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Influence of β Glucan and Chicory root extracts on immune system of broiler chickens

A Thesis Presented By

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VI. SUMMARY

Over the last few decades, an over flow of studies is triggered to introduce suitable alternatives for antibiotics. Medicinal plants and natural products are introduced as candidates for use in broiler diets in which their beneficial effects as phyto-genic feed additives have been proven, Such compounds influence poultry productivity and health mainly by stabilization of normal gut microflora, prevention of pathogens colonization, digestive enzymes production and activities improvement, other factors such as vaccination failure, infection by immune suppressive diseases, and abuse of antibiotics can induce immunodeficiency. Utilization of immuno-stimulants is one solution to improve the immunity of animals and to decrease their susceptibility to infectious disease.

The experimental design at this study was 280 one-day old Ross type chicks were obtained from a local hatchery. Chicks were weighed and randomly allocated into seven dietary treatment groups (A-G) on floor pen and kept under hygienic conditions for 5 weeks. Group A: birds were offered non-supplemented basal diets for 42 days and kept as control. Group B: Chicks in this group were fed diets containing 200mg pure β glucan /kg diet for 42 days. Group C: Chicks in this group were fed diets containing 400mg pure β glucan /kg diet for 42 days. Group D: Chicks in this group were fed diets containing 10 gm Chicory root extract/kg diet for 42 days. Group E: Chicks in this group were fed diets containing 30 gm Chicory root extract/kg diet for 42 days. Group F: Chicks in this group were fed diets containing 400mg pure β glucan /kg diet and 30 gm Chicory root extract/kg diet for 42 days. Group G: Chicks in this group were fed

diets containing 200mg pure β glucan /kg diet and 10 gm Chicory root extract/kg diet for 42 days.

The study aimed to determining the effect of dietary supplementation with β glucan and chicory roots extract at different concentrations on growth performance, leucogram, protein profile of broiler chickens in addition monitoring both innate immunity by measuring peripheral mononuclear cells (morphology, phagocytic activity, , nitric oxide production and Lysozyme activity, measuring humeral immune response by measuring antibody titer of ND and AIV vaccine, Detection of Malondialdehyde and Glutathione, and Monitoring the immunomodulatory effect of β glucan and chicory roots extract *in vivo* by challenge test by *E.coli* (protection, monitoring and counting effect).

There was no cell morphological changes have been observed between control group, β glucan and chicory roots extract supplemented diet groups.

There were significant increase in body weight gain in broilers of all groups especially for broilers of group E followed by broilers of group D.

Also there were a significant increase in total leucocytic count in broilers of group B, group D, and group F at 2nd and 4th weeks of age. Also broilers of group showed significant increase in TLC as compared to control group at 4th week of age. Regarding heterophils broilers of group B and that of group F fed showed significant increase in heterophils as compared to control group in 2nd and 4th weeks of age, while broilers of group D showed significant increase in heterophils as compared to control group in 4th week of age only. For lymphocytes, broilers of group B ,group D, and that of group F showed significant increase in lymphocytes of broilers as compared to control group in 2nd and 4th weeks of age, broilers

of group C significantly increase in lymphocytes as compared to control group in 4th week of age only

The values of the protein gram of chicken's fed supplemented diets with β glucan and chicory roots extract, group B, group C, group D, group E, group F and group G did not show any significant change in albumin levels of broilers as compared to control broilers in weeks 1 and 4, group B and group C showed significant higher globulin levels in broilers as compared to control broilers in weeks 1 and 4. Groups B & C showed significant higher globulin levels in broilers as compared to control broilers in all stages of experiment, group D, group E, group F and group G did not show any significant change in globulin levels as compared to control broilers in 1st and 4th weeks.

Regarding phagocytic% There were significant increase in phagocytic % of peripheral blood monocyte cells of broiler chickens in group B at 14th, 21st, 30th and 40th days of age, and in of broiler chickens of group C at 30th day of age, also in broiler chickens in group D and broilers in group 21st day of age, as well as broilers of group F fed on diet and broilers of group G at 21st and 30th days as compared to broilers of control group. And for phagocytic index broiler chickens in group B showed significant increase in phagocytic index as compared to control group at 14th, 21st, 30th and 40th days of age. Also broiler in group C recorded significant increase at 30th day of age as compared to broilers in control group. Broiler chickens in group D & E showed significant increase in phagocytic index as compared to control group at 30th and 40th days of age Broiler chickens in group F showed significant increase in phagocytic index as compared to control group at 21st and 30th days of age, Broiler chickens in group G showed significant increase in phagocytic index as compared to control group at 30th day of age

Regarding NO production, Group B showed significant increase in NO levels of broilers as compared to control broilers in first day post second vac. NDV, first day post first vac. AIV, first day post second vaccination and finally at the end of experiment, while it did not show any significant change as compared to control broilers in first day post first vac. NDV. while group C, group D, group E, group F and group G did not show any significant change in NO levels as compared to control broilers in all stages of experiment .

Lysozyme activity was measured by agarose gel plate lysates assay and the cleared zones diameters were measured, the concentration of lysozyme was obtained from logarithmic curve prepared using standard lysozyme solution. Group B showed significant increase in serum lysozyme compared to control broilers in all stages of experiment. group C, group D and group E showed significant increase in lysozyme of broilers as compared to control broilers at the end of experiment while they did not significantly change their lysozyme as compared to control broilers in first day post first vac. NDV, first day post second vac. NDV, first day post first vac. AIV and first day post second vac. AIV.

The detection of Antibodies Titer to ND and AI was done using Haemagglutination inhibition test (HI), and the results for ND broilers of group B, broilers in group D, and that in broilers in group F had significant increase in Newcastle HI titer as compared to control broilers group in 21st and 35th days of age. While for AIV Broilers of group B the only group showed significant higher AI HI in broilers as compared to control broilers in 21st and 35th days of age.

Malondialdehyde (MDA) and Glutathione (GSH) were measured and the results were: group B, group C and group D significantly increased GSH level of chicks as compared to control chicks, Group E, group F and group G did not show any significant increase in GSH level of chicks as compared to control group while all groups significantly decreased MDA.

After 4 weeks of dietary supplementation with β glucan and chicory the chickens were challenged with multidrug resistant clinically isolated *E. coli* strain at different CFU doses. Clinical symptoms were observed. Interestingly, symptoms of *E. coli* infection was observed on the control chickens at 2-3 days post infection. The symptoms include fever, feather ruffling, weight loss, and diarrhea it was more severe symptoms in control group than β glucan and chicory fed supplemented diet chickens.

The survived chickens were slaughtered, anatomized and spleen, liver, lung and intestine were harvested and also these organs were harvested from the chickens after death. The organs showed some pathological changes in the control group than β glucan and chicory dietary supplemented groups. The numbers of CFU were determined, there was a significant reduction in the presence of *E. coli* count in the spleen, liver and intestine of chickens fed on supplemented ration with β glucan or chicory roots when compared with the control group. Also, there were variations between all groups when compared with each other.