 76.18±1.37 |
| 36 – 38 | 74.20±0.40 | 73.01±1.05 | 77.77±0.39 | 74.99±2.48 | 76.26±3.57 | 74.99±0.68 | 75.79 ±2.41 |
| Mean | $77.22^{bc}$±1.76 | $74.59^{ab}$±1.27 | $79.61^{b}$ ±1.57 | $72.51^{a}$ ±0.82 | $79.46^{b}$ ±1.77 | $76.38^{abc}$±1.36 | $76.38^{abc}$±1.36 |

The mean values in same row with different superscripts differ significantly (P< 0.05)

**Table 4**

**Mean values of egg mass production (g/day/hen) during progressive age (weeks) under different dietary treatments**

| Weeks/ Treatment | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ | $T_7$ |
|---|---|---|---|---|---|---|---|
| 22 – 24 | 36.02±0.82 | 35.87±0.60 | 37.59±0.90 | 35.73±0.72 | 36.28±0.72 | 35.46±0.96 | 36.06±1.23 |
| 24 – 26 | $40.16^{b}$±.60 | $34.93^{a}$±1.67 | $41.14^{b}$±0.46 | $35.09^{a}$±0.75 | $40.86^{b}$±1.13 | $37.63^{ab}$±2.57 | $35.93^{a}$±0.64 |
| 26 – 28 | $40.71^{b}$±0.91 | $40.12^{b}$±2.36 | $44.35^{b}$±0.32 | $35.49^{a}$±2.46 | $43.34^{b}$±0.70 | $41.81^{b}$±0.51 | $39.85^{b}$±0.82 |
| 28 – 30 | $45.55^{b}$±0.90 | $42.51^{ab}$±1.60 | $46.43^{b}$±0.23 | $39.32^{a}$±2.82 | $46.36^{b}$±0.28 | $42.58^{ab}$±1.81 | $43.37^{ab}$±0.78 |
| 30 – 32 | $40.88^{ab}$±0.82 | $40.31^{a}$±0.31 | $43.96^{bc}$±1.02 | $40.95^{ab}$±1.93 | $45.17^{c}$±0.65 | $42.17^{abc}$±0.60 | $41.58^{ab}$±1.33 |
| 32 – 34 | $38.20^{a}$±0.73 | $38.51^{a}$±0.59 | $42.38^{b}$±0.82 | $38.05^{a}$±1.58 | $40.59^{ab}$±0.82 | $40.49^{ab}$±0.97 | $41.20^{ab}$±0.62 |
| 34 – 36 | 39.99±1.76 | 39.29±0.91 | 40.76±0.34 | 38.85±0.53 | 41.34±0.86 | 39.49±0.69 | 40.69±1.47 |
| 36 – 38 | 39.87±0.23 | 39.01±0.29 | 42.03±1.05 | 40.05±1.31 | 41.11±1.43 | 40.13±0.68 | 40.86±1.40 |
| Mean | $40.17^{ab}$±0.95 | $38.81^{a}$±0.86 | $42.33^{b}$±0.94 | $37.94^{a}$±0.79 | $41.88^{b}$±1.10 | $39.97^{ab}$±0.85 | $39.94^{ab}$±0.93 |

The mean values in same row with different superscripts differ significantly (P< 0.05)

**Table 5**

**Mean values of feed intake (kg) per dozen egg production during progressive age (weeks) under different dietary treatments**

