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Muscovy duck fed black soldier fly larvae meal: effects on blood parameters and antioxidant status

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The black soldier fly (Hermetia illucens, HI) represents a promising alternative protein source for poultry. The aim of the study is the evaluation of dietary partially defatted HI larvae meal inclusion on blood parameters and antioxidant status of female Muscovy ducks. A total of 192 3-day-old female Muscovy ducks were assigned to 4 experimental treatments (6 replicate/treatment; 8 birds/pen) with increasing dietary HI levels (0, 3, 6, 9%, HI0, HI3, HI6, HI9, respectively) in substitution of corn gluten meal. At 51 days of age, after 12h of feed withdrawal, 12 ducks/treatment (2 birds/pen) were slaughtered, blood samples were collected and prepared for further analysis. The total red and white blood cell counts, serum protein, lipid and minerals, liver and renal function serum enzymes were then evaluated. Plasmatic concentration of glutathione peroxidase, total antioxidant status, methylglyoxal, malondialdehyde, 3-nitrotyrosine were evaluated. The collected data were tested by one-way ANOVA using polynomial contrasts to test the linear and quadratic responses to increased levels of HI inclusion in the diet (significance at $P<0.05$). Red and white blood cell, as well as the serum proteins were not affected by dietary treatments ($P>0.05$). Serum lipids were affected by dietary treatment, showing a linear response (minimum for HI9) for triglycerides and cholesterol levels ($P<0.05$). Among serum minerals, Ca and P were not affected by treatments, while Mg and Fe showed a linear response to increasing dietary HI levels ($P<0.05$). Regarding liver serum enzymes, only alkaline phosphatase showed a linear decrease with a minimum for HI9 ($P<0.05$). Renal serum enzymes were partially affected by dietary treatment. Uric acid serum levels were similar among groups, while creatinine showed a linear decrease (minimum for HI9; $P<0.05$). Finally, the antioxidant status results showed a linear decrease with a minimum for HI9 for malondialdehyde and 3-nitrotyrosine ($P<0.05$). The obtained results showed that the dietary inclusion of a partially defatted HI larvae meal could be suitable in Muscovy duck nutrition, with unaffected haematological traits and liver and renal functions. Moreover, a reduction of serum cholesterol and triglycerides was observed, with an improvement of the antioxidant and health status of birds.

Keywords: duck; blood; antioxidant status; black soldier fly