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# Effect of ginger (*Zingiber officinale*) powder supplementation on growth performance of commercial broilers under field conditions

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**Abstract**

**Effect of ginger (*Zingiber officinale*) powder supplementation @ 250 ($G_1$), 500 ($G_2$) and 750 ($G_3$) g/q in the feed of broilers was studied in deep liter system. The trials were conducted in three villages of district Kangra of Himachal Pradesh on day-old commercial broilers upto 42 days of age. Each treatment had 50 day-old broiler chicks and a parallel control group was maintained in each treatment. The gain in weight was 16.69, 35.10 and 24.60 percent higher in $G_1$, $G_2$ and $G_3$, as compared to their respective controls. The supplementation resulted in decrease in feed consumption. The supplementation decreased mortality by 50 percent in all the treatments. The $G_1$, $G_2$ and $G_3$ treatments showed 21.91, 34.04 and 17.71 % better feed conversion ratio when compared to their respective controls. It was concluded that ginger powder could be used @ 500g/q of feed to increase the growth performance of broilers.**

**Key words:** Ginger, broilers, feed conversion ratio, biological performance.

## Introduction

The awareness of consumer about residual effect of chemical growth promoters necessitates the use of alternative additives. The meat and egg industry has to compete at global level in post WTO scenario. Use of antibiotics as growth promoters has been banned by European Union from March 2006. So, it has become need of the hour to produce drug/chemical free products. At the same time, we cannot afford to compromise with the production level because of increasing demand of animal products due to increasing awareness of consumer regarding the importance of animal protein and increasing population. So the poultry industry is eagerly looking for some suitable products, which could be used as replacements of chemicals or synthetic growth enhancers, without affecting the expenditure involved in this entrepreneurship. The herbs or spices could be one of the alternatives. The products so produced are likely to fetch more prices because of being free from chemicals. The herbs have multiple functions besides increasing the flavour and shelf-life of the product. In Himachal Pradesh annual ginger production was 14570 MT in 2005-06 (Spice Board 2006) and it is available in every household because it is being used as a kitchen spice. So the present experiment was planned with the objective to assess the effect of use of different levels of ginger powder supplementation on growth performance of commercial broilers under field conditions.

## Materials and Methods

A total of 300 (Nos.) day-old broiler chicks of Hubbord strain were randomly divided into 6 groups of 50 birds each and were reared in deep litter system. The experiment was conducted in a project under women empowerment scheme of Govt. of India, whereby different groups of women in different selected villages of district Kangra of Himachal Pradesh were trained to rear

broilers upto 42 days of age. The trials were conducted in three different villages with three levels of ginger powder supplementation i.e. 250 ($G_1$), 500 ($G_2$) and 750 ($G_3$) g/q of feed. The feeds were formulated as per BIS (1992) specifications. The physical and chemical composition of feeds is presented in table 1 and 2, respectively. The formulated feeds were analysed for proximate principles by following AOAC (1985) method and the ME was calculated as per Lodhi *et al.* (1976). Because the three-supplementation levels were studied at different sites, so parallel control groups were also maintained with each supplementation level. The feed consumed and body weight was recorded at 4th and 6th week of age. Mortality was recorded daily. Gain in body weight during both the phases and mortality % was worked out. The data were analysed statistically as per the method described by Snedecor and Cochran (1967).

## Results and Discussion

**Biological performance during starter phase**

The initial body weight, weight at 4th week of age, feed intake, gain in weight, feed conversion ratio and mortality is given in table 3. The initial body weights of chicks were not significantly different because they were divided into two groups at each location in such a way that both the groups had similar average body weights. Because all the three dose levels were tested at different locations, the comparison across the treatments was not possible, owing to different environmental and physical conditions. During the starter phase, the chicks of $G_2$ treatment showed significantly ($P< 0.001$) higher average body weight than that of its control, whereas the weights of other two treatment groups did not differ significantly from their controls. The gain in weights of $G_1$ and $G_2$ were significantly ($P< 0.05$) higher than their respective controls, whereas gain in weight of $G_3$ was numerically higher than its control but did not reach a significant level, which could be because of higher standard errors. Significantly higher gain in weight in $G_1$ and $G_2$ indicates that the ginger powder exerted its effects at 250 and 500 g/q supplementation during starter phase. The statistical tests for significance could not be applied on feed intake data, because all the 50 birds were reared in one half of the room in deep litter system and so there was only one value of feed intake. However, feed intake of all the experimental chicks was lower than their respective controls. Sood (2007) has also reported a lower feed intake in chicks receiving 250, 500 and 750 g/q ginger powder in their feed as compared to the chicks receiving unsupplemented feed. The FCR of the treatment groups was significantly ($P< 0.05$) better than their respective controls, which could be attributed to lower feed intake and significantly higher gain in weight in $G_1$ and $G_2$ and, lower feed intake in $G_3$ treatment. These findings of FCR values corroborated with that reported by Sood (2007), who also reported significantly better FCR in ginger supplemented groups than the negative and even the positive (antibiotic supplemented group) control.