| Weeks/ Treatment | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ | $T_7$ |
|---|---|---|---|---|---|---|---|
| 22 – 24 | 1.89±.04 | 1.89±.04 | 1.88±.03 | 1.95±.04 | 1.90±.02 | 1.98±.04 | 1.94±.08 |
| 24 – 26 | 1.74±.05 | 1.90±.10 | 1.78±.03 | 1.97±.04 | 1.73±.04 | 1.88±.16 | 1.93±.03 |
| 26 – 28 | $1.72^{a}$±.04 | $1.77^{a}$±.08 | $1.67^{a}$±.01 | $2.01^{b}$±.15 | $1.61^{a}$±.04 | $1.67^{a}$±.05 | $1.69^{a}$±.00 |
| 28 – 30 | $1.64^{a}$±.04 | $1.77^{ab}$±.04 | $1.64^{a}$±.04 | $1.92^{b}$±.13 | $1.65^{a}$±.06 | $1.74^{ab}$±.07 | $1.67^{a}$±.04 |
| 30 – 32 | $1.80^{ab}$±.04 | $1.83^{ab}$±.04 | $1.80^{ab}$±.03 | $1.86^{b}$±.08 | $1.65^{a}$±.01 | $1.78^{ab}$±.07 | $1.71^{ab}$±.05 |
| 32 – 34 | $1.95^{ab}$±.00 | $1.94^{ab}$±.02 | $1.85^{ab}$±.05 | $2.00^{b}$±.07 | $1.82^{ab}$±.05 | $1.89^{ab}$±.04 | $1.88^{a}$±.01 |
| 34 – 36 | $1.92^{bc}$±.05 | $1.97^{bc}$±.06 | $1.99^{c}$±.02 | $1.96^{bc}$±.00 | $1.78^{a}$±.03 | $1.84^{ab}$±.01 | $1.78^{a}$±.04 |
| 36 – 38 | 1.89±.04 | 1.95±.08 | 1.84±.06 | 1.93±.04 | 1.85±.09 | 1.86±.04 | 1.87±.07 |
| Mean | $1.81^{ab}$±.04 | $1.87^{bc}$±.03 | $1.80^{ab}$±0.05 | $1.95^{c}$±0.02 | $1.74^{a}$±0.03 | $1.83^{ab}$±0.03 | $1.81^{ab}$±0.03 |

The mean values in same row with different superscripts differ significantly (P< 0.05)

**Table 6**

**Mean values of feed intake (kg) per kg egg mass production during progressive age (weeks) under different dietary treatments**

| Weeks/ Treatment | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ | $T_7$ |
|---|---|---|---|---|---|---|---|
| 22 – 24 | 3.21±0.06 | 3.17±0.05 | 3.10±0.06 | 3.23±0.07 | 3.20±0.05 | 3.29±0.05 | 3.23±0.15 |
| 24 – 26 | $2.87^{ab}$±0.07 | $3.18^{ab}$±0.14 | $2.93^{ab}$±0.05 | $3.31^{b}$±0.10 | $2.83^{a}$±0.02 | $3.12^{ab}$±0.30 | $3.22^{ab}$±0.06 |
| 26 – 28 | $2.91^{a}$±0.09 | $2.94^{a}$±0.16 | $2.68^{a}$±0.01 | $3.32^{b}$±0.23 | $2.64^{a}$±0.05 | $2.74^{a}$±0.05 | $2.80^{a}$±0.02 |
| 28 – 30 | $2.51^{a}$±0.03 | $2.80^{ab}$±0.09 | $2.59^{a}$±0.06 | $3.05^{b}$±0.19 | $2.59^{a}$±0.03 | $2.75^{ab}$±0.08 | $2.70^{a}$±0.10 |
| 30 – 32 | $2.87^{b}$±0.06 | $2.91^{b}$±0.06 | $2.76^{ab}$±0.04 | $2.90^{b}$±0.14 | $2.58^{a}$±0.02 | $2.82^{ab}$±0.09 | $2.69^{ab}$±0.09 |
| 32 – 34 | $3.06^{ab}$±0.04 | $3.10^{ab}$±0.09 | $2.87^{a}$±0.06 | $3.17^{b}$±0.13 | $2.92^{ab}$±0.10 | $2.99^{ab}$±0.07 | $2.87^{a}$±0.00 |
| 34 – 36 | $3.04^{ab}$±0.14 | $3.07^{b}$±0.08 | $3.09^{b}$±0.03 | $3.10^{b}$±0.01 | $2.81^{a}$±0.02 | $2.92^{ab}$±0.03 | $2.81^{a}$±0.10 |
| 36 – 38 | 2.95±0.05 | 3.06±0.06 | 2.87±0.12 | 3.05±0.07 | 2.89±0.13 | 2.92±0.06 | 2.90±0.09 |
| Mean | $2.92^{ab}$±0.07 | $3.02^{bc}$±0.04 | $2.86^{ab}$±0.06 | $3.14^{c}$±0.05 | $2.80^{a}$±0.07 | $2.94^{ab}$±0.06 | $2.90^{ab}$±0.07 |

