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Effects of Chinese Medicinal Herbs on Immunological Indexes and Serum Level of Antioxidant Enzymes in Sansui Laying Duck

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Abstract: Chinese Herbal powders Herb Ⅰ and Herb Ⅱ were applied in this study. 300 Sansui laying ducks at 1 day of age were randomly divided into five groups. The control group of ducks were received a basal diet (BD) without herbal additives, the experimental group I, groupie were fed BD added 1%, 1.5% of Herb I, the experimental group III, group IV were fed BD added 1%, 1.5% of Herb II. The results showed that the contents of serum GsH-Px and the serum SOD levels for all groups were inordinately higher than control group ($P < 0.05$). The IgA, IgG, IgM, ALB values and TP contents of four experimental groups had inordinately increased ($P < 0.05$). Suggesting that Chinese medicinal herbs can improve the immunological indexes and serum level of antioxidant enzymes in Sansui laying duck.

Key words: Chinese medicinal herbs, Sansui laying duck, Antioxidant index, Immunized parameters

1. Introduction

Sansui duck is one of the native laying duck breeds, which was listed in "The catalog for Chinese poultry breeds" in 1982. Together with Beijing duck, Shaoxing duck and Gaoyou duck being named as the four laying duck breeds in China, which mainly being distributed in the eastern areas in Guizhou province. Sansui duck has been regarded as a precious indigenous breed due to its tender muscle meat, plentiful amino acid content, low cholesterol, early sexual maturation, strong immunological response ability. In recent year, with the further development of feed industry, some problems have been brought into duck industry. Particularly, some feed additives such as hormones, antibiotics, although improve duck production, harm to human health because of its chemical residual [8]. Alternatively, the herbal medicine additive is a good choice with its natural, versatility, low toxicity, low cost and no-residual. Chinese medicinal herbs (CMH) are nature plants with pharmaceutical activities and have been broadly consumed by humans based on their important biological benefits, such as antimicrobial activity, antioxidant activity and anti-inflammatory activity [5, 6, 10].

There are a lot of reports related to the antioxidant and immunomodulatory activities of Chinese medical herbs in pig, cattle, sheep and chickens [2, 7, 9, 17]. However, a few of articles concerning laying duck could be found. The objective was to measure the effects of herbs on diets of laying dicks. In this study, Chinese herbal additives were used as the substitute to

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antibiotics, Sansui laying ducks were used as experimental animals to check their antioxidant capacity and immune function.

Three hundred Sansui laying ducks at 1 day of age were randomly divided into five groups, each group consisted of three replicates and each replicate had 20 ducks. The control group of ducks were received a basal diet (BD) without any feed additive, the experimental group I was fed BD added 1% of Herb Ⅰ, the experimental group II was fed BD added 1.5% of Herb I, the experimental group III was fed BD added 1% of Herb II, and the experimental groupⅣwas fed BD with 1.5% of Herb II. Herbal feed additives were divided into two components — Herb I: *Astragali Radix*, *Shenqu*, *Citri Reticulatae Pericarpium*, *Glycyrrhizae Radix Rhizoma*, *Dioscoreae Rhizoma*, *Schisandrae Chinensis Fructuse Chinensis Fructus*, *Cinnamomi Cortex*, *Mume Fructus*; Herb II: *Foeniculi Fructus*, *Eucommiae Cortexe Cortex*, *Atractylodis Macrocephalae Rhizoma*, *Hordei Fructus Germinatus*, *Houttuyniae Herbae Herba*, *Crataegi Fructus*, *Citri Reticulatae Pericarpium*, *Zingiberis Rhizoma*. Herb I and Herb II were to be made into powers and adding into basal diets.

The experimental duration was 120 days and rearing environment for all groups were completely the same. Sansui laying duck recipes and nutritional level of the basal diet test are shown in Table 1.

Table 1 The composition and nutritional level of experimental basal diet for Sansui laying duck.