**Biological performance during finisher phase**

The final body weight of chicks of all the treatments was significantly ($P< 0.001$) higher than that of their respective controls. The gain in weight of $G_3$ treatment did not differ significantly from its control whereas the gain in weight of chicks of $G_1$ and $G_2$ were significantly ($P< 0.05$) higher than their controls. Although statistics could not be applied to the feed intake

**Table 1. Per cent composition of experimental feeds for starter phase**

| Ingredients parts/100kg | Starter feeds | | | | Finisher feeds | | | |
|---|---|---|---|---|---|---|---|---|
| | Control | $G_1$ | $G_2$ | $G_3$ | Control | $G_1$ | $G_2$ | $G_3$ |
| Maize | 40.0 | 40.0 | 40.0 | 40.0 | 48 | 48.0 | 48.0 | 48.0 |
| Groundnut cake | 12.00 | 12.00 | 12.00 | 12.00 | 11.00 | 11.00 | 11.00 | 11.00 |
| Sunflower cake | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| Mustard cake | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| De-oiled rice bran | 11.00 | 11.00 | 11.00 | 11.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| Soya flakes | 13.00 | 13.00 | 13.00 | 13.00 | 12.00 | 12.00 | 12.00 | 12.00 |
| Fish meal | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| Molasses | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| Di calcium phosphate | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Lime powder | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Bentonite | 0.75 | 0.50 | 0.25 | --- | 0.75 | 0.50 | 0.25 | --- |
| Premix* | 0.250 | 0.250 | 0.250 | 0.250 | 0.250 | 0.250 | 0.250 | 0.250 |
| Ginger powder | --- | 0.25 | 0.50 | 0.75 | --- | 0.25 | 0.50 | 0.75 |

$G_1$: ginger powder @ 250g/q, $G_2$: ginger powder @ 500g/q, $G_3$: ginger powder @ 750g/q

Composition of premix:-

1) Merivite $AB_2 D_3$ K: 25g (Vit.A-82,500IU, Vit. $B_2$-52 mg, Vit. $D_3$-12000 IU, Vit. K- 10 mg, Ca-166 mg, $PO_4$-395 mg/g)
2) Nicomix BE: 25g (Vit. $B_1$- 4mg, Vit.$B_6$-8mg, Vit.$B_{12}$-40 g, Niacin-60 mg, Calcium pentothenate-40mg, Vit. E-40 mg/g)
3) Trace minerals: 100g (Ferric oxide-2g, Copper sulphate-2g, Ferrous sulphate-10g, Zn sulphate-0.6g, Di calciumphosphate-53.65g, Manganese sulphate-2.5g, Pottasium iodide-2.5g, Sodium thiosulphate-0.75g, Zn oxide-1g)
4) Choline chloride: 100g

data for the reasons explained previously, the feed intake of the experimental birds during this phase was also numerically lower than their controls. Sood (2007) reported a lower feed intake in $G_2$ treatment but higher in $G_1$ and $G_3$ treatments than the control. Significantly ($P<0.05$) better FCR of $G_1$ and $G_2$ during this phase could be because of significantly higher gain in weights of these chicks and lower feed intake. No significant difference of FCR of $G_3$ chicks from its control indicated that the chicks of this group did not perform well during this phase. Sood (2007) reported no difference in FCR of ginger supplemented chicks of all the three treatments during finisher phase. The differences could be because of the differences in rearing conditions.

**Overall biological performance**

The results revealed that the ginger powder supplementation at all the levels resulted in overall significantly ($P< 0.001$) higher gain in weight compared to their respective controls. Because the comparisons across the treatments were not possible,