The mean values in same row with different superscripts differ significantly (P< 0.05)

the present study, Omer *et al.* (2019) analysed that incorporating garlic powder, onion powder, and the mixture of them in laying hen diets had a significant improvement in the egg mass/hen.

The results of the study unveiled that dietary supplementation of GP and OP at different levels had no effect on the feed intake per dozen egg production and per kg egg mass production (Table 5 & 6). In agreement with current study, Asrat *et al.* (2018) found that feed conversion was not improved by addition of garlic powder in white leghorn hens. However, Omer *et al.* (2019) reported that incorporating garlic powder, onion powder, and the mixture of them in laying hen diets had a significant improvement in feed conversion. The mean

**Table 7**

**Mean values of egg weight (g) during progressive age (weeks) under different dietary treatments**

| Weeks/ Treatment | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ | $T_7$ |
|---|---|---|---|---|---|---|---|
| 22 – 24 | 49.62±0.33 | 49.95±0.78 | 50.92±0.59 | 50.88±1.16 | 49.78±1.20 | 50.79±1.14 | 50.48±1.26 |
| 24 – 26 | 50.87±0.70 | 50.13±0.72 | 51.25±0.65 | 49.96±0.62 | 51.56±1.45 | 50.67±0.74 | 50.59±0.79 |
| 26 – 28 | $49.55^{a}$±0.17 | $50.77^{ab}$±0.34 | $52.53^{b}$±0.33 | $50.92^{ab}$±0.92 | $51.31^{ab}$±1.17 | $51.19^{ab}$±0.79 | $50.72^{ab}$±0.27 |
| 28 – 30 | 52.89±0.20 | 53.06±0.23 | 53.34±0.80 | 52.99±0.72 | 53.43±0.38 | 53.15±0.54 | 52.30±0.89 |
| 30 – 32 | 52.84±0.49 | 52.65±1.01 | 54.74±0.26 | 54.03±0.47 | 53.96±0.55 | 53.18±0.84 | 53.46±0.33 |
| 32 – 34 | 53.48±0.61 | 52.50±1.15 | 54.20±1.80 | 53.01±1.55 | 54.11±0.77 | 53.15±0.10 | 53.27±0.51 |
| 34 – 36 | 53.28±0.23 | 53.85±0.68 | 54.25±0.02 | 53.22±0.04 | 53.42±0.92 | 52.94±0.92 | 53.38±0.97 |
| 36 – 38 | 53.74±0.24 | 53.46±0.67 | 54.04±0.38 | 53.42±0.23 | 53.91±0.10 | 53.51±0.41 | 53.91±0.52 |
| Mean | 52.03±0.61 | 52.17±0.54 | 53.15±0.51 | 52.30±0.52 | 52.68±0.56 | 52.32±0.42 | 52.26±0.51 |

The mean values in same row with different superscripts differ significantly ($P< 0.05$)

egg weight did not differ significantly during entire experimental period among the different treatment groups (Table 7). Cumulative mean of egg weight of different dietary garlic and onion powder treatment groups did not differ significantly when compared to control diet. Present findings are in consistent agreement with those found by Canogullari *et al.* (2009) who demonstrated that egg weight did not change when laying hens fed ration containing 1% garlic powder. It can be concluded that supplementation of GP and OP improved production performance of layers.

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