

# **DEDICATION**

TO MY FAMILY WITH LOVE

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## ABSTRACT

This study was undertaken to investigate the effect of including garlic (*Allium Sativum*) powder, whole black seed (*Nigella Sativa*) and garlic + black seed in broilers feed on some aspects of broiler production such as health, production performance, carcass and meat quality, fatty acids and some blood parameters.

Six-hundred day-old commercial broiler chicks of the Hybro strain were used in this experiment. The chicks were divided into three major groups A, B and C of 200 chicks each. Chicks of each major group were weighed and further subdivided into twenty sub-groups of 10 chicks each. The sub-groups of each major group were assigned at random to five experimental diets: 1, 2, 3, 4 and 5 with four replicates each. Sixty, 21 day old broiler chicks, twenty from each of the control (0% garlic, 3% and 6% garlic) fed groups were selected at random and injected with a booster dose of Newcastle Disease Virus vaccine. These birds were used to determine the effect of including garlic powder in the diet of broilers on their immune system.

The same commercial starter ration fed between 1-35 days and the finisher ration fed between 35-49 days were fed to all groups except that they contained either garlic powder, black seed or garlic + black seed at the rates of 0, 3, 6, 9 and 12%. The starter ration contained 25% soybean meal, 65% corn and 10% concentrates. The protein content of the diet was 23.0 g/kg dry matter and energy content was 3040 Kcal/kg in the dry matter which was 89.95 g/kg. The finishing ration was made of 68% corn, 22% soybean meal and 10% concentrates; and contained 20 g/kg crude protein and had an energy value of 3100 Kcal/kg in the dry matter that was 90.14

g/kg.

Feed and water were freely available to all birds at all times till the end of the experiment at 49 days.

The inclusion of herbs (garlic, black seed or garlic + black seed) significantly reduced mortality rate in the treated birds. On overall basis, the treated birds scored lower (7.91%) mortality rate than the control group (14.5%) . Including garlic at 3 and 6% and black seed at 6% rate resulted in the lowest (5.0 %) mortality rate.

The inclusion of black seed and garlic at all rates increased feed intake. Birds on black seed treatment displayed the highest daily feed intake, followed by birds on the garlic treatment. The control birds had the lowest feed consumption value.

Birds on black seed treatment displayed the highest weight gain and those on the garlic treatment recorded the least gain at the end of the trial. Also there was a significant ( $P<0.05$ ) week but not treatment or their interaction effect on feed conversion ratio. Birds on black seed and garlic diets scored the highest feed conversion ratio, followed by birds on the control and black seed + garlic in descending order.

Live body weight, warm carcass weight and the dressing percentage were significantly affected by the treatment but were not affected by the interaction between treatment and level of herb.

There was a highly significant ( $P<0.01$ ) treatment, level and level  $\times$  treatment effects and their interaction on thigh bone and skin weights but not on the other remaining carcass components. None of the sources of variation affected blood or feathers percentages.

The treatment, level and their interactions had highly significant ( $P<0.0001$ ) effect on weights of slaughter by-product. The inclusion of

black seed and garlic significantly increased the weight of the lymphatic organs. Abdominal, intramuscular and subcutaneous fat depots were significantly reduced by the inclusion of garlic followed by black seed + garlic at 3 and 6% levels.

The treatment significantly ( $P < 0.001$ ) affected fiber diameter of muscle *Iliotibialis cranialis*. Birds on control treatment had the thickest muscle fibers followed by the birds on black seed treatment. Birds on the garlic treatment had the thinnest muscle fibers among all treatments.

The chemical composition of the thigh muscle revealed a highly significant effect for all source of variations on the dry matter, protein and fat percentages.

The treatment significantly ( $P > 0.05$ ) affected the sensory attributes of breast muscle. Birds on the garlic treatment scored the highest tenderness, flavor, taste and smell scores, but not juiciness scores.

The microscopic examination of sections of liver, kidneys, spleen, bursa of Fabricius, thymus gland and thigh muscle of the different groups showed normal histological picture in both control and treated groups. The histological picture of lymphatic tissue was also normal, with moderate lymphoid proliferation in the sections of garlic treated group with more lymphoid tissue proliferation in the sections of the black seed treated group compared to the control group.

There were no significant differences between the control and treated groups in the reticular and collagen fibers of the muscle *Iliotibialis Cranialis*.

Serum cholesterol, triglycerides, high density lipoprotein and glucose levels were significantly decreased by treatment, level and their interactions. Inclusion of garlic at 3, 6 and 9% resulted in the lowest

values for serum cholesterol, triglycerides, and high density lipoprotein and glucose levels; followed by black seed +garlic treatment.

The Haemagglutination Inhibition Test (HIT) showed that the maximum anti-body response was seen with the birds of the 3% garlic treatment, followed by the birds of the 6% treatment. With the exception of the initial response, birds of the control treatment scored the minimum antibody levels throughout the experiment. The hemoglobin percentage, red and white blood cells, packed cell volume (PCV) and blood clotting time were significantly affected by all sources of variations. Birds on the garlic treatment had the highest haemoglobin percentage, red blood cells, white blood cells, the packed cell volume (PCV) values and the lowest blood clotting time values, followed by birds on black seed treatment.

The sources of variation, significantly reduced the weight, iodine number and rancidity values of abdominal, subcutaneous and inter-muscular fat depots. The lowest fat and degree of fat saturation values, were scored by birds on garlic and black seed +garlic treatments. The refractive index of the thigh abdominal, subcutaneous and inter-muscular fat depots was not significantly affected by the treatment, rate of inclusion or their interactions.

The fatty acids of the abdominal, subcutaneous and inter-muscular fat depots that were significantly ( $P < 0.001$ ) influenced by the treatment were C14 (*Myristic*), C16 (*Palmitic*), C18:0 (*stearic*), the two monounsaturated fatty acid C16:1 (*Pamitoleic*) and C18:1 (*Oleic*), and the two polyunsaturated fatty acids C18:2 (*Linoleic-omega 6*) and C18:3 (*linolneic-omega 3*). There was a marked decrease in the concentration of the saturated fatty acid C12 (*Lauric*), the monounsaturated C16:1

(*Pamitoleic* ) and the two polyunsaturated fatty acids C18:2 (*Linoleic-omega 6*) and C18:3 (*linolneic-omega 3*). At the same time there was a marked increase in the concentration of the two saturated fatty acids C16 (*Palmitic*) and C18:0 (*Stearic*).