**Table 2. Chemical composition of experimental feeds (percent on dry matter basis)**

| Ingredients parts/100kg | Starter feeds | | | | Finisher feeds | | | |
|---|---|---|---|---|---|---|---|---|
| | Control | $G_1$ | $G_2$ | $G_3$ | Control | $G_1$ | $G_2$ | $G_3$ |
| Dry matter (DM) | 88.75 | 91.90 | 91.45 | 91.25 | 84.4 | 88.80 | 88.40 | 88.10 |
| Crude protein (CP) | 20.66 | 20.56 | 20.34 | 20.23 | 18.93 | 18.92 | 18.89 | 18.82 |
| Crude fibre (CF) | 6.05 | 6.50 | 6.00 | 7.00 | 6.31 | 6.00 | 6.02 | 6.12 |
| Ether extract (EE) | 3.00 | 2.73 | 2.71 | 2.98 | 3.89 | 4.87 | 4.02 | 4.78 |
| Total ash (TA) | 9.00 | 8.90 | 8.70 | 8.80 | 8.80 | 7.80 | 8.80 | 9.10 |
| Nitrogen free extract (NFE) | 61.30 | 61.34 | 62.25 | 60.99 | 62.07 | 62.41 | 62.29 | 61.18 |
| Acid insoluble ash (AIA) | 4.90 | 3.30 | 3.90 | 4.90 | 3.20 | 3.30 | 2.80 | 2.50 |
| Calcium (Ca) | 1.53 | 2.36 | 2.06 | 2.21 | 1.84 | 2.44 | 2.39 | 2.41 |
| Phosphorous (P) | 0.53 | 0.54 | 0.52 | 0.50 | 0.46 | 0.49 | 0.48 | 0.49 |
| Metabolisable energy (ME: Kcal/kg)* | 2894 | 2869 | 2893 | 2868 | 2928 | 3012 | 2944 | 2968 |
| ME:CP | 1:140 | 1:140 | 1:142 | 1:141 | 1:155 | 1:159 | 1:156 | 1:158 |

$G_1$: ginger powder @ 250g/q, $G_2$: ginger powder @ 500g/q, $G_3$: ginger powder @ 750g/q
*Calculated value
Each value is the average of duplicate determination

they were compared on the basis of % change in gain in weight. The gain in weight of $G_1$, $G_2$ and $G_3$ were 16.69, 35.1 and 24.60% higher than their respective controls. The total feed consumption of ginger supplemented chicks was lower (numerically) than their controls because of lower intake in both the phases. Sood (2007) also reported significantly ($P< 0.05$) less feed consumption by chicks receiving ginger powder at the same levels as in the present experiment. Pungent taste of ginger might be the cause of less feed consumption as reported by Sood (2007) that the feed intake decreased with the increase in level of supplementation. Significantly ($P< 0.05$) higher gain in weight despite less feed consumption indicated that the gain in weight were not governed through higher intake but could be because of anti-inflammatory affect of ginger on the intestinal tract (Moscolo *et al.*, 1998; Kiuchi *et al.*, 1993; Flynn *et al.*, 1986), thereby increasing the availability of nutrients and/or its antioxidant action (Jeyakumar *et al.*, 1999). The ginger supplementation decreased the mortality by 50 percent in all the treatments. The increased survivability could be attributed to the antimicrobial (Srinivasan and Sambaiah, 2001, James *et al.*, 1999) analgesic, antipyretic (Mascolo *et al.*, 1998) and antioxidant (Zhang *et al.*, 2009; Kikuzaki and Nakatani, 1993) activities of ginger. The overall FCR of all the supplemented chicks was significantly ($P< 0.001$) better as compared to their respective controls. Because no comparison was possible across the treatments, so the FCR of $G_1$, $G_2$ and $G_3$ were

**Table 3. Biological performance of commercial broilers offered diets supplemented with ginger powder**

| S. No. | Particular | $G_1$ | | | $G_2$ | | | $G_3$ | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Control | Experiment | P | Control | Experiment | P | Control | Experiment | P |
| 1. | Initial body wt. (g) | 49.67 ± 0.52 | 50 ± 0.45 | NS | 50.81 ± 0.54 | 51.25 ± 0.61 | NS | 50.00 ± 0.36 | 50.00 ± 0.48 | NS |
| **Starter phase** | | | | | | | | | | |
| 2. | Wt. at 4th week (g) | 816.84 ±14.31 | 879.74 ±18.71 | NS | 563.64 ± 22.45 | 692.60 ± 24.67 | ** | 1020.00 ± 48.99 | 1190.00 ± 66.99 | NS |
| 3. | GIW (g) | 783.68 ± 11.37 | 829.74 ± 18.71 | * | 510.00 ± 24.49 | 642.0 ± 24.67 | ** | 970.00 ± 48.99 | 1140.00 ± 66.99 | NS |
| 4. | Feed intake (g) | 1120 | 1028 | | 1175 | 1025 | | 1210 | 1150 | -- |
| 5. | FCR | 1.47 ± 0.04 | 1.26 ± 0.05 | * | 2.35 ± 0.11 | 1.61 ± 0.06 | *** | 1.28 ± 0.07 | 1.04 ± 0.07 | * |
| **Finisher phase** | | | | | | | | | | |
| 6. | Final body wt. (g) | 1063.00 ± 20.72 | 1255.00 ± 23.20 | *** | 1030.00 ± 26.03 | 1362.00 ± 47.347 | *** | 1580.00 ± 38.15 | 1830.00 ± 51.75 | ** |
| 7. | GIW | 224.00 ± 17.71 | 413.00 ± 42.97 | *** | 470.00 ± 44.84 | 670.00 ± 37.30 | * | 560.00 ± 63.16 | 640.00 ± 68.23 | NS |
| 8. | Feed intake (g) | 1427 | 1300 | | 1570 | 1390 | | 1450 | 1390 | -- |
| 9. | FCR | 6.74 ± 0.56 | 3.54 ± 0.45 | ** | 3.77 ± 0.53 | 2.13 ± 0.12 | * | 2.84 ± 0.26 | 2.39 ± 0.24 | NS |
| **Overall** | | | | | | | | | | |
| 10. | GIW (g) | 1021.6 ± 19.89 | 1192.10 ±20.33 | *** | 980.00 ± 26.03 | 1330.00 ± 48.96 | *** | 1534.00 ± 36.82 | 1780.00 ± 51.75 | ** |
| 11. | Feed consumed (g) | 2547 | 2328 | -- | 2745 | 2415 | -- | 2660 | 2540 | -- |
| 12. | Percent change in FCR | -- | -21.91 | -- | -- | -34.04 | -- | -- | -17.71 | -- |
| 13. | Mortality (%) | 2 | 1 | -- | 2 | 1 | -- | 4 | 2 | -- |

