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A quality analysis of breast filets of broiler chickens slaughtered at different ages and fed with various supplementations of histidine and β-alanine (#495)

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Introduction

The high demand for white meat has led to an unbalanced genetic selection for high growth rates and pronounced meat yields in broiler chickens. The accelerated growth rates resulted in increased quality deviations in the meat, especially in the breast filet. Breast myopathies like white striping and wooden breast are significant quality issues characterized amongst other factors by reduced concentrations of the antioxidants carnosine (Car) and anserine (Ans) in affected muscles. The aim of this study was to increase the carnosine concentration in the pectoralis muscle by dietary supplementation with the precursors β-alanine (β-ala) and histidine (His) to improve the antioxidative status and the meat quality in chicken breast filets.

Methods

In this study, 2208 one day old Ross 308 male chicks were randomly allocated to six dietary treatment groups (TG) with 16 replicates and 23 birds in each pen. Feed and water were supplied *ad libitum*. Feeding phases were defined as starter, grower, finisher I and finisher II from 0-10, 11-20, 28-33 and 34-53 days of age. The dietary treatments consisted of a commercial basal diet with a His to lysine (Lys) ratio (His:Lys) of 44 (CON) and two diets supplemented with His having His:Lys 54 (HIS1) and 64 (HIS2). In the other 3 treatments the latter His:Lys ratios were tested with an addition of 0.5 % β-ala (BA_CON; BA_HIS1; BA_HIS2). Meat quality was analyzed in 60 filets per treatment after finisher I and finisher II phases. The filets were stored aerobically under temperature-controlled conditions (4 °C) and analyzed in 4 blocks of 15 filets/treatment after 48 h, 96 h, 144 h and 192 h. Meat quality parameters included sensory analysis, pH, L*a*b* color, grading of white striping, hardness, cooking loss (after 48 h and 192 h) and thawing loss. The concentration of His, β-ala, Car and Ans was measured by a LC-MS/MS based method in 10 filet samples per treatment after 35 and 54 days of age. Data were analyzed using non-parametric tests in Minitab 18®; significance was declared at $p \leq 0.05$.

Results

Growth performance was not affected by the dietary treatments. The concentrations of His and Car were increased in the TG as compared to CON after 35 days of age (both $p < 0.001$). The β-ala concentration in muscle was independent of the β-ala supplementation in the diet, but was lower in all groups with increased His feeding ($p \leq 0.001$). The concentration of Car was independent of the presence of β-ala in the diet, and the Ans content was not different between treatments. The overall trend was similar for the 54 days old chickens but less pronounced. Older chickens had greater concentrations of Ans and His ($p = 0.003$) whereas Car concentration was lower ($p < 0.001$) than in younger animals. Meat quality was not influenced by the different treatments but differences between the slaughter ages were observed, especially regarding general parameters like pH, L*a*b* color, cooking and thawing loss. The pH values were higher in breast filets of older chickens on each measured storage day ($p \leq 0.021$). Filets of chickens slaughtered after 53 days of age showed a higher redness than filets of younger chickens ($p \leq 0.001$) and half of them also showed a higher yellowness. Cooking loss was higher in older chickens whereas thawing loss was lower ($p < 0.001$). The average shelf life of the filets was calculated based on sensory parameters. The shelf life of filets from younger chickens was between 125 and 133 h, but was reduced in older chickens by 10 h ($p < 0.001$). The occurrence of white striping was affected neither by age nor by treatment. However, with moderate levels of His supplementation in the diet, a numerical, albeit insignificant, decrease of the incidence of white striping was observed in the filets of 33 days old chickens.

Conclusion

Increased His concentrations in the breast muscle could be achieved by a high dietary His supplementation, whereas β-ala supplementation did not affect the concentration of β-ala. This result might indicate that requirements for β-ala can be fulfilled by aspartate as natural precursor for β-ala in the muscle with the used basal diet.Therefore, a dietary supplementation of His and β-ala and the increased concentration of the dipeptides Car and Ans seemed to have no influence on meat quality parameters. However, higher concentrations of these dipeptides could increase the nutritional value of chicken meat.

Notes