EFFECT OF GARLIC *(ALLIUM SATIVUM)* AND GINGER *(ZINGIBER OFFICINALE)* AS FEED ADDITIVES ON BLOOD PROFILE AND BROILER PERFORMANCE

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ABSTRACT

This study was undertaken to investigate the effect of incorporating garlic and ginger powder, as a growth promoter in broiler feed . 240 day-old commercial broiler chicks (Cobb-400) were divided equally into four groups of 60 birds each, and were assigned to four isocaloric isonutritive diets, viz., Diet-I basal control diet without additives, Diet-II, basal diet + 1 % garlic, Diet-III, basal diet + 1 % ginger and Diet-IV, basal diet + mixture of 1 % garlic and 1 % ginger. The experiment was conducted in three replicates each of 20 birds. Feed and water were offered *ad libitum* . The starter and finisher diets were given to birds from 1 to 28 and 29 to 42 days of age, respectively. Growth performance parameters and blood parameters were measured. Broilers fed Diet - IV had significantly ($P<0.05$) increased feed intake. Body weight, body weight gain and efficiency of feed utilization of birds were superior with Diet-III. Dressing percentage showed no significant difference between the various dietary treatments. All three different dietary treatments significantly ($P<0.05$) suppressed haemoglobin and packed cell volume, and increased total erythrocytes and total leucocytes counts as compared to control diet, but the values of all were within normal range. It was thus concluded that the incorporation of garlic and ginger as feed additives at 1 % level significantly enhanced growth performance of broiler chicks without side effects as detected by normal blood profile.

KEY WORDS: Garlic and Ginger, Broiler Performance, Haematology.

INTRODUCTION

Feed additives are nutritive and non-nutritive substances that are included in poultry feed such as antibiotics, enzymes, antioxidants, pellet-binders, antifungal, coloured pigments and flavouring agents. Feed additives are generally used to improve feed intake and to increase the growth rate in broilers (Fadlalla *et al.*, 2010; Bali *et al.*, 2011; Abouelfetouh and Moussa, 2012 and Quereshi *et al*., 2012). Garlic is well known as a spice and herbal medicine for the prevention and treatment of a variety of diseases ranging from infections to heart diseases (Javandel *et al.*, 2008; Khan *et al*., 2007). Moreover, Adibmoradi *et al.* (2006) reported that garlic possess antimicrobial activity also. Garlic and ginger are considered to possess antibiotic, anticancer, antioxidant, immune-modulatory, anti-inflammatory, hypoglycemic and cardiovascular protecting effects (Reuter *et al.*, 1996).Qureshi *et al.* (1983) concluded that garlic has the tendency to lower serum and liver cholesterol. Singh *et al.* (2014), reported significant increase in body weight of broilers, decreased feed consumption, better FCR and significant reduction in serum cholesterol. Tekeli *et al.* (2011) demonstrated the positive effects of herbal supplements on production performance and carcass quality. Demir *et al*. (2003) reported that garlic can improve productive performance of broiler chicks. Garlic has been used for about 50 years as antibiotic growth promoter and to enhance growth performance in poultry and swine (Dibner and Richards, 2005; Demir *et al.*, 2008 and Shamsudden and Jagdeeswaran, 2013).The objectives of this study was to investigate the effects of supplementing garlic and ginger in broiler rations on some production aspects such as growth rate, feed efficiency, carcass composition and blood profile in broiler chicks.

MATERIALS AND METHODS

The experiment was conducted at Modern Poultry Farm, Mangrol, Junagadh (Gujarat, India). A total of 240 day-old chicks of the commercial broiler strain with average body weight 40 g (Cobb-400) were randomly and equally allocated into one of four treatments of three replicates each and replicate consisted of 20 broilers. From day 1 to 28, the broilers were fed a starter diet followed by a finisher diet between days 29 and 42.

The four isocaloric isonutritive dietary treatments used were: Diet - I a control basal diet as per ICAR (1998) , Diet - II, basal diet + 1 % garlic powder, Diet - III, basal diet + 1 % ginger powder and Diet - IV, basal diet + plant premix (1 % garlic + 1 % ginger). The garlic and ginger were purchased from the local market as a readymade powder and the experimental diets were prepared. Feed and water were provided *ad libitum*. Continuous light was supplemented throughout the experimental period.

The Growth parameters were recorded weekly, which include feed intake, live body weight, weight gain and feed conversion ratio. Blood samples (2 ml) were collected from the wing vein in anticoagulant vial from three birds of each treatment on 42nd day for evaluation of the haematological parameters, viz., Hb (hemoglobin), PCV (packed cell volume), TEC (total erythrocyte count) and TLC (total leukocyte count) by automatic hematology analyzer (BC-Vet 2800). The data was analyzed statistically using complete randomized design (CRD) as per Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