$G_1$: ginger powder @ 250g/q, $G_2$: ginger powder @ 500g/q, $G_3$: ginger powder @ 750g/q.
Wt.: body weight, GIW: gain in weight, FCR: feed conversion ratio.
* = P< 0.05, ** = P< 0.001, *** = P< 0.0001

compared on the basis of percent improvement in FCR taking FCR of the respective control as base line. The chicks of $G_1$, $G_2$ and $G_3$ groups had 21.91, 34.04 and 17.71 % better FCR, respectively, when compared to their controls. So out of the three supplementation levels, 500g ginger powder per quintal feed was the best level, followed by 250g and 750 g. So on the basis of overall biological performance, it could be concluded that the ginger powder can be used @ 500g/q to increase the production performance of broilers and hence the profits of broiler industry.

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## References

AOAC 1985. *Official Methods of Analysis*. Association of Official Analytical Chemists, Arlington VA and USA **24**: 868-78.

BIS 1992. Bureau of Indian Standards. Poultry Feed Specification. Manas Bhavan Bhadur Shah Zafar Marg, New Delhi.

Flynn D, Rafferty M and Boctor A. 1986. Inhibition of Human Neutrophil 5-lipoxygenase activity by gingerdione, shogol, capsaicin and related pungent compounds. Prostglandins Leukotrienes Medicine **24**: 195-98.

James ME, Nannapaneni R and Johnson MG. 1999. Identification and characterization of two bacteriocin producing bacteria isolated from garlic and ginger root. J. Food Prot. **62**: 899-904.

Jeyakumar SM Nalini N and Venugopal M 1999. Antioxidant activity of ginger *(Zingiber officinale* Roscoe) in rats fed a high fat diet. Medical Sci. Res. **27**: 341-44.

Kikuzaki H and Nakatani N 1993. Antioxidant effect of some ginger constituents. J. Food Sci. **58**: 1407-10.

Kiuchi F, Goto Y, Sugimoto N, Akao N, Kondo K and Tsuda Y 1993. Inhibitors of prostaglandin biosynthesis from ginger. Chem. Pharm. Bull. **30**: 754-57.

Lodhi GN, Singh D and Ichoponani JS 1976. Variation in nutrient content of feeding stuff rich in protein and reassessment of the chemical methods of metabolisable energy estimation. J. Agric. Sci. **86**: 293-303.

Mascolo N, Jain R, Jain SC and Capasso F 1998. Ethnopharmacologic investigation of ginger (*Zingiber officinale*). J. Ethnopharmacol. **27**: 129-40.

Snedecor G and Cocharn WG 1967. *Statistical methods*. 6th Ed.. Oxford and IBH.

Sood S 2007. Use of some herbs as substitute of antibiotic growth promoters in broiler rations. M V Sc Thesis. CSK Himchal Pradesh Krishi Vishvavidyalaya, Palampur, (unpublished).

Spice Board 2006. NABARD'S Model Bankable Projects. http://www.nabard.org/modelbankprojects/ginger.asp

Srinivasan K and Sambaiah K 2001. The effect of spices on cholesterol and alpha hydroxylase activity and on serum and hepatic cholesterol levels in the rat. Intl. J. Nutr. Res. **61**: 364-69.

Zhang GF, Yang ZB, Yang WR Jiang SZ and Gai GS 2009. Effect of ginger root (*Zingiber officinale*) processed to different particle sizes on growth performance, antioxidant status and serum metabolites of broiler chickens. Poult Sci. **88**: 2159-66.