Chondroitin sulfate and manganese dietary supplementation affects the physicochemical quality of broiler meat

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Introduction: Muscular hypertrophy in genetically improved broilers is considered to cause deficiencies in intramuscular connective tissue formation, causing hypoxia, oxidative stress, and myopathies. These conditions alter the physical, chemical, and nutritional composition of the meat (i.e., crude protein and fatty acid content). In this context, we aimed to evaluate the effect of supplementation with chondroitin sulfate (CS) and manganese (Mn) on the diet of broilers to determine how these elements influence the physicochemical broilers' meat quality.

Materials and methods: A total of 1152 Cobb male chicks were housed during 47 days and distributed in a completely randomized design, in a 4 x 3 factorial arrangement: four doses of chondroitin sulfate (0.00, 0.06, 0.12, and 0.18%) and three doses of manganese (0, 40, and 80 mg/kg), totaling 12 treatments of eight replicates with 12 birds each. In the slaughter process, two breasts were collected per experimental unit, one to assess the presence of white striping myopathy, and the other to determine the chemical quality of the meat, through analysis of the chemical composition, fatty acids (FA) profile, and collagen content. The results were submitted to the analysis of variance and the means were compared by the Tukey test at 5% probability.

Results: For the myopathy presence evaluation, it was found that regardless of CS or Mn diet levels, the breasts showed moderate white striping myopathy. However, it is noteworthy that the control diet without the CS and Mn inclusions provided the breasts with the largest striation sizes (0.78 mm) compared to the striations of the breasts from broilers receiving diets with 0.18% CS and 80 mg/kg Mn (0.64 mm) or with 40 mg/kg Mn (0.64 mm). Regarding meat chemical composition and collagen content, no effects were found for the CS and Mn supplementation levels influence on crude protein, dry matter, ether extract, and ashes, as well for the total and soluble collagen content. However, an effect of SC levels was observed on the FA profile ($P < 0.05$). The 0.12% SC diet increased the percentages of PUFA, nonanoic, elaidic, erucic, and linolelaidic fatty acids on the breast meat compared to the diet without SC. Similarly, the 0.12% SC diet showed high concentrations of PUFA/SFA ratio, eicosatrienoic, arachidonic, and eicosapentaenoic fatty acids, as well as obtained low concentrations of myristic, palmitic, myristoleic, palmitoleic, and n6 fatty acids. In addition, the FA profile was influenced by the Mn levels ($P < 0.05$). The breasts of broilers receiving the diet with 40 mg/kg Mn showed lower levels of pentadecanoic, vaccenic, and arachidic fatty acids, and a greater percentage of docosapentaenoic fatty acid compared to the other levels of Mn inclusion.

Conclusion: The CS supplementation, as well as the inclusion of 40 mg/kg Mn in the diet of broilers can be an alternative to improve the breast meat FA profile, without affecting the chemical traits. Likewise, CS and Mn supplementation possibly minimize the incidence of white striping myopathy.

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