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Effects of adding ginseng roots to diet on productive traits of Ross-308 broilers exposed to heat stress

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ABSTRACT

The current study was carried out on a poultry farm that belongs the Animal Production Department, College of Agriculture, University of Kufa, Iraq for a period from 10 September through 14 October 2020 in 5 weeks. In this study, we assessed the effects of adding antioxidant (ascorbic acid) and red ginseng root powder (*Panax*) in reducing the effects of heat stress. The experiment included 240 unsexed Ross-308 cross chicks, one-day old, with an average initial weight of 40 g. The chicks were divided into 4 treatments encompassing 60 chicks per treatment with three replications (each 20 chick). The treatments including control diet fed on standard ration (T_1), diets with the added red ginseng root powder (*Panax*) at 2 g kg^{-1} feed (T_2), 4 g kg^{-1} (T_3) and 6 g kg^{-1} (T_4). The chicks were fed on starter diet for the first 21 days and a final diet from 22^{nd} to 35^{th} days. The results showed that T_4 were significantly ($p < 0.05$) superior to the control treatment by recording the highest average live body weight, total weight gain, and total feed consumption rate as well as the lowest value of feed conversion factor.

Keywords: Antioxidants, Poultry, Nutrition, Broiler, *Panax* spp.
Article type: Research Article.

INTRODUCTION

Poultry nutrition specialists have a great interest in the use of medicinal plants as food additives to poultry diet. It is believed that such plants can be effective in reducing the negative effects of heat stress, improving the productive and physiological qualities of poultry during the summer months in the tropics (Awais *et al.* 2018; Almrsomi *et al.* 2021, Chauhan *et al.* 2021). Ginseng is one of the most important medicinal plants used as a tonic due to its antioxidant contents, and stimulating the immune system. The roots are the main used part of ginseng, however other parts can also be used, including the leaves and flowers (Van Duy *et al.* 2016; Kellogg *et al.* 2019; Tashtemirova 2020). Ginseng contains various active compounds including saponins, ginsenosides, essential oils, poly acetyl alcohol, peptides, vitamins, and sugars (Kim & In 2010; Sun 2011). Therefore, this study aims to evaluate the effect of adding red ginseng root powder to broiler diets under heat stress conditions, and how this would affect production performance of treated chicks.

MATERIALS AND METHODS

This study was carried out in a poultry farm belongs to the Department of Animal Production, College of Agriculture, University of Kufa, Iraq from October 10, 2020 through November 15, 2020 (5 weeks). Treatments were added antioxidant (ascorbic acid) and/or red ginseng root powder (*Panax*) to the chicks diet in order to reduce the effects of heat stress. The experiment included 240 unsexed Ross-308 cross chicks, one-day old, with an average initial weight of 40 g obtained from Al-Anwar hatchery in Muradia Province of Babil. The chicks were divided into 4 treatments, 60 chicks each with 3 replications (20 chicks in each replicate). The treatments were as feed additives (Table 1) including control without addition (T_1), fed with the added red ginseng root powder (*Panax*) to diets at 2 g kg^{-1} (T_2), 4 g kg^{-1} feed (T_3) or 6 g kg^{-1} feed (T_4).

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Table1. Feed materials (%) used in the experiment.

Feed material	Starter diet (%)	Finisher diet (%)
Yellow corn meal	54.00	58.5
Soybean grain	36.00	29.00
Crushed wheat	5.00	5.00
Premix*	2.50	2.50
Corn oil	1.00	3.50
Di-calcium phosphate**	0.1	0.1
Limestone	1.1	1.1
Salt	0.3	0.3
Total	100	100
Energy (Kcal kg^{-1})	2991	3199.5
Crude protein (%)	23.04	20.08
Total calcium (%)	1.101	1.085
Available phosphorus (%)	0.75	0.72
Raw fibre (%)		
Sistine (%)	0.35	0.31
Methionine + (%)	0.49	0.46
Raw protein/ energy ratio	129.8	159.33

Note: *Premix (produced by Provemi, Jordan) contains ready-made energy 4900 kcal kg^{-1}, raw protein 18%, calcium 15-19%, lysine 9.4%, phosphorus 6.8%, sodium 4.8%, chlorine 5.8%, methionine 7.8%, methionine + cystine 7.8%, threonine 0.55% and also a mixture of trace vitamins and minerals required for the birds. **Contains calcium diphosphate (22% inorganic calcium and 18% inorganic phosphorus).

Statistical analysis

The data are presented in tables as mean ± standard deviation, analysed by SPSS (version 21). Significant occurred among means, was set at the level of $p < 0.05$ by LSD (George and Mallery 2011).

RESULTS AND DISCUSSION

It is evident from the results in Table 2 that after five weeks of rearing the chicks, adding ginseng powder to the ration at a rate of 6 g kg^{-1} ration (T_4) led to the highest values in the average body weight (2113.25 g) and the total weight gain rate (2073.25 g) with a slight difference from the treatments T_3 (4 g kg^{-1}) and T_2 (2 g kg^{-1}), but differed significantly ($p < 0.05$) from the control treatment (T_1), which recorded 2014.65 g and 1974.65 g, respectively.

On the other hand, the results showed that the highest total feed consumption rate was 3122.92 g $bird^{-1}$ in T4, which differed significantly from its value of 3038.92 g $bird^{-1}$ in T_2, however, did not differ significantly from T_3 and T_1. Similarly, the total feed conversion ratio (FCR) differed significantly between the different treatments ($p < 0.05$). In general, T_4 recorded the lowest value of the FCR (1.50) with a significant difference from T_1 (1.57), and slightly different from T_3 and T_2. The improvement in the weight of birds fed with ginseng powder added to the diet may be due to the role of the active compounds in the ginseng roots and their effects on elevating metabolic rates and body composition. In addition, ginseng reduces the production of corticosterone hormone and thus works to mitigate the harmful effect of heat stress (Blumentha 2003). The improvement in the rate of weight gain of birds may be due to a rise in the rate of live body weight, which in turn was reflected in the rate of weight gain due to the positive relationship between the rate of live weight and the rate of weight gain (Mashaly *et al.* 2004). The ginseng root powder contains effective compounds, including saponins and flavonoids in general, which increase the metabolic rates and promotes the growth of birds, which is positively reflected in the rate of weight gain (Chung & Choi 2016). Our results are in agreement with previous studies reporting that there was a significant increase in the rate of weight gain when using 600 mg kg^{-1} of the ginseng root powder in broiler diet (Al-Jubouri

2016) or when using ginseng root extract at a concentration of 8% in broiler drinking water under conditions of heat stress (Al-Muslimawi & Ibrahim 2019). The results are also in agreement with those of Yner & Colpan (2021) who reported that using the ginseng root powder in the diet at low rates (225, 150, 75 mg kg^{-1}) did not exhibit a significant rise in the rate of weight gain compared to the control.

Table 2. Effect of ration treated with different level of ginseng roots powder on some productive traits in Ross-308 broiler.

Treatments	Values after 5 weeks of the breeding			
	Live body weight (g)	Total weight gain (g)	Feed Consumption Rate (g)	Feed conversion ratio
T_1 [y]	2014.65± 37.09 [b]	1974. 65 ± 11.54[b]	3106.43 ± 4.00[ab]	1.57 ± 0.00[a]
T_2	2032.88 ± 11.54 [ab]	1992.88 ± 11.54[b]	3038.92 ±14.00[b]	1.52 ± 0.00[ab]
T_3	2034.88 ± 4.06 [ab]	1994.88 ± 4.06[b]	3105.75 ± 31.35 [ab]	1.55 ± 0.01[ab]
T_4	2113.25 ± 7.30[a]	2073.25 ± 7.30[a]	3122.92± 20.35[a]	1.50± 0.01[b]
Significant level	*	*	*	*

Note: [y] T_1 represents control group; T_2, T_3 and T_4 represent 2, 4 and 6 g of ginseng root powder added to each kg of feed, respectively. *Values followed by same letter(s) within a column are not significantly different according Duncan's multiple range tests ($p < 0.05$).

The improvement in the feed conversion ratio in T_4 is probably due to the role of ginseng powder as an antioxidant. The antioxidants have a significant role against free radicals caused by oxidative stress generated by heat stress (Altan *et al.* 2003). The active compounds in ginseng powder increase the secretion of digestive enzymes, reducing the pathogens harmful to the digestive system. These compounds elevate the immune response, which in turn reduces the germs in the gut hence, reserving energy for growth. As the harmful microorganisms transform the digested energy in the intestine for their survival and reproduction, thus reducing such microorganisms results in an elevation in energy and an improvement in the weight gain along with food conversion ratio (Fascina *et al.* 2012). The results agreed with AL-Muslimawi & Ibrahim (2019) who observed a significant improvement in the values of the TCF when using ginseng root extract in the drinking water of heat-stressed birds. No significant effect was observed on the TCF when adding low levels (600 mg kg^{-1}) of ginseng root powder.

CONCLUSION

Findings of this study showed that the addition of ginseng root powder to broiler diet improved the productive characteristics of broiler chickens raised under heat stress conditions. The highest average live body weight, total weight gain, total feed consumption rate, and the lowest value of feed conversion ratio were obtained in chicks fed on ration treated with ginseng root powder at the highest rate (6 g kg^{-1} feed).

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