Ingredients	Rate/%	Nutrient levels	Rate/%
Corn	68.00	DM（%）	88.2
Soybean meal	18.00	ME/(MJ/kg)	11.6
Premix	3	CP/%	17
Wheat bran	1.5	Ca/%	1.06
Colze cake	4	P/%	0.88
$CaHPO_4$	2	Met/%	0.31
Powder	3	Lys/%	0.63
NaCl	0.5		
Total	100		

plus Met 100 g/100 kg, Lys 150 g/100 kg, $NaHCO_3$ 300 g/100 kg, Na_2SO_4 150 g/100 kg, trace mineral feed 300 g/100 kg, Poultry complex vitamins 100 g/100 kg, Choline chloride 40 g/100 kg, V_C 50 g/100 kg. Per kg of feed containing V_A 1400 IU, V_D 4000 IU, V_E 45 mg, V_{K5} mg, V_{B1} 4 mg, V_{B2} 8 mg, V_{B6} 8 mg, V_{B12} 0.03 mg, V_{b3} 60 mg, V_{B5} 15 mg, V_{B9} 1.5 mg, V_{B7} 0.2 mg, Choline chloride 550 mg, Fe 100 mg, Cu 12 mg, Mn 110 mg, Zn 90 mg, I 0.5 mg, Se 0.3 mg.

At 120th days of trial period, 20 Sansui duck of each group were randomly selected , and 5ml of blood was collected from vein of wing for measuring the contents of Serum immunoglobulin G (*IgG*), immunoglobulin A (*IgA*), immunoglobulin M (*IgM*), the total protein(TP), and albumin (ALB); the values of superoxide dismutase (SOD), glutathione peroxidase (GSH-Px), and malondialdehyde (MDA) were determined according to the method of enzyme-linked assay (ELISA) using measuring kit from US biotechnology company. The experimental data were analyzed statistically using analysis of variance (ANOVA) technique for Completely Randomized Design (CRD) and statistical significances were recorded.

The parameters representing immunized and antioxidant functions were listed in Table 2, and the different indexes indicating different functions are showed in Fig. 1. Serum total protein levels directly reflect the absorption, synthesis and metabolism of body protein and other conditions, and also to reflect the health of the body's liver function and kidney function. Albumin, immunoglobulins (*IgA*, *IgM*, *IgG*) and other components of the total protein, serum total protein, albumin levels increase, can promote digestion and absorption of pigs, accelerate protein circulating in pigs, enhance their immunity , improve metabolism

and pigs, pig promote growth and development [1, 3, 13]. In the present study, group II, III, IV increased by 10.41%, 8.75%, 9.71% respectively, in content of serum *IgA* compared with the control group ($P < 0.05$), Group I was slightly higher but no difference was detected when compared with control ($P > 0.05$). The *IgG* contents for four groups (I, II, III, IV) increased by 9.25%, 17.98%, 9.07%, 8.99% , respectively compared with the control group ($P < 0.05$). The *IgM* levels for all experimental groups were slightly higher than control group ($P < 0.05$). For the indexes of TP and ALB, group II and group IV were greater on TP than control group ($P < 0.05$). ALB levels for all experimental groups were higher than control group ($P < 0.05$), group II was the highest. These results suggested that the effective components of Chinese herbs can not only increase the immunological indexes in Sansui laying duck, but improve growth of laying duck. Although a few of reports can be found in laying duck, these results are consistent with the reports in chickens [4, 11].

Table 2 The contents of *IgA*、*IgM*、*IgG*、TP、ALB, (g/l) and the levels of GsH-Px, SOD, and MAD in serum (pg/ml) for Sansui laying duck.