The effect of garlic and ginger on the performance of broilers chicks are presented in Table 1. There were significant ($P < 0.05$) differences in the net weight and weight gain of the birds among the four treatments. Birds fed garlic and ginger supplemented diets (D-II and D-III) recorded significantly ($P < 0.05$) higher net body weight and body weight gain. The improvement in weight achieved by ginger and garlic supplementation over the control indicates that they have great impact on the growth of the birds. This improvement may be due to improved gut environment and microflora achieved with garlic and ginger supplementation. This effect is attributed to the fact that the susceptibility of pathogenic gram positive bacteria to the antibacterial components of garlic and ginger are higher than that of the physiological desirable intestinal bacteria (Reeds *et al.*, 1993). This observation is in agreement with the findings of Shi *et al.* (1999) and Javandel *et al*. (2008). However, this observation contradicts the reports of Omage *et al.* (2007), Ademola *et al.* (2009)

Table 1: Effect of garlic, ginger and their mixture on performance of broiler chicks

Performance parameters	Treatments (n=20)			
	Control (D-I)	Garlic (1%) (D-II)	Ginger (1%) (D-III)	Garlic (1%) + Ginger (1%) (D-IV)
Body Weight (g/bird)	1646.68^{c} ±1.15	1689.32^{b} ±52.88	1758.89^{a} ±38.06	1638.26^{c} ±59.01
Feed Intake (g/bird)	3270.56^{b} ±54.48	3259.12^{b} ±81.83	3367.77^{a} ±136.43	3395.61^{a} ±155.74
Body Weight Gain (g/bird)	1606.7^{c} ±1.83	1649.17^{b} ±53.08	1724.17^{a} ±33.78	1598.36^{c} ±59.26
FCR (kg/kg)	1.90^{b}±0.02	1.87^{b}±0.06	1.84^{b}±0.03	1.99^{a}±0.01

Means bearing different superscripts in a row differ significantly ($P<0.05$)

and Horton *et al.* (1991) who reported that the inclusion of ginger and garlic did not improve the weight gain of broilers.

There was significantly ($P < 0.05$) higher feed consumption of the birds in the mixture of garlic and ginger treated group (D-IV) followed by ginger alone (D-III). The inclusion of garlic as a sole agent (D-II) numerically reduced the feed intake of the birds. Garlic has a pungent odour that can adversely affect feed intake. This suggests that it is the organoleptic properties of garlic that are responsible for decreased feed intake (Cullen *et al.*, 2005). This is of particular importance to the birds as its sense of smell is heavily implicated in feed intake like other monogastric animals (Mellor, 2000).

There was no significant difference in the feed conversion ratio between D-I, D-II and D-III, however, ginger- and garlic-supplemented diets (D-IV) recorded superior feed conversion ratio than other three diets. The improved feed efficiency observed in birds fed garlic and ginger supplemented diets suggests that the antimicrobial action of garlic and ginger may be sufficient to inhibit microbial fermentation (Ankri and Mirelman, 1999). According to Reeds et al. (1993) in rapidly growing young animals, gastro-intestinal tract and skeletal musculature has greater capacity to draw and deposit nutrients efficiently from the same limited supply of nutrients compare to older animals. 6% of net energy in animal diet is lost due to glucose utilization by bacteria in small intestine. Bacterial requirements for amino acids are similar to the requirements by the animal of the same amino acids. When garlic and ginger were added to the diet, they have sparing effect, i.e. more nutrient were diverted for skeletal and muscular growth. Thus, feed conversion efficiency was improved.

Table 2: Hematological profile of experimental birds

Parameters	Treatments (n=20)			
	Control (D-I)	Garlic (1%) (D-II)	Ginger (1%) (D-III)	Garlic (1%) + Ginger (1%) (D-IV)
Hb (g/dl)	$13.60^{a} \pm 0.87$	$12.83^{b} \pm 0.97$	$12.83^{b} \pm 0.29$	$13.00^{b} \pm 0.60$
TEC ($\times 10^{6}/\mu l$)	$2.93^{a} \pm 0.21$	$2.74^{b} \pm 0.18$	$2.77^{b} \pm 0.07$	$2.74^{b} \pm 0.14$
TLC ($\times 10^{3}/\mu l$)	$23.60^{b} \pm 0.30$	$23.86^{a} \pm 0.25$	$23.84^{a} \pm 0.02$	$23.85^{a} \pm 0.16$
PCV (%)	$37.76^{a} \pm 2.70$	$35.60^{b} \pm 2.67$	$35.60^{b} \pm 1.1$	$35.76^{b} \pm 1.96$

Mean values bearing different superscripts in a raw differ significantly ($P<0.05$)

The average values of hematological parameters are presented in Table 2. The statistical analysis of Hb and PCV values showed non-significant differences among D-II, D-III and D-IV groups, but all had significantly ($P<0.05$) lower values than D-I. Though there was negative effect of garlic and ginger supplementation on Hb and PCV values, it was within normal range. Result of statistical analysis for TEC and TLC values also showed non-significant differences among the dietary supplementation groups, i.e. D-II, D-III and D-IV, but all had significantly ($P< 0.05$) lower TEC and higher TLC value than control group (D-I). In all treatment groups these were within normal range, suggesting that garlic and ginger did not affect TEC and TLC values much. The results of present study are supported by Ademola *et al.* (2009), who concluded that garlic, ginger and their mixture when supplemented to broiler diet had significant ($P<0.05$) effect on the hematological indices of broiler chickens.

It is concluded that the garlic and ginger as feed additives at 1 % level either alone or in combination has significant growth performance enhancing effect in broiler chicks without any side effects as detected by normal physiological blood profile.

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