

Effect of dietary orotic acid and histidine supplementation on meat quality and growth performance of broiler chicken

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Objectives: Orotic acid is a vitamin-like substance that affects metabolism and stimulates the growth of living organisms but does not have all the properties characteristic of vitamins. Orotic acid, which is found in high concentrations in cow's milk, is a key intermediate in the pyrimidine biosynthesis pathway. Orotic acid can enter the de novo synthesis pathway for pyrimidines beyond the rate-limiting step, and thereby improve throughput. The object of this study was to evaluate the effect of dietary supplementation with orotic acid and histidine on the meat quality and growth performance of broiler chickens during the long-term feeding period.

Materials and Methods:

Experimental animals and diets 24-14 days-old female ROSS strain broilers were allocated to four groups: [Control group], broilers fed a diet without orotic acid; [Orotic acid 0,6% group], broilers fed a diet with 0,6% orotic acid supplementation; [Histidine 200% group], broilers fed a diet with 200% of required dose of histidine; [Orotic acid 0,6 % + Histidine 200% group], broilers fed a diet with 0,6 % orotic acid and 200% histidine supplementation. Histidine 100% means a histidine requirement. Chickens are fed each diet for 28 days. All nutrition levels fulfilled the requirements of the Nutrition Supplement (2019).

Measurements At the end of the trials, feed intake and body weight were measured for productivity. Blood samples were taken, and breast muscle was collected. Cooking loss, drip loss, and shear force value were also measured was also measured for meat quality in breast muscle.

Results and Discussion:

Growth performance There was a significant difference in feed conversion ratio of the 4th experimental group compared to the control ($P<0,05$). Feed intake was not different among each group. However, Body weight gain was increased significantly in the "Orotic acid 0,6 % + Histidine 200%" group compared with the control group ($P<0,05$). At the same time, there was a significant increase in right and left breast muscle mass in the "Orotic acid 0,6 % + Histidine 200%" group compared with the control group ($P<0,05$). Also, there was a significant decreasing in the abdominal fat level in the "Orotic acid 0,6 % + Histidine 200%" group compared with the control group ($P<0,05$). We have also noticed the significant increasing of Anserine level in 3rd and 4th groups compared to the control group ($P<0,05$). The level of Carnosine was also significantly increased in all experimental groups compared to the control group ($P<0,05$).

Meat quality results There was a step-by-step decrease in drip loss value in the 3rd and 4th experimental groups compared to the control, but this decrease was not significant. However, the cooking loss value was significantly decreased in the "Histidine 200%" group and in the "Orotic acid 0,6 % + Histidine 200%" group compared with the control group ($P<0,05$). At the same time, we can observe a significant decreasing the shear force value in the "Orotic acid 0,6 % + Histidine 200%" group compared with the control group ($P<0,05$). In this study, the effects of orotic acid and histidine supplementation on growth performance and meat quality were investigated. The mass of the breast muscles in all experimental groups was markedly increased. Also, we noticed that there was a decrease in abdominal fat levels in all experimental groups. In the orotic acid-containing groups, this decrease was significant. There was research that indicates that orotic acid can improve the health of livestock because it prevents some cases of ischemic heart disease. It has been suggested that OA may increase myocardial pyrimidine levels, accelerate RNA synthesis, support the development of hypertrophy or improve energy supply. The result of this research allows us to conclude that using orotic acid as a feed supplementation can decrease an abdominal fat level (because of lower energy accumulated level) and as a result improve a health condition.

On the other hand, we can notice that usage of high histidine concentrations can also affect the meat quality, improving the consumer quality indicators. Also, until now there were no experiments regarding the effect of orotic acid on the meat quality attributes such as meat tenderness, drip loss, and cooking loss. In this experiment, we can observe that the cooking loss level was significantly decreased and improve the water-holding capacity of meat during cooking. We can also say that using of orotic acid and histidine supplementation can affect meat tenderness, reducing the hardness of the meat.

Key words: Orotic acid, Histidine, Meat quality, Broiler meat