Groups	*IgA*	*IgM*	*IgG*	TP	ALB	GsH-Px	SOD	MDA
Control group	1.143±0.044^a	1.756±0.030^a	1.179±0.007^a	27.120±0.764^a	19.261±1.762^a	4.282±0.047^a	3.026±0.034^a	5.784±0.964^b
Group Ⅰ	1.171±0.032^a	1.772±0.028^a	1.288±0.003^b	28.497±1.265^a	20.880±1.263^b	4.396±0.014^b	3.13±0.026^b	5.496±0.234^a
Group II	1.262±0.043^b	1.876±0.032^b	1.391±0.003^b	29.521±1.301^b	22.386±1.616^b	4.395±0.013^b	3.138±0.034^b	5.455±0.272^a
Group III	1.243±0.042^b	1.812±0.051^b	1.286±0.004^b	28.443±1.196^a	22.141±1.783^b	4.288±0.011^a	3.135±0.040^b	5.591±0.184^a
Group IV	1.254±0.046^b	1.781±0.033^a	1.285±0.006^b	29.731±0.859^b	21.667±1.805^b	4.284±0.012^a	3.130±0.025^b	5.590±0.172^a

Note: The same column data marked shoulder adjacent letters indicated significant differences ($P < 0.05$), the same shoulder standard letter said the difference was not significant ($P > 0.05$), the same below.

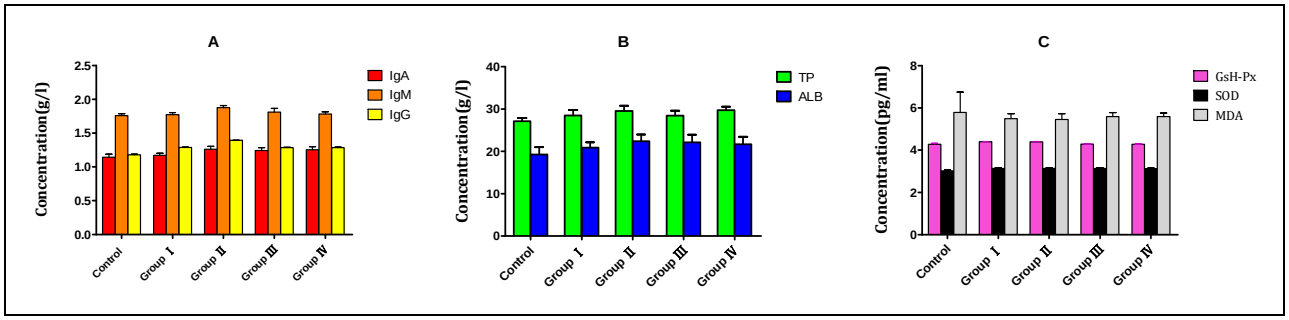

Fig. 1 The changes of concentration of *IgA*, *IgM*, *IgG*, TP, ALB, (g/l) representing immunized indexes and the changes of levels of GsH-Px, SOD, and MAD in serum (pg/ml) representing antioxidant indexes for Sansui laying duck.

Under circumstances of poor antioxidant function status, unsaturated fatty acids in cell membrane will be oxidized, which leads to disruption of normal membrane structure and function, and production performance of animals will be decreased [15]. SOD can catalyze the dismutation of superoxide anion radical generation H_20_2, removing-OH radicals, increased serum total antioxidant effect and reduce serum of MDA, can significantly improve the body's antioxidant function [4]. Liu et al. reported that Chinese herbs can improve SOD activity in broiler when added Ligustrum, Schisandrae Chinensis Fructus, and other herbal additives [12]. Yang, et al. demonstrated that adding *Astragali Radix, Angelicae Sinensis Radix* and other herbs can significantly increase GsH-Px activity and antioxidant capacity in chicks [16]. Qiao et al. reported that Fructus Ligustri Lucidi extract (FLLE) has capability to improve antioxidant function of sheep [14]. But little is known about the functions of Chinese medicinal herbs in laying duck. In current study, GsH-Px contents for group I and group II were higher than control ($P < 0.05$) , but no different for group III and IV compared with the control group ($P > 0.05$). There were significantly increasing on SOD value for

four experimental groups compared with control group ($P < 0.05$). For MDA values, there were a significantly decreasing ($P < 0.05$). This experiment provided a further explanation that antioxidant enzymes such as SOD, GSH and GR present in blood are able to inhibit lipid oxidation of cell membrane and decrease end product (MDA) of cell membrane oxidation in blood.

From these results above, it can be concluded that Chinese medicinal herbs can improve the immunological indexes and serum level of antioxidant enzymes in Sansui laying duck